UNIT - I

Financial Derivatives

INTRODUCTION

The past decade has witnessed an explosive growth in the use of financial derivatives by a wide range of corporate and financial institutions. This growth has run in parallel with the increasing direct reliance of companies on the capital markets as the major source of long-term funding. In this respect, derivatives have a vital role to play in enhancing shareholder value by ensuring access to the cheapest source of funds. Furthermore, active use of derivative instruments allows the overall business risk profile to be modified, thereby providing the potential to improve earnings quality by offsetting undesired risks

Despite the clear benefits that the use of derivatives can offer, too often the public and shareholder perception of these instruments has been coloured by the intense media coverage of financial disasters where the use of derivatives has been blamed. The impression is usually given that these losses arose from extreme complex and difficult to understand financial strategies. The reality is quite different. When the facts behind the well-reported disasters are analyzed almost invariably it is found that the true source of losses was a basic organizational weakness or a failure to observe some simple business controls.

The corollary to this observation is that derivatives can indeed be used safely and successfully provided that a sensible control and management strategy is established and executed. Certainly, a degree of quantitative pricing and risk analysis may be needed, depending on the extent and sophistication of the derivative strategies employed. However, detailed analytic capabilities are

not the key issue. Rather, successful execution of a derivatives strategy and of business risk management in general relies much more heavily on having a sound appreciation of qualitative market and industry trends and on developing a solid organisation, infrastructure and controls. Within a sound control framework, the choice of a particular quantitative risk management technique is very much a secondary concern. The objective of this chapter is to examine the growth of financial derivatives in world markets and to analyse the impact of these financial derivatives on the monetary policy.

FINANCIAL DERIVATIVES: RECENT TRENDS

Changing interest rate and exchange rate expectations, new highs reached by equity markets and the sharp reversal of leveraged positions in the latter part of 1998 stimulated activity in derivatives markets in 1998. Exchange-traded business soared in the third quarter of 1998 as investors withdrew from risky assets and shifted their exposure towards highly rated and liquid government securities. Competition between exchanges remained intense, particularly in Europe, where the imminence of the euro and the inexorable advance of automated exchanges challenged the dominance of established marketplaces. Moreover, exchanges continued to face competition from the rapidly growing over the counter (OTC) markets, forcing them to offer a wider range of services to make up for the loss of their franchises. The sharp increase in OTC outstanding positions in the second half of 1998 showed that the need for a massive reversal of exposures following the Russian moratorium more than offset the dampening impact of increased concerns about liquidity and counter party risks. Nevertheless, the turbulence and related losses revealed the weaknesses of existing risk management systems in periods of extreme volatility and vanishing liquidity, prompting market participants to reconsider their risk models and internal control procedures.

FINANCIAL DERIVATIVE INSTRUMENTS

Exchange-traded instruments

The aggregate turnover of financial contracts expanded further in 1998 (by 9%, to $388 trillion). Interest rate products, which remained by far the most actively traded, experienced a sustained increase in activity and reached to $350 trillion. Uncertainty over the course of monetary polity in Europe and North America supported trading in short-term interest rate contracts for much of the 1998, while the flight towards highly rated and liquid government paper boosted activity along most of the yield curve in the second half of 1998. There was, however, a decline in turnover towards the end of 1998 owing to the calming effect of lower official rates, the withdrawal of leveraged investors and the paring-down of positions ahead of EMU. Contracts on equity indices continued to record much faster growth than interest rate products (=16%, to $34 trillion) as new indices were introduced and bouts of downward market pressure and volatility prompted investors to seek protection. In contrast, the wide fluctuations seen in the major currency pairs were not accompanied by an overall upturn of activity in currency-related contracts (-17%, to $3.5 trillion). Aside from the continuing dominance of OTC business in the management of currency risk, observers attributed this subdued activity on exchanges to the stability of European cross rates and investors reluctance to take positions in emerging market currencies.

The CBOT remained the largest exchange in the world (with a 16% increase in the number of contracts traded, to 281 million), owing to the sharp rise in the turnover of US Treasury contracts and the growth of new equity index products. The CME and the CBOE, the next largest US exchanges, also

reported an increase in activity (by13% and 11% respectively, to 227 million and 207 million contracts). In Europe, Eurex Germany (formerly the DTB) posted a new record (+87%, to 210 million) and overtook LIFFE as the third busiest marketplace in the world. The flight t quality in the second half of 1998 propelled its bund futures contract into third position in the interest rate category after US Treasury bond and Eurodollar contracts. However, the squeeze which occurred in German government bonds at the time of the turmoil created concerns that the underlying market might not be sufficiently large to support futures trading in periods of stress. Meanwhile, overall activity on LIFFE declined (by 7% to 194 million), as increases in the area of short-tern interest rate products and in some equity-related products were more than offset by a contraction in government bond instruments. In particular, the exchange's bund contract dried up as trading migrated to Eurex's cheaper electronic system. Despite strong advances in technology; trading on MATIF fell sharply 9 –31%, to 52 million contracts in a context of reduced relative movements between continental European interest rates.

The anticipated consolidation in European interest rate instruments spurred the introduction of plethora of euro-compatible contracts, creating concerns that, in the drive to innovate, liquidity might suffer. Another notable development in Europe was the significant increase in the trading of equity-related products, which benefited from attempts to introduce a variety of new pay-European equity indices and contracts, as well as the reduction in the unit value of certain options. Activity in the Pacific rim was generally subdued, particularly in Japan, where; despite some trading opportunities provided by the "Japan premium", the record low level of interest rate (except for a short period at year-end) reduced the demand for interest rate hedging. There was a tentative recovery in other Asian markets due t more active trading of equity-related

contracts. Nevertheless, activity in Asian and other emerging markets remains a fraction of that in industrial countries in values terms.

The battle for European market share took a dramatic new turn as exchanges that had been based primarily on open outcry, such as LIFFE and MATIF, surrendered to the relentless expansion of screen-based trading. The agreement between the Deutsche Borse (DB) and the London Stock Exchange in July, 1998 while focusing on the cash trading of securities, also accentuated pressures for consolidation and for new regional links. US exchanges, for their part, entered into a number of joint ventures with wholesale market brokers and specialized IT firms to introduce electronic facilities for the joint trading of government securities and related derivative. With the rapid development of trading technology, the battle for supremacy is gradually shifting from the listing of new contracts to the technological arena, to the benefit of a small number of cost-efficient hubs. In this respect, it is worth noting that the proprietary systems of core electronic exchanges are already being challenged by “new generation” trading systems that permit the interconnection of different exchange-traded and OTC facilities (in particular, via the internet). The growing importance of screen-based facilities cutting across product and market segments is creating new challenges for regulators wishing to ensure the soundness and transparency of such systems.

Over-the-counter instruments

Following a pause in 1997, expansion resumed in OTC instruments in 1998. Although the rise in notional amounts of positions outstanding (76%) was inflated by the increases in the number of dealers, the adjusted rate of growth remained significantly higher than the rise in open interest on exchanges (35%

and 9% respectively). In particular, the unwinding of leveraged positions which took place in the second half of 1998 led to an upsurge in the volume outstanding (since, in contrast to futures markets, existing positions are not extinguished by the writing of opposite contracts). However, concerns about credit risk led to a sharp cutback in credit line to weaker counter parties towards the end of 1998 thus acting as a damper on overall market expansion. The activity in *interest rate products* was the main driving force. Faced with heavy losses, proprietary traders and leveraged funds unwound their positions, *inter alia* through asset swapsand structured securities. In addition, the unusual revolution of Japanese interbank rates and bond yields towards the end of 1998 generated some trading. As Japanese banks faced new upward pressures on their interbank liabilities, western-based banks began to offer negative rates on yen-dominated deposits, prompting a reversal of outstanding yen swaps and some activity in interest rate floors.

In the area of *cross-currency derivatives* the fairly steady appreciation of the dollar against the yen until August, 1998 fuelled activity in related options, offsetting somewhat the decline in intra-European business and emerging market currencies. Thereafter, the massive deliver aging of positions in dollar-denominated securities was associated with a parallel unwinding of short yen positions, leading to record volatility in the major exchange rates and a drying-up of activity. There was, however, some improvement in non-Japanese Asian business, as the appreciation of local currencies and the recovery of stock markets allowed a gradual relaxation of monetary policy and a partial resumption of trading in forward contracts.

In the market for *credit derivatives,* the crisis in Asia had already focused the attention of market participants on the issue of credit risk, but its

global extension in the second half of 1998 subjected the market to conflicting influences. On the one hand, concerns about banks' exposure to highly leveraged institutions and emerging market countries created broad interest in instruments offering protection against counterparty risk. On the other hand, the pronounced widening of credit spreads for emerging market names led intermediaries to exhibit caution in providing hedges to lower-rated entities. Moreover, market sources reported that liquidity suffered from doubts about the adequacy of loan documentation, as highlighted by legal disputes between counterparties over hedges arranged on credit exposure to Russia. Buyers of protection faced difficulties in enforcing payment owing to disagreements over the definition of a credit event, the pricing of reference credits and the settlement of contracts.

INTERMARKET LINKAGES AND TRANSPARENCY

OTC derivatives markets at end-June 1998 provide a snapshot of the situation prevailing just before the Russian debt moratorium. Four features are of particular significance in the context of subsequent events. First, notional amounts showed that exposure to changes in interest rates in OTC derivatives markets, which was four times that in exchange-traded markets, was the main source of market risk in the derivatives industry. Such interest-rate-related exposure accounted for two-thirds of the $72 trillion of OTC aggregate notional amounts outstanding reported at end-June 1998 (and for 90% of the $14 trillion on exchanges). It should be noted, however, that the development of sophisticated trading strategies, the related expansion of cross-market linkages and regulatory arbitrage may have reduced the meaningfulness of aggregate data on individual market risk categories. For instance, the high capital costs of cross-currency swaps have resulted in their replication through a combination of interest rate and short-term foreign exchange swaps. This means that the build-

up of currency exposure is not accurately reflected in data on cross-currency swaps.

Second, the national amounts of interest rate and currency-related positions in OTC derivatives markets are now comparable to total cash positions in global banking and securities markets. Notional amounts are generally used as a reference to calculate cash flows under individual contracts. As such, they enable a rough comparison of the potential transfer of market risk in cash and derivatives markets, but they do not provide an accurate measure of the gains and losses incurred in such a transfer A better indicator is the gross market value of OTC contracts, which measures the replacement cost of all outstanding contracts had thy been closed on the reporting date. Such replacement costs stood at $2.6 trillion at end-June 1998 (or 3.6% of the notional amounts).

Third, financial institutions other than reporting dealers have become an important class of counter parties (accounting for 41% of the total notional amounts), reflecting the rise to prominence of institutional and leveraged investors. Anecdotal evidence abounded, even before the LTCM debacle that such intermediaries had built up large positions aimed at profiting from the divergence/convergence of yields and volatility in a variety of fixed income instruments. Indeed, as arbitrate opportunities narrowed, the growing pursuit of such strategies led to an ever-increasing degree of leverage in order to achieve acceptable returns. One widely favoured strategy was the yen carry trade, which involved taking short positions in the yen money markets and long positions in higher-yielding assets in other currencies. The unwinding of such positions in the wake of the Russian moratorium in August, 1998 large repayments of yen liabilities, and apparently precipitated the very sharp appreciation of the yen in September and early October, 1998. Although these strategies were widespread, they could not be directly captured by existing statistics owing to the variety of

channels used to achieve the required exposure to market and/or credit risk. Nevertheless, the strong growth of forex swaps, yen currency options and interest rate swaps since 1995 suggests that the yen carry trade evolved from an initial focus on the cash market to include a wide range of derivative instruments.

Finally, after allowing for the effect of netting arrangement on gross positive market values of contracts, the credit exposure of institutions arising from their undertaking of OTC derivatives positions stood at $1.2 trillion at end-June 1998.While this was considerably smaller than on-balance sheet exposure, with hindsight it appears that this figure seriously underestimated potential credit risk. The LTCM episode may help illustrate this point. LTCM, whose strategy consisted in exploiting price, differentials between wide varieties of financial market assets was perhaps the world's single most active user of interest rate swaps. By August 1998, $750 billion of its total notional derivatives exposure of more than $1 trillion was in such swaps with about 50 counter parties around the world, with none being aware of LTCM's overall exposure. This swap exposure represented more than 5% of the total reported to central banks by dealers vis-à-vis "other" financial institutions. While the current credit exposure of its counter parties was fully collateralized, these had taken no protection against the potential increases in exposures resulting from changes in market values. Only when LTCM's dire situation became known in September, 1998 did counterparties start to seek additional collateral. The fund's efforts to raise cash by selling its most liquid securities were felt in markets around the world, transmitting the shock wave from low-rated and illiquid securities to benchmark instruments.

Thus, even if the Russian default was the trigger, the turmoil of 1998 stemmed primarily from the build-up of excessively large and concentrated exposures to customers who proved to be more vulnerable to market, credit and liquidity risks than had been supposed. The crisis also revealed the inadequacy of information supplied by leveraged investors on the extent of their market risk exposures, the nature of their trading strategies and the validity of their risk management methodologies. While collateral may have provided participants with a sense of protection against the associated credit risk the unexpectedly high degree of interlinkage between positions and intermediaries destabilized even the most highly rated and liquid securities. This showed that core financial markers are insulated less than ever from crises that appear at the periphery of the system since then, lending institutions have begun to review their models' assumptions and to put greater emphasis on stress testing and fundamental analysis.

GLOBAL FINANCIAL INTEGRATION: FINANCIAL DERIVATIVES AND THE MONETARY POLICY

In the past two decades the world has moved even closer together. This has been brought about not only by the dismantling of various regulatory barriers but also, and in particular, by technical innovations. "Global networking" is no longer a mere metaphor for worldwide activities but now describes in very literal terms the advances in information and communication technology which have been a major driving force behind internationalization in many areas of life, but especially in the economy. Within the economic sector, in turn, it is in the financial markets that globalization has been particularly dynamic.

The far reaching changes brought about in the financial markets by innovation in the field of computer technology are layed out in the immaterial character of the goods traded in these markets. Now-a-days, financial transactions are as a rule settled through electronic book-keeping operations and thus much more swiftly and cheaply than before the time of computers. New standards have been set, and not only for the execution of financial transactions. There has also been a huge increase in the quantity of available information – and hence the input for investment decisions – as well as in the speed at which it is processed. Finally, globalization not only stands for product and process innovation, but has also brought institutional investors into the limelight as a special species of financial market players.

Financial innovation, internationalization and institutionalization of investment activities are different but ultimately inseparable aspects of the radical fundamental changes in the financial sector. The markets for financial derivatives – futures and options – can be regarded as the epitome of these new structures. The infrastructure of derivatives markets is geared to international transactions. Trading is as a rule fully computerized, so that portfolio switching can be effected on a large scale within the shortest possible time regardless of geography. The contract volumes and trading practices are tailored to the professional market players. Bearing this in mind, it is not surprising that the derivatives markets are characterized by exceptionally high degrees of internationality. According to the findings of the first global survey of derivatives business, which was carried out by the BIS in the spring of 1995, about half the daily turnover in OTC interest and currency derivatives, amounting to an average nominal value of over US$ 800 billion, is accounted for by cross-border transactions.

It was not only the industrial countries, with their highly developed and rapidly growing financial markets that benefited from the strong increase in international capital flows. Capital on a considerable scale also has flown to the emerging markets since the end of the eighties after their sources of funds had almost "dried up" in the wake of the international debt crisis. According to the World Bank, aggregated net inflows of resources to the developing countries increased from US$ 85 billion to over US$ 250 billion between 1989 and 1996.

The marked increase in international financial flows, the growing speed at which financial transactions are settled and the considerable turnover volumes show the momentum and market forces can gather in an environment largely free from regulation. It is especially this extremely strong dynamism – which according to the critics is reflected in particular in a growing volatility of the financial markets – which is seen as evidence of the fact that the financial sector has now increasingly distanced itself from the real sector of the economy. What is then more natural than reducing the susceptibility of financial markets to abrupt changes in investors' perception by regulating measures?

As even leading economists are warning of the dangers of vagabond financial flows, it is not surprising if sociologists and political pundits use this skepticism to launch a general attach on "globalization". The fear generated in this way can easily be exploited politically. Whereas formerly it was the "gnomes of Zurich", now it is the comparison with AIDS which is cited to demonstrate the danger of stateless financial capital. A contributory factor here may be that for the economic layman it is not easy to correctly interpret the inconceivably high amounts – especially if one is not interested in doing so. A case in point illustrating the abuse of statistics is the derivatives markets. According to the findings of the aforementioned BIS survey, the nominal value

of derivatives contracts outstanding worldwide amounted to US$40,000 billion. Such a virtually incomprehensible figure is well-suited to kindle the fear of financial markets with their uncontrolled growth – in fact, so well-suited that in most cases no mention is made of the fact that the market value of these contracts – which gives an idea of the actual payment lows –a US$ 1,700 billion, amounts for not even 5% of that amount.

The central bank observe and analyse these developments without agitation, but very attentively. This is necessary, if only because the central banks are particularly affected by these changes. Monetary policy measures are focused on the financial markets and use these as channels through which monetary impulses are transmitted. Given financial market players' global scope for action and the associated alternatives, it is by no means a matter of course that monetary policy can always affect financial market conditions in the manner intended. Moreover, the central bank depends on its measures influencing expenditure and price decisions – i.e. real transactions – as desired. If the real and monetary spheres are (partially) detached, this can radically change monetary policy makers' scope for intervention.

Retracing the evolutionary development, so to speak, of monetary policy – beginning with "archaic" forms of direct monetary control by means of credit ceilings and administratively set interest rates, moving on to the increasing use of indirect control mechanisms in still largely segmented markets and finally to a global financial system – one could thus conclude that monetary policy is drifting ever close towards ultimate impotence. Diametrically opposed to this view is the observation that now the financial markets are evidently responding more sensitively than ever before to possible changes in the stance of central bank policy; the research departments of the institutional investors are

incessantly trying to figure out, at a huge expense of time and money, what the future course of the central bank will be. If it really were ineffective, monetary policy would hardly be the focus of so much attention. Is it more reasonable, therefore, to conclude, in direct contradiction to the theory of impotence, that monetary policy makers now have great international leverage and thus exert even more influence than they did in the past?

Importance of monetary policy makers in an environment of globalised markets The importance of monetary policy has been bemoaned in the past in completely different circumstances. The central banks, for example, indeed almost completely lost control over their currencies stock under the system of a fixed exchange rate to the US dollar and unlimited obligatory intervention. There was no talk yet of the globalization of the financial markets, derivative instruments and the predominance of institutional investors at the time. It was not until the floating of the exchange rate vis-à-vis the dollar that the central banks were able to develop and successfully implement their strategy of monetary targeting. Monetary policy in the sense of controlling the national inflation rate is thus only at all possible if specific institutional requirements are met.

Renewed debate about the effectiveness or ineffectiveness of monetary policy is concerned with something else. The question now is: in an environment of globalised financial markets, is the central bank able to influence the price level in the currency area in accordance with its own objectives even if the institutional requirements – above all the protection of the economy against external constraints – are met ? (Let us leave aside the special case of “small, open economies” in this context). The answer is basically yes, for the monetary policy lever is effective as long as there is an adequate demand for central bank

money generated by non-banks' demand for currency, and if appropriate, minimum reserves are required to be held on interbank money. No direct risk to this leverage capability is posed by the globalization of the financial markets.

This may be illustrated more clearly using financial derivatives as an example. In economic terms, derivatives make it possible to trade market price risk separately – without buying or selling the underlying instrument – and consequently with a much lower input of liquidity and capital. The isolation of risks allows the features profile of financial contracts and the risk structure of individual portfolios to be designed very much more flexibly. In the final analysis, derivatives help to implement the financial markets and bring the financial sector closer to a world of perfect markets in the sense of the Arrow-Debreu model. To this extent, they can be regarded as pointing the way for future innovation trends and are therefore also predestined to be a benchmark for assessing the monetary policy implications of globalization.

From a monetary point standpoint, it is essential that financial derivatives basically do not affect the central bank's note issuing monopoly (which as a rule is incorporated in law) and thus cannot compete with the central bank as the supplier of central bank money. The demand for central bank money, too, is basically preserved. It is true that derivatives make it possible to flexibly manage risk positions and thus to insure against a variety of contingencies. But even in the theoretical ideal state of complete hedging possibilities, this would not affect the central bank's ability to control inflation by controlling central bank money.

From the fact that national monetary policy continues to be basically effective, it follows immediately that differences between individual currency

areas in the movement of the price level may continue to exist. Moreover, there are of course also other country-specific characteristics, such as the size of the economy and its degree of diversification and hence its ability to absorb shocks, or the stance of fiscal policy. All these factors result in internationally largely standardized financial instruments – such as government bonds with a ten-year maturity or futures contract traded on them – having differing country-specific risk profiles.

The differing country-specific risk profiles of financial assets have two implications. Firstly, international diversification of financial assets makes it possible to reduce the portfolio risk, as country-specific non-systemic risks can ideally be diversified to such an extent that only the global systemic risk and the exchange risk remain. By structuring assets appropriately, investors basically have the possibility of an interposal smoothing of consumption flows and a simultaneous extension of the range of available investment projects. The resulting wealth-increasing effects of the internationalization of the financial markets are therefore largely undisputed. For the rest, there is good reason to believe that the existing scope for diversification is far from having been fully utilized. Studies suggest at any rate that investment decisions are still marked by a considerable home bias on the part of investors.

The second implication concerns monetary policy direct and explains to a large extent why so much attention is paid in the markets to the central bank's actions : If (relative) risks play a crucial role in the valuation of financial assets and portfolio decisions, it is important to predict price-relevant events as precisely as possible. Market participants' expectations regarding the inflation outlook are a major part of this calculation. As long as players in the international financial markets believe that monetary policy has a systematic

influence on the price level in the domestic currency area, that policy in principle also has an impact on international capital flows. One cannot therefore talk of the impotence of monetary policy.

A characteristic feature of the globalization process is that market players' expectations are playing an ever increasing role. Institutional investors are an important group of market players for whom it is worthwhile; due to the economies of scale available to them, to apply resources on a large scale to processing information and to resort to portfolio shifting in response to even minor changes in expectations. With derivatives they have instruments at their disposal which allow incurring positions in the financial markets at particularly low cost. The combination of innovation and professionalisation thus results in the increased sensitivity of financial markets to expectations. In principle, this should be considered a positive development, for it basically implies that more information affects prices more promptly.

However, one must not overlook the fact that certain incentive structures in portfolio management – such as the measurement of one's own portfolio performance relative to the market – may encourage parallel behaviour and contribute to increasing short-term price fluctuations in the financial markets. Although the empirical evidence of the trend of volatility does not provide any clear results so far there is hardly any evidence of a general and sustained increase in financial market volatility. Recent experiences suggest that while periods of high volatility are more frequent now, price fluctuations on a longer-term average have not increased significantly.

That raises the question of the extent to which the monetary policy latitude must be redefined i.e., the depth the different levels which define the

central bank's latitude. Specifically, the question is to what extent the stability of the financial markets is affected by the process of internationalization, which transmission channels the central bank can and should use, and what bearing this has on the use of monetary policy instruments.

Interdependence between monetary policy and macroeconomic stability: A close mutual relationship exists between the financial system and the central bank's measures. On the one hand, for monetary policy makers the financial markets represent a given institutional arrangement in a given situation. To that extent the central bank is a dependent agent, and in implementing its policy it must take due account of these underlying conditions. On the other hand, the financial sector of a country also reflects the specific impact of monetary policy measures and thus of past central bank policy.

Stable financial market conditions can develop only in an environment of monetary stability. Or, to put it another way : a monetary policy stance which is not in a position to ensure an adequate degree of price stability and to keep inflation expectations at a low level will inevitably prompt efforts to evade these uncertainties, if possible, in order to avoid or at least limit the resulting disadvantages. Viewed from this single, monetary instability can be the driving force behind the emergence of all kinds of hedging instruments in the domestic financial markets. In a world of globalised decisions, other currency areas, too, which are marketed by a higher degree of monetary stability, may be seen as an alternative. Stability based on a country's own efforts does not therefore provide protection against the transmission of disruptions produced by unstable foreign markets.

In seeking to ensure stable financial market conditions, monetary policy makers are thus faced with a dual task: firstly, it is important to prevent structural disruptions and inefficiencies being caused by "evasive innovation" within the national currency area, and secondly, instabilities – say, in the form of sharp price fluctuations in the financial markets-caused by volatile cross-border capital movements must be counteracted.

The thrust of monetary policy aimed at safeguarding domestic stability, as defined in this sense, seems basically unambiguous: inflation expectations, and thus the incentives for evasive reaction, can be minimized by a consistent non-inflationary monetary policy. On the external flank, however, such a policy does not provide unconditional protection against tensions because large-scale and sudden capital movements may be sparked off by a change in the country's relative stability position. In other words, disruptions may also be caused by a "flight to quality" on account of deterioration, in relative terms, of inflation expectations in other countries, and can confront domestic monetary policy makers with a situation which is often described, rather rashly, as a "confidence trap". As a result, there may be increasing pressure to counteract the external imbalances – in the form say, of a sharp appreciation of the domestic currency – by monetary policy measures.

Such a policy course seems extremely risky, for it sacrifices the stabilization of inflation expectations at a low absolute level for the sake of a relative orientation and may even be towed along by excessive speculative market movements. The consequences may be serious : a massive loss of confidence in monetary policy may be caused when the response to changed external conditions is interpreted as a departure from the counter-inflationary policy. At the same time, this may also trigger evasive reactions in the domestic

markets which will lead to hitherto stable basic monetary relationships being eroded and ultimately the ground for the longer-term anchoring of expectations being lost.

Monetary policy makers cannot stand idly by in the event of extreme disruptions. However, they must proceed with utmost care and, above all, be aware of their limits. In the longer run, real capital market rates and real exchange rates which are ultimately decisive are beyond the central bank's control. Yet in the short term, too, any attempt to gear monetary policy to varying objectives will soon be recognized by market participants, thwarted by corresponding counter-movements and in the end possibly be neutralized. Incidentally, it would probably be completely pointless to try and reduce short-term price fluctuations by purely discretionary, supposedly smoothing intervention in the market. Such action would have to be interpreted by market participants as a downright invitation to speculation. The only suitable approach for avoiding excess volatility is to forestall expectations uncertainties as much as possible.

The stabilization of market expectations also seems appropriate in order to counteract the detachment of the real sector from the monetary sector and limit the real economic costs caused by disruption in the financial markets. If continued excessive price movements and increased risk premiums occur on account of highly uncertain expectations, this impedes growth of the real economy through misallocation. This is also one reason why the risk of short term disruptions of the financial system – with corresponding adverse feedback effects on the real economy – has tended to increase on account of the risk concentration on individual market players with the wider use of derivatives. This not only calls for a non-inflationary monetary policy, but poses new

challenges to banking and financial market supervisors. This is true, for instance, in terms of limiting and controlling market price risks or ensuring adequate market transparency.

There is no alternative to a consistent counter-inflationary monetary policy stance, especially in a system of open financial markets. The unambiguous commitment of a growing number of central banks to the objective of general price stability and the successes scored in combating inflation in recent years are clear indications that this fact is being recognized to an ever increasing extent worldwide. One reason for this is no doubt that inflation has clearly shown its "ugly face"in the form of risk spreads and high interest rates precisely because of the internationalization of financial markets. This experience has really inspired the fight against inflation.

Increased complexity of the transmission mechanism: The concept of the transmission mechanism of monetary policy was for a long time marked by the notion that interest rate measures taken by the central bank impact on the national financial markets, which are more or less hermetically sealed off from external factors, and that they trigger parallel movements of domestic interest rates over the whole maturity range. This simple, "mechanistic" idea of the effect of monetary policy impulses has probably never been correct and must be basically rethought in two respects in the light of the globalization of financial markets. Firstly, as a result of the internationalization of capital flows, interest rate stimuli imparted by the central bank are also increasingly being transmitted through the exchange rate channel. Secondly – as mentioned – market participants' expectations are now much more significant than they used to be.

The complexity of the transmission of monetary policy impulses has undoubtedly increased with the globalization of the financial markets. In this connection, derivatives may be cited once again as an example; by raising the flexibility of the risk profile, they also enhance the "exchangeability" between domestic and foreign financial assets. Monetary impulses then diffuse over a correspondingly broader range of markets. The scope for discretionary action narrows in this environment if only because the transmission channels are even more difficult to identify than before and the effect of such action can virtually not be calculated.

It seems that it is not so much the number of transmission channels with their ramifications – i.e. the markets and the available alternative investment facilities – which is significant for a monetary policy stance that is consistent with the target, but rather the fact that the "expectation bias" of the financial markets is constantly increasing. With a view to the transmission process it implies two things. Firstly, the impact of monetary policy is transmitted largely through confidence effects. A discretionary departure from a counter-inflationary course is penalized more quickly and harshly – by capital outflows and rising interest rates. Secondly, expectation uncertainties are more quickly translated into market action and are more likely to lead to periods of high price volatility.

Of key importance in this context is a monetary policy strategy which supplies interest and inflation expectations of private market players with an anchor through a credible formulation of nominal targets. From the theoretical point of view, this suggests a rule-formulation of nominal targets. From the theoretical point of view, this suggests a rule-bound policy – notably in the form of a money stock rule – as it makes monetary policy more predictable. A

medium-term policy of monetary stabilization – with a sufficient measure of flexibility – offers a number of further advantages in terms of steadying expectations; it implies a self-commitment by the central bank, and what is more, responsibilities are more clearly defined than, say, in the case of a direct inflation target. Moreover, the quantity theory furnishes the concept of monetary targeting with a clear theoretical foundation, which is a major reason for its transparency.

Without a reliable nominal anchor for monetary policy it is hardly possible for market players to assess the medium to long-term trends of monetary benchmarks, such as interest rates. This lack of orientation will inevitably lead to frequent revisions of market expectations and correspondingly sharp price fluctuations in the financial markets. Basing the strategy on financial market prices such as interest rates, the yield curve or also exchange rates, particularly seems highly problematical. A monetary policy which is based on such indicators will hardly be in a position, particularly in periods of heightened uncertainty and high volatility, to give reliable guidance to market expectations. In the absence of an external anchor, it will be very difficult for market participants to assess the monetary policy stance; this, in turn, is likely to lead to larger swings in expectations. In the final analysis, the central bank may find itself facing a situation in which, because the monetary policy strategy is geared to market expectations, the intended stabilization of the latter is completely foiled. The strategy of monetary targeting, however, which is geared to the longer term, basically offers a chance of largely decoupling expectations from short-term trend – and hence volatility – through the monetary policy stance. This makes it easier to break the circular connection between the distortion of monetary indicators, uncertainty about the monetary policy stance and increasing price fluctuations.

Implications for the use of monetary policy instruments. Especially in an environment which tends to be more susceptible to shifts in market sentiment, monetary policy makers must have at their disposal a set of instruments which enables them to manage the provision of central bank money as precisely as possible without sending wrong or undesirable signals. There is no room in such a box of monetary policy tools for dirigisme measures – such as credit ceilings or administratively controlled interest rates. For one thing, they are at odds with the primacy of indirect monetary management, which uses market mechanisms and seeks to avoid allocative distortions as far as possible. For another, dirigisme measures would be ineffective anyhow, given the multiplicity of international evasion routes. At the instrumental level, too, the room for selective intervention by monetary policy makers has become negligible as a result of globalization. It is merely a logical consequence that in the operational implementation of monetary policy, the focus worldwide is now on open market policy.

The role of the minimum reserve instrument has changed radically. Whereas in he past the Bundesbank tried to actively influence the bank's money creation leeway by varying the reserve ratios, which were often very high, the minimum reserve instrument is now primarily used to smooth out fluctuations in the demand for central bank money in the money market. The minimum reserves required to be maintained on an average basis can perform the function of a buffer against unexpected liquidity fluctuations during the reserve period. This has a steady effect on the interest rate movements in the money market and enables the central bank to keep its intervention frequency low. Perpetual fine-tuning of the money market, by contrast, not only presents greater technical difficulties. A high intervention frequency in the money market runs a dual risk.

For one thing, the central bank could give the market false signals; for another, the risk of making oneself a prisoner of market expectations will increase.

With a view to derivatives, the question arises of whether they could perhaps provide monetary policy makers with a completely new class of instruments which could be used to exert a more selective and more sophisticated influence on the markets than in the past. Caution is advisable here: it is tempting, of course, to use the leverage effect of derivative instruments in order to implement monetary policy intentions in the markets more consistently. Another consideration is that "discreet" intervention would be possible using derivatives insofar as, for example, the sale of an option does not appear immediately in the central bank's balance sheet.

However, there are serious reservations against making active use of these "technically" tempting features of derivative instruments. The most important objection is no doubt that intervention in the futures market, too, is bound to fail if the interest rate or exchange rate level which the central bank considers desirable is perceived by market participants to be unsustainable. In the event of unsuccessful intervention the leverage which is offered by derivatives will, on the other hand, rebound on the central bank, with all the (undesirable) liquidity effects that were initially avoided.

A potential field of application for derivative instruments is their "passive" utilization as indicators in the monetary decision-making process. Option prices contain information about market participants' expectations which is not available from other sources. Indicators derived from option prices of the degree of uncertainty prevailing in the markets – for instance, implied volatilities and implied probabilities – can provide, at the tactical level, useful

indications for the timing and gauging of money policy measures. It must be ensured, however, the tactical considerations in no way impair a clear strategic orientation of monetary policy. This use of derivatives in the monetary decision-making process, incidentally, rules out their simultaneous utilization for intervention purposes because, in the case of intervention by the central bank, prices no longer reflect market expectations in an unadulterated form.

The increasing professionalism of investment activities has likewise resulted – at least in the broader sense – in an extension of the range of monetary policy instruments. The significance of the central bank's information policy and public relations work is increasing as financial transactions are already triggered by expected central bank measures. This shows clearly the especially close interlinkage of the monetary policy strategy and its practical implementation in an "expectation-biased" environment. A transparent monetary policy strategy-such as, in particular, monetary targeting – provides a much clearer starting point for explaining monetary policy to the general public than an approach geared to looking at everything.

The changing nature of financial industry, especially as reflected in developments in the financial derivatives market, provides considerable opportunities for risk sharing or inter-temporal smothering. Portfolio managers or financial institutions' executives making balance sheet decisions are operating in a constantly changing environment. What happens to the value of the portfolio when interest rate changes and how can the risk of value be measured? How can the interest rate risk be managed with changes in portfolio or balance sheet composition? How can the others risks of the portfolios, such as credit, liquidity, and currency risks, be assessed? What actions can be taken to control or plan for these risks and can value be produced through risk

management activities? Financial derivatives, representing decomposition of risk exposure relative to other assets or future and forward contracts, have had a revolutionary impact on the financial service industry. Financial institutions with a solid asset/liability plan should consider derivatives as a way to reduce exposure to interest rate risk. Derivatives can complement the traditional methods of matching asset and liability to minimize interest rate risk. Though, pricing of derivatives, based on arbitrage and required conditions in financial markets which may not be met in fact, is a complex but an extremely useful in pricing the risk of insurance against bad financial outcomes and pricing complex cash flows associated with a variety of financial instruments.

In the historic transformation of global financial markets, Indian Financial System India also is in the midst of a process of fundamental structural and operational changes due in large part to various combinations of a more intensive competitive environment, the official deregulation moves and the impact of technology. At the same time the pace of financial innovation has accelerated bringing with it changes in the risk characteristics in the financial system. The resulting shifts in the behaviour of market require the authorities, in turn, to revise their regulatory and control methods, calling proper timing and adequate preparation. If deregulatory measures are adopted haphazardly, they can actually do more harm than good to the society. As the first step in the decision-making process leading to the dismantling of financial regulations, the government must determine whether the financial market is mature and resilient enough to adapt to the new financial landscape. These changes are likely to have important implications both for the structure of financial systems, the operation of financial institutions and the conduct and operation of monetary policy and prudential regulation.

Futures-INTRODUCTION

The liberalization and integration of world capital markets in the 1980s was inspired by a combination of hope an necessity. The hope lay in the expectation of more efficient allocation of saving and investment, both within national markets and across the world at large. The necessity stemmed from the macroeconomic and financial instability the instability engendered government deficits and external imbalances that required financing on a scale unprecedented in peace time and that exceeded the capacity or willingness of the traditionally fragmented financial markets to cover. This financing need joined with advances in technology and communications to spawn a host of innovations, ranging from securitization in place of intermediated bank credit to new derivative instruments. Taken together, innovation, technology and deregulation have smashed the barriers both within and among national financial markets.

Today world financial markets are growing in size, sophistication, and global integration. According to an estimate, the international securities transactions amounted to $ 6 trillion per quarter in the second half of 1993 about five to six times the value of international trade-in six Group of Seven countries. This increased volume of portfolio capital movements has made foreign exchange markets much more sensitive to changes in financial markets. These markets have acquired clout as an indicator of the credibility of the government's actual or prospective policies, as a disciplining mechanism for inconsistent government policies, and as an impetus for reform of financial markets in industrial and developing countries alike.

FUTURES MARKETS

In the past several years, derivatives markets have attracted many new and inexperienced entrants. The spectacular growth of the new futures markets in interest rates and stock market indexes has generated a demand for a unified economic theory of the effects of futures markets in commodities, financial instruments, stock market indexes and foreign exchange upon the intertemporal allocation of resources.

The basic assumption of the investment theory is that investors are risk averse. If risk is to be equated with uncertainty, can we question the validity of this assumption? What evidence is there? As living, functional proof of the appropriateness of the risk aversion assumption, there exists entire market whose sole underlying purpose is to allow investors to display their uncertainties about the future. These particular markets, with primary focus on the future, are called just that future markets. These markets allow for the transfer of risk from hedgers (risk adverse individuals), a key element necessary for the existence of futures markets is the balance between the number of hedgers and operators who are willing to transfer and accept risk.

What economic theory of futures markets can explain these phenomena? Keynes viewed the futures market as one where commercial firms hold inventories of commodities and sell futures to transfer the risk of price fluctuations. 'Speculators' are on the other side of the market and purchase these futures at a discount below the expected price. The magnitude of this discount is the risk premium demanded by the speculators. His theory of **'normal backwardation'** has been the subject of controversy. Set of theories of futures markets, based upon the capital asset pricing model (CAPM) or the

intertemporal CAPM, are incapable of explaining the essential features of futures markets.

The quality of positive economic theory must be judged by its ability to explain with precision clarity and simplicity the key elements of a complex economic phenomenon. Theories which ignore or cannot explain the basic characteristics cannot qualify as relevant or good theories of futures markets. The main characteristics of futures markets to be explained by a good economic theory are: (i) there is only a small number of actively traded products with futures contracts. The trading unit is large and indivisible; (ii) Almost all of the open interest is concentrated in the nearby contract, which has a maturity of no more than three months; (iii) The success ratio of new contracts is about 25 per cent in world financial markets. Some new contracts succeed and then, which seem to have similar useful features, fail; (iv) Futures are seldom used by farmers. Instead, they are forward contracts. The main users of agricultural futures are intermediaries (dealers) in the marketing process; (v) There are both commercial and non-commercial users of futures contracts in interest rates and foreign exchange. The commercial users are to a large extent dealers: intermediaries in the marketing process; (vi) The position of the commercials and dealers in interest rate futures are almost evenly divided between long and short positions; (vii) The main use of futures by the commercials is to hedge corresponding cash and forward positions; (viii) The positions of the non-commercials are almost entirely speculative positions; (ix) In foreign exchange futures, the positions of the commercials are unbalanced. In some currencies they are net short and in others they are net long. However, their positions are primarily hedging against corresponding cash and forward positions. The non-commercial positions are against corresponding cash and forward positions. The non-commercial positions are overwhelmingly speculative positions; and,

finally, futures are used in the underwriting of fixed income securities but not in equity underwriting.

Each of these characteristics entails risk. The spectacular growth of the derivatives market and the heavy losses incurred recently by several firms undertaking derivative transactions has reinforced concerns about the possible risks involved. Need to accelerate the implementation of sound risk management practices is well recognized to maintain the stability of the derivatives market. With pools of high-yield-seeking capital growth rapidly, with the technology of international capital markets making it cheaper and easier to alter the composition of portfolios at short notice, and with institutional fund managers under continuing pressure to deliver high performance, the importance of systemic risk control management cannot be over-emphasized.

The economic theory of futures markets focus upon the inter-related questions. How do the futures markets affect the intertemporal allocation of resources? To what extent do these markets post relevant information concerning supply and demand at a later date? How do these markets affect the risk premiums that producers charge, when the prices of output or of input are uncertain? These questions can be combined into the following: How do futures markets affect the supply functions of output, when there is price uncertainty? What are the welfare effects of the futures markets? To what extent does the diversity in the forecasting ability of the futures speculators simply result in transfers of wealth among themselves and to what extent does it affect the output produced, the price paid by the consumer and the variance of that price? How does the existence of futures markets affect the level of expected production and the variance of the price paid by consumers, relative to the situation that would prevail if there were no futures markets? How can we

evaluate the extent to which a particular futures market changes the economic welfare? Does trading in financial instruments serve any economic purpose?

These questions are of great interest to the policy makers as well as to the academics. Extensive trading in financial futures and increased volatility in security prices and interest rates affect the formation of real capital in the economy (particularly that of a long-term nature) and the structure of liquidity in the credit market.

Widespread recognition of the need for continued progress is felt to reduce the sources of systematic risk. Recent important initiatives that have been taken include: (i) a proposed extension of the 1988 Basle Capital Accord. (The Basle Accord established in international framework for measuring regulatory capital and setting capital adequacy standard). Proposals include a more comprehensive treatment of the market risk of derivative positions, including separating banks' loan the trading books; isolating market risk, including risk of unexpected interest and exchange rate changes from specific risk; and allowing banks to reduce credit exposures through bilateral netting (that is, creating a single legally binding net position that replaces a large number of gross obligations; (ii) improved disclosure and accounting standards. More transparency about consolidated positions in the derivatives market would help lower the risk of precautionary runs based faulty information; (iii) improved market infrastructure. Initiatives include moving to real time gross settlement systems, which provide immediately finality of payments, thereby reducing settlement risk, and adopting a clearing house structure for netting and setting standardized over-the counter derivatives.

FUTURES CONTRACTS AND FUTURE TRADING

The future contract is an agreement to buy or sell an asset at a certain time in the future for a certain price. Equities, bonds, hybrid securities and currencies are the commodities of the investment business. They are traded on organized exchanges in which a clearing house interposes itself between buyer and seller and guarantees all transactions, so that the identity of the buyer or seller is a matter of indifference to the opposite party. Futures contracts protect those who use these commodities in their business.

Futures trading are to enter into contracts t buy or sell financial instruments, dealing in commodities or other financial instruments, for forward delivery or settlement, on standardized terms. The major functions performed by future markets are: they facilitate stockholding; they facilitate the shifting of risk: they act as a mechanism for collection and dissemination of information: and they perform a forward pricing function. To perform these functions for future trading, the customary condition is that there must be variation in the price of the actual commodity under consideration; second, there must exist economic agents with commitments in the actual market; and third, it must be possible to specify a standard grade of the commodity and to measure deviations from this grade. As a result of the first two conditions, some economic agents will face a price risk and there will be a demand for hedging facilities. A futures market established specifically to meet purely speculative demands is possible but is unknown. The third conditions which are thought of necessary for the establishment of futures trading are the presence of speculative capital and financial facilities for payment of margins and contract settlements. In addition, a strong infrastructure is required, including financial, legal and communication systems.

Financial futures contracts exist to provide risk management services to participants. Risk and uncertainty in the form of price volatility and opportunism are major factors giving rise to future trading. Futures trading evolved out of autonomous forward contracting by merchants, dealers and processors, designed to increase business efficiency. Indeed, early futures markets were viewed as delivery markets in which transactions were facilitated by the provision of uniform rules on grade and delivery terms, and the security provided b the clearing houses in guaranteeing individual contracts. This evolution from spot to forward to futures contracts suggest a progressive adaptation of institutions to more efficient methods of dealing with price risk. It is frequently argued that a pre-condition for futures trading is a well developed cash market and the breakdown of forward contracting. Futures markets develop because they are a more efficient means of transferring those contract rights attached to price. Spot and forward contracting may become too costly. However, these three contracting modes are not mutually exclusive ways of transacting. Indeed, the development of futures markets improve the efficiency of spot and possibly of forward contracting. It is perhaps best to view futures markets as '**side'** markets designed to deal with price volatility that is poorly handled by spot and forward markets. This transactional superiority of futures markets comes mainly from their transaction cost reducing attributes.

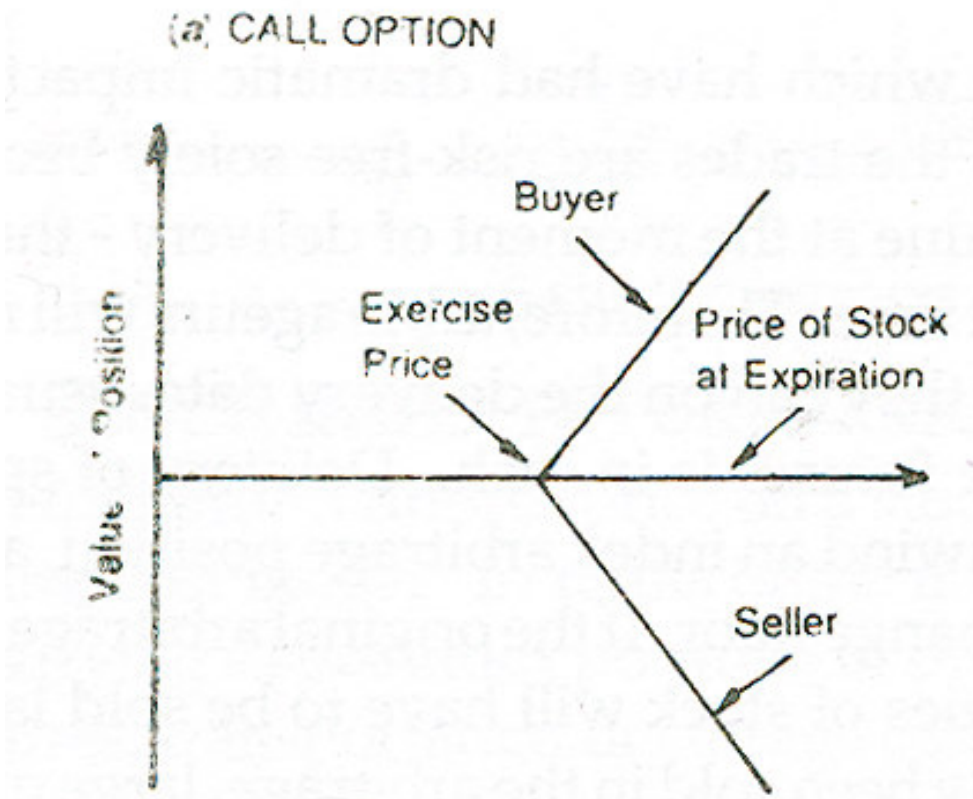
Futures markets, by forming prices relating to forward delivery dated, project their prices into the future. These prices are used by agents to plan future production to price forward contracts for the supply of commodities, and to tender for forward contracts. Agents need not transact on future exchanges to use futures prices in this way, and the information contained in such prices is an externality to them. Agents may also use futures markets in deciding whether to store a commodity (using the forward premium as an indicator of whether

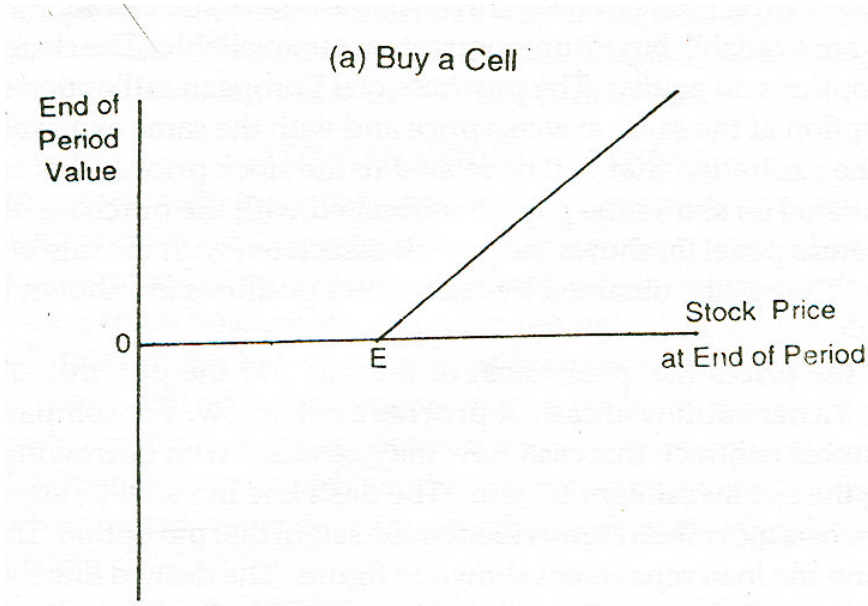
storage is expected to be profitable). In addition, futures markets may help agents to decide the timing of inputs purchases and of processing activities according to the expected outcome of hedging. Agents in these latter two categories are, of course, transactors on futures markets. Thus, futures markets perform a forward pricing function, and in these ways futures prices facilitate the allocation of resources between present and future uses.

FUTURES VERSUS OPTIONS

Investors occasionally make the mistake of confusing a future contract with an options contract. Some analogies can be made between futures contracts and option contracts. Both involve a predetermined price and contract duration. An option, however, is precisely that an option. The person holding an option has the right, but not the obligation, to exercise the put or call. If an option has no value at its expiration, the option holder will allow it to expire unexercised. But with futures contracts, a trade must occur if the contract is held until its delivery deadline. Futures contracts do not expire until exercised. One party has promised to deliver an asset, which another party has promised to buy. It is also possible for one or both parties to the trade to transfer their half of the promise to someone else via an offsetting trade.

Figure 1 contrasts the situation faced by the buyer and the seller of a call option with the situation faced by the buyer and the seller of a futures contract. Specifically, terminal values for buyers and sellers are shown at least possible moment the expiration date for the option and the delivery date for the futures contract.


(a) CALL OPTION
Buyer
Exercise Price
Price of Stock at Expiration
Seller



As shown in panel (a), no matter what the price of the underlying stock, an option buyer cannot lose and an option seller cannot gain on expiration date. Option buyers compensate sellers for putting themselves in this position by paying them a premium when the contract is signed. However, the situation is quite different with a futures contract. As shown in panel (b), the buyer may gain or lose, depending on the price of the asset in the delivery month. Whatever the buyer gains or loses an exactly offsetting loss or gain will be registered by the seller. The higher the contract price (that is, the price of the futures contract when the buyer purchased it from the seller), the greater the likelihood that the buyer will lose and the seller will gain. The lower the contract price, the greater the likelihood that the seller will lose and the buyer will gain.

Synthetic futures contract can be enacted even in the case of such assets for which both put and call options are available but future contracts are unavailable. The clearest example involves European options on equity. The

purchase of a European call option and the sale of a European put option at the same exercise price and with the same expiration date will provide a value at the expiration that will be related to the stock price at that time. This is shown in Figure 2 Pane (a) shows the pay-off associated with the purchase of a call at an exercise price E, whereas panel (b) shows the pay-off associated with the sale of a put at the same exercise price. The results obtained by taking both position are shown by the solid line in panel (c).

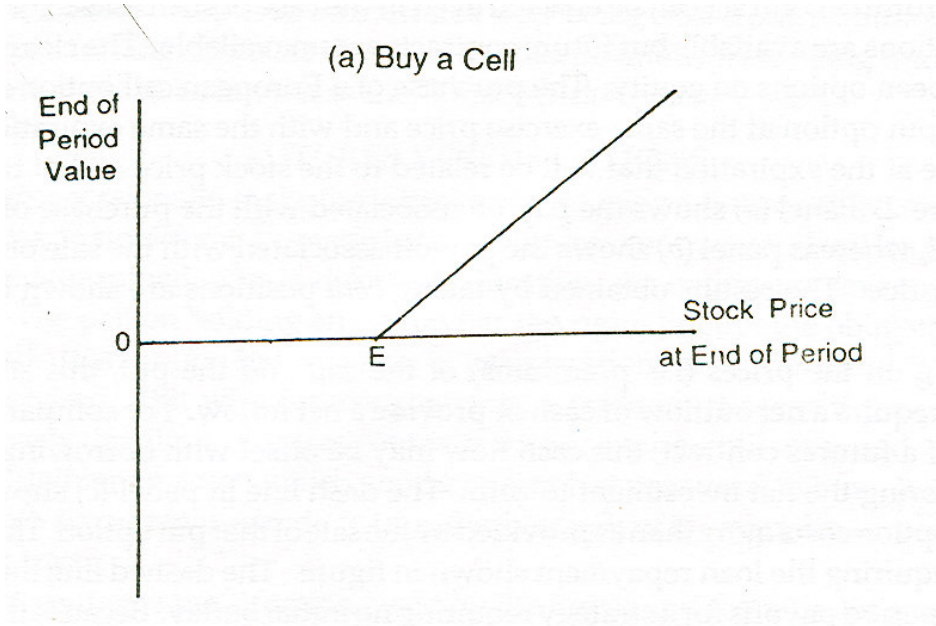
Depending on the prices (i.e. premiums) of the call and the put, this strategy may initially either require a net outflow of cash or provide a net inflow. For comparability with the purchase of a futures contract, this cash flow may be offset with borrowing or lending as required to bring the net investment to zero. The dash line in panel (c) shows a case in which the call option costs more than as provided by the sale of that put option. The difference is borrowed, requiring the loan repayment shown in figure. The dashed line thus indicates the net end of period payoffs for a strategy requiring no initial outlay. Because these payoffs are equivalent to the payoffs for a strategy requiring no initial out lay. Because these payoffs are equivalent to the payoffs from a futures contract with a contract price equal to F, a synthetic futures contract has been created. In practice, however, the equivalence is not perfect. Moreover, synthetic future is not market to market on a daily basis. Despite these differences, the existence of well functioning markets for call and put options will enable investors to create arrangements similar to futures on the underlying asset synthetically.

FUTURES VERSUS FORWARD MARKETS

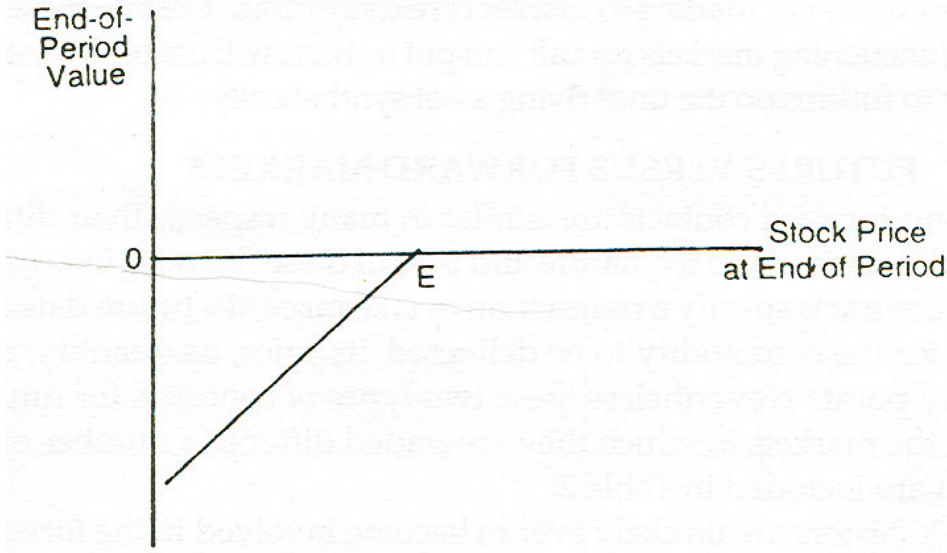
While futures and forward contacts are similar in many respects, their differences are more important to fully understand the nature and uses of these financial instruments. Both futures and forward contracts specify a transaction to take place at a future date and include précis requirements for the commodity to be delivered, its price, its quantity, the delivery date, and the delivery point. Nevertheless these two types of contracts for future delivery of a commodity and the markets in which they are traded differ in a number of significant ways, some of which are included in Table 2.

Although most investors are unlikely ever to become involved in the forward market, it is important to understand some of the attitudes, particularly as a good deal of the literature on pricing futures contracts typically refers to these contracts interchangeably. Specifically, it might be inferred from Table-2 that differences resulting from liquidity, credit risk, search, margin, taxes and commissions could cause futures and forward contacts not to be price identically. For instance, in dealing with price risk, futures contracts have several transactional advantages relative to spot and forward contracts. Sequential spot contracts that are spot contracts where the terms of the contract are re-negotiated as events unfold; do not inject any certainty into the transaction. Such a method of contracting is particularly liable to the hazards of opportunism and may deter investment because of the relatively high probability that the contract will be reached. On the other hand, forward and futures contracts inject some certainty into their transaction. Both share the property that the parties agree to perform the terms of the contract at some future date. In fact, time-dated contracts are generally costlier to enforce than spot contracts. This is due to the absence of the self-enforcing, near simultaneous exchange of value

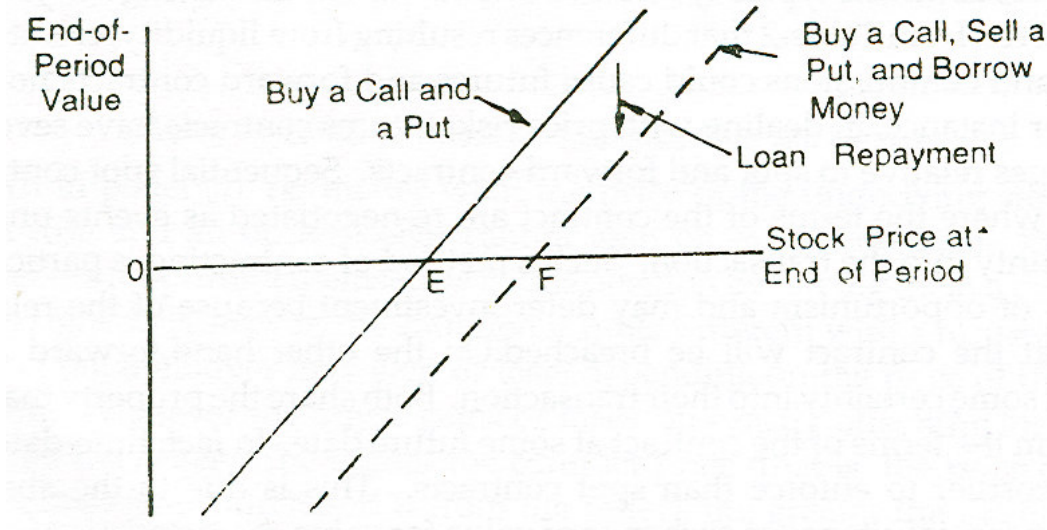
for value characteristic of spot transactions and the greater uncertainty attached both to the eventual outcome and each party's compliance with the terms of forward contracts.



(b) Sell a Put



(c) Multiple Positions



A Comparison of Futures and Forward Markets

	Future Market		Forward Market
1.	Trading is conducted in a competitive arena by "open outcry" of bids, offers, and amounts.	1.	Trading is done by telex or telephone, with participants generally dealing directly with broker-dealers.
2.	Contract terms are standardized with all buyers and sellers negotiating only with respect to price.	2.	All contract terms are negotiated privately by the parties.
3.	Non-member participants deal through brokers (exchange members who represent them on the exchange floor.	3.	Participants deal typically on a principal-to-principal basis.
4.	Participants include banks, corporations financial institutions, individual investors, and speculators.	4.	Participants are primarily institutions dealing with one other and other interested parties dealing through one or more dealers.
5.	The clearing house of the exchange becomes the opposite side to each cleared transactions; therefore, the credit risk for a futures market participant is always the same and there is no need to analyze the credit of other market participants.	5.	A participant must examine the credit risk and establish credit limits for each opposite party.

6.	Margins deposits are to be required of all participants.	6.	Typically, no money changes hands until delivery, although a small margin deposit might be required of non dealer customers on certain occasions.
7.	Settlements are made daily through the exchange clearing house. Gains on open positions may be withdrawn and losses are collected daily.	7.	Settlement occurs on date agreed upon between the parties to each transaction.
8.	Long and short positions are usually liquidated easily.	8.	Forward positions are not as easily offset or transferred to other participants.
9.	Settlements are normally made in cash, with only a small percent age of all contracts resulting actual delivery.	9.	Most transactions result in delivery.
10.	A single, round trip (in and out of the market) commission is charged. It is negotiated between broker and customer and is relatively small in relation to the value of the contract.	10.	No commission is typically charged if the transaction is made directly with another dealer. A commission is charged to both buyer and seller, however, if transacted through a broker.
11.	Trading is regulated.	11.	Trading is mostly unregulated.
12.	The delivery price is the spot price.	12.	The delivery price is the forward price.

Forward and futures contracts differ, however, in their susceptibility to opportunism, especially in their role of reducing price risk. First forward contracts that cover all feasible contingencies are costly to devise. The information and transaction costs will thus preclude a fully specified forward contract and this contractual incompleteness will give rise to enforcement and execution difficulties. Incomplete contracting has a clear economic justification. Given the cost of tailoring the contract to the particular needs of the parties, it will usually be cost-effective to use standard form contracts. In this regard, organized forward and futures contracting have identical properties. Nevertheless, enforcement and execution difficulties can be expected to pose a more serious problem for forward contracts. This is so for several reasons. First, in forward contracting, individuals will have to incur the expense of determining the reliability risk of the opposite party. To the extent that there are scale economies in such specialization by identity, forward contracting will be more expensive than organized futures contracting where the exchange ensures the integrity of its members and trading practices. Forward contracts also are subject to high enforcement costs where personal markets sanctions are weak. The penalty risk of contract law is costly to enforce and may not deal effectively with all types of breaches.

Another disadvantage of forward contract is that they are **tied** transactions. The forward contract transfers rights relating to quantity, quality and price. The last, however, may best be separated, especially when the parties are risk averse and their access to insurance markets limited. Price changes have an unfortunate zero-sum quality that increases the likelihood of opportunism. Thus, while forward contracts may inject certainty into the quantity and possibly quality dimensions of future transactions, it is not clear that they are the least

cost adaptation to price risk. Depending on the transaction costs in alternative markets, and the strength of governance in each, it may be desirable for both risk-spreading and opportunism-reducing reasons to separate price risk from the other aspects of time-dated transactions. Since spot, forward and futures markets deal in different bundles of rights among different individuals, rights can be divided between those relating to quantity and quality, and those counseling certainty of profits and costs. Forward contracts, especially in personal markets, are best suited to ensuring that contract terms relating to the former are complied with, whereas futures contracts deal with price volatility.

Future contracts permit the price risk to be separated from the reliability risk by removing the former from the set of factors giving rise to opportunism. The governance structure supplied by the exchange authority effectively eliminates reliability risk from futures trading. The seller of futures contracts incurs a liability not to the buyer, but to the clearing house, and likewise the buyer acquires an asset from the clearing house. The clearing house in effect guarantees all transactions. In addition, the exchange rules, especially regarding its members' contract, severely limit their ability to behave opportunistically. Organized exchanges greatly reduce default and reliability risk from future contracts. This is achieved by transferring transactions over price risks from a personal to an impersonal market through standard form futures contracts traded in a self-regulated market price.

Future contracts are standard form contracts with only one negotiable term: **Price.** The standardization of future contracts has significant implications for transaction costs. This is so for several reasons. First, contract standardization eliminates the cost of bargaining over non-price terms and of enforcing contract provisions. Second, it reduces monitoring costs that are

generally incurred in principal-agent relationships. The principal only needs to give his broker instructions as to price and quantity which are easily observed. The monitoring costs in the futures market are, therefore, significantly lower than those in the spot market, where numerous other matters require attention and provide the broker with opportunities to take advantage of the principal. Third, contract standardization makes all futures contract is not a property shared by forward contacts.

The liquidity and competitive nature of future trading also reduce the waiting costs of brokers and speculators for acceptable bids and offers. One component of the transaction costs of futures trading is the ask-bid spread which in a competitive situation, is directly correlated with the search costs of finding acceptable bids and offers. We may live in the information age, but much of the information we deal with every day is often perplexing. Perhaps most confusing of all is the world of finance. We are deluged with data, analyses with incomplete information, buyers and sellers will have to search each other out. The costs of such search activity will differ and will be greater the more geographically dispersed and heterogeneous are buyers and sellers. In fact, the transaction cost arises because the parties to transactions are different individuals with asymmetric information, divergent motives and mutual suspicions and because expenditure of resources can reduce the gap in information and protect the parties against each other. Search costs will not only raise the cost of activities but may preclude otherwise value maximizing transactions from taking place. The importance of market liquidity arise not only because it reduces waiting costs, but also because it ensures that competitive pressures exist to keep waiting cost to a minimum for any volume of trade. Competition among the futures traders will have the effect of weeding out these with excessive search costs and poor forecasting ability. Large speculators make

consistent profits whereas small traders make losses since the performance difficulties occasioned by opportunism raise the cost of transacting. Each party is confronted by what can be termed a reliability risk – the risk that the other party will default either on the whole transaction or on individual terms in a way that decreases the expected wealth of the non-defaulting party. Reliability risk is an important source of transaction costs because it will pay individuals to guard against opportunism and contract breach. Acquiring information on the reliability of those with whom one transacts yields benefits in the form of reduced losses due to default and incomplete or inferior performance. Degree of success of futures markets can be explained in terms of a net benefits function. The most actively traded commodities have the most variable prices. Choices can be made among contractual arrangements on the basis of maximum net benefit, taking account of transaction costs.

STRATEGIES FOR FUTURES MARKETS.

Today ‘s financial manager must be able to use all of the tools available to control a company’s exposure to financial risk. Derivative securities have been very successful innovation in capital markets. Financial futures markets are an increasingly important feature of the world’s major financial centres. The introduction of financial futures in the 1970s brought trading volume to previously unheard of levels and entirely changed the character of futures markets. Markets for options, stocks, bonds, index funds, foreign currencies, and other currencies have been profoundly affected by the introduction of related future contracts as well s future options. Recently active financial futures markets have been introduced in developed and developing countries alike. Programme trading, a wide array of most futures contracts as well as futures options, lower transaction costs, increasing trading volume, expanded trading

hours, electronic trading, and domestic and international intermarket links continue to tie all of these financial markets into a remarkable a tight and efficient financial trading network. Markets for options, equities, bonds, index funds, foreign currencies, and other currencies have been profoundly affected by the introduction of related future contracts as well as future options.

Futures markets are to provide an opportunity for market participants to hedge against the risk of adverse price movements. Futures are obligations to buy or sell a specific commodity on a specific day for a present price. Shares, bonds and currencies are the commodities of the investment business. Just as the dramatic changes in the price rise affect farmers, rice mills and ultimately the consumer so does the changes in interest rates, the relative value of currencies and the direction of the stock market send ripples—and sometimes waves—through the financial community. Futures contracts based on a financial investment or a financial index are known as *financial futures.* Financial futures can be classified as (i) stock index futures; (2) interest rate futures; and (3) currency futures.

In modern life financial engineering approach keep people and business going. Today, futures markets are dominated by large commercial firms who interact with professional risk bearers. Those who want insurance against price risk should either buy options or engage in forward transactions. In the world financial markets, futures markets are used by commercial firms to manage but not to eliminate, the price risk inherent in their ordinary business. Major users of futures markets are dealers and financial intermediaries who are professional risk—bearers. If they did not use the futures markets, the risk premium that they would have to charge their customers would significantly decrease the demand

for their services. Anticipating what this approach will cost fuels the futures market.

The investment manager can tailor a given risk position in a variety of ways. Without financial futures, investors would have only one trading location to alter portfolio positions when they get new information that is expected to influence the value of assets – the cash market. If they hear economic war that is expected to impact the value of an asset adversely, investors want to reduce their price risk exposure to that asset. The opposite would be true if the new information is expected to impact the value of an asset favourably; an investor would increase price risk exposure to that asset. There are, of course, transactions costs associated with altering exposure to an asset – explicit costs (commission), and execution costs (bid-as spread and market impact costs).

Thus, the futures market is an alternative market that investors can use to later their risk exposure to an asset when new information is acquired. But which market – cash or futures – should the investor employ to alter a position quickly on the receipt of new information ? The answer is simple : the one that most efficiently achieve the objective. The factor to consider is liquidity, transactions, costs, taxes and leverage advantages of the futures contract.

There are four basic strategies for using the futures markets : ***speculation, hedging, spreading and arbitrate.*** The most important distinction between these uses is their different risk-return characteristics. Speculating in futures increases risk not only by undertaking a futures position with potential high returns but also with the risk of a large loss. Hedging exists when a future position is taken to reduce the risk of a current or anticipated cash position. Spreading involves taking almost offsetting future positions that create a net

position that typically possesses significantly less risk than pure speculation, but has lower expected returns. Arbitrate provides a risk-free profit when a trader takes opposite positions in a cash asset and the associated futures counter it when these respective instruments are mispriced in relation to one another.

Speculators wish to take a position in the market. Either they are betting that a price will go up or they are betting that it will go down. In other words, a speculative position can be either a long or a short. A long position occurs when the futures contract is purchased; profits arise when prices increase. A short position when its futures contract is sold, a short trader profits when prices decrease.

Speculative futures positions are very profitable for those who are able to forecast correctly both market direction and the extent of the market move. This profitability is enhanced because the speculator needed to put up only a small percentage of the value of the underlying cash instrument for margin, there by allowing a significant degree of leverage. Of course, if a speculator forecasts incorrectly, then the mark-to-market rules cause a cash outflow as the futures position deteriorates. Consequently, a speculator needs forecasting ability and substantial knowledge of the underlying cash markets, plus sufficient funds to overcome a short-term (or permanent) loss of funds from losing trades.

There is an important difference between speculating using forward markets and speculating by buying the underlying asset in the spot market. Buying a certain amount of the underlying asset in the spot market requires an initial cash payment equal to the total value of what is bought. Entering into a forward contract on the same amount of the asset requires no initial cash payment. Speculating using forward markets therefore provide an investor with

a much higher level of leverage than speculating using spot markets. In the highly leveraged futures markets, minimums are set to ensure that the speculators can afford any potential losses. For this very reason a levy of 15 per cent margin on the contract price has been suggested in the Bombay Stock Exchange plans to introduce futures trading on the exchange parallel to cash transactions on the market. The percentage of margin is to be constant throughout the contract but the amount of margin will vary based on the mark to market price. Members are to pay margins on all futures contracts on a gross basis.

In a volatile market, the speculator needs to establish realistic goals for trades. After reaching these goals, it is best to cover the trade. If a speculator becomes emotionally involved in a position (which generates greed and fear), the ability to make a realistic decision about covering a position is impaired. Some speculators attempt to circumvent such emotional considerations by placing special trading orders with the broker so that the trader is automatically removed from a disadvantageous situation. Although such orders are useful for speculators who are not in constant contact with the market and have specific forecasts of market movements, many active traders believe that recognizing the current trend in the market and then adapting to that trend is more important than mechanical position trading.

Whereas speculators wish to take a position in the market, hedgers want to eliminate an exposure to movements in the price of an asset. *Hedging with financial futures is an art as well as a science.* By future hedging, we mean to take a position in futures contracts that offset some of the risk associated with some given market commitment. The essence of hedging is the adoption of a future position that, on average, generates profits when the market value of the

commitment is higher than expected. The notion of designing a futures strategy to generate losses under certain circumstances may seem quixotic to some. One must keep in mind the well-repeated adage:" There are no free lunches". One cannot expect trading profits as well as risk reduction (although that sometimes happens). The key is to coordinate losses in futures with gains elsewhere, and vice versa. How does one achieve that kind of coordination? Such futures are not an answer to all investment management problems, but they do provide the finance manager with new means to act upon market decisions. An understanding of the futures contracts and how the futures markets operate is critical to designing a successful hedge strategy. As with any innovative technique, potential hedgers need to take the time to study the markets and determine the risk/return potential for each application.

In order to profit from a spread transaction the trader attempts to determine whether the size of the difference between the prices of the two contracts will increase or decrease. A spread earns a profit if the correct direction of the price difference is forecasted and the appropriate spread transaction is set up in conjunction with the changing price structure of the future contracts.

Spreaders must forecast the relevant factors that cause changes in the spreads. Change in financial futures spread depends upon the behaviour of interest rate. A profitable spread creates a gain on one side of the spread that is larger than the loss on the other side of the spread. A pure speculator would make more money by taking only the profitable side of the market; however, a spread reduces the risk of a position in case the forecast is incorrect. In recognition of the reduced risks, margins on spread positions are much less than the margins on pure long or short positions, and hence the leverage for spreads

is increased. Risk is reduced, since both sides of spread usually move in the same direction, even though their prices can change by different amounts.

Arbitrage exists when a trader is able to obtain risk-free profits by taking one position in the cash market and an exact opposite position in the futures market. The arbitrage position is covered later by delivering the cash security into the futures position. The arbitrageur can close the position prior to delivery if the profit potential has been achieved; this situation occurs principally in the stock index futures market because of the price swings.

Arbitrage keeps the futures and cash prices in line with one another. This relationship between the cash and fair futures prices is expressed by the simple cost of carry pricing. This pricing shows that the fair futures prices are the set of buying the cash asset now and financing this asset until delivery into the futures contract. If the current futures price is higher than the fair price dictated by the cost of carry pricing, then arbitrage is possible by buying the cheaper instrument (the cash) and selling the more expensive instrument (the futures). Alternatively, if the current futures price is less than the fair price, then the arbitrageur purchases futures and sells the cash short. This activity forces the prices of the cash and futures instruments back into their appropriate relationship.

Futures markets reflect the buying and selling activities of many buyers and sellers of the homogeneous contract. Firms often have the power to affect the market price in cash and forward markets because they are merchandising contracts custom-made to the two parties. However, a single party is less able to affect the price in the broad futures market, i.e., the ability of the firm to trade large quantities without affecting the price is one of the main reasons why the new futures markets in financial instruments have flourished.

Futures markets disseminate information quickly, effectively and inexpensively, and thereby reduce monopoly power. In the cash and forward markets, a large firm has a substantial advantage over a smaller firm. The larger firm has more extensive and reliable information concerning current and impending developments. It is difficult for a small firm to gauge the reasonableness of the dealer's offer because the costs of search are high. When there is a futures market, potential buyers and sellers have means of gauging what a broad group of buyers and sellers expect will be the subsequent price of the commodity specified in the futures contract and there is a historic relation between the price of the specific commodity in position and the commodity specified in the futures contract. The parties evaluate the reasonableness of the dealer's often in terms of its relation to the futures price.

In the future markets, who can beat the market? It is observed in most of the studies that small speculators are big losers, large speculators are small winners, and hedgers are big winners. Since the profits of the large speculators for the individual futures markets are small, the speculators do not earn sufficient profits to compensate for the risk of trading in futures markets. *Why do small trades continue to trade if they consistently lose money?* The possible reason to this may be :- (i) small speculators enjoy 'playing the game'; it is exciting, dynamic, and a great conversational topic; (ii) small speculators believe they can forecast; in other words they remember their profits but forget their losses; (iii) losers drop out, with their places being taken by new small speculators; meanwhile winners become large speculators; (iv) the perceived ability of potential large gains is greater than the disutility of small losses with the possibility of large losses discounted as being "unlikely" by the small speculators.

Swaps -INTRODUCTION

Today's financial swaps markets have their origin to the exchange rate instability that followed the demise of Bretton Woods system in the early 1990s and to the controls on international capital movements that most counties maintained in those days. Swaps are at the center of the global financial revolution. Fantastic numbers and growth are talked of. All this is true. But what is also certain is that the current heady acceleration f this market cannot continue. Otherwise, there will be no other activity left-only swapping. Already the shakeout has started. In the "plain vanilla" dollar sector, the profits for brokers and market makers, after costs and allocation of risk capital, are measured in fewer than five basis points. This is before the regulators catch u and force disclosure and capital haircuts. At these spreads the more highly paid must move on to currency swaps, tax-driven deals, tailored structures and Schlock swaps.

What is certain that, although the excitement may diminish, swaps are here to stay. Already, swaps have had a major macro economic impact forging the linkage between the Euro and domestic markets, flattening the cash yield curves and reducing central bank monopoly influence on markets. We are all swappers now. And, when you are offered sweet deals, remember the Tibetan saying "Beware of honey offered on a sharp knife". The problem in following the chaotic progress of this very important market is quite simply that 'he who knows does not speak, he who speaks does not know." A brief glimpse of how the swap market has matured and a short list of the non-proprietary tools in the swapper's arsenal is presented below :

SWAPS – THE TEENAGE YEARS

The essence of a swap contract is the binding of two counterfeiters to exchange two different payment steams over time, the payment streams over time, the payment being tied, at least in part, to subsequent and uncertain market price developments. In most swaps so far, the prices concerned have been exchange rates or interest rates, but they increasingly reach out to equity indices and physical commodities, notably oil and oil products. All such prices have risk characteristics in common, in quality of not in degree. And for all, the allure of swaps may be expected cost saving, yield enhancement, or hedging or speculative opportunity.

Financial swaps, simple in principal and versatile in practice, are revolutionary, especially for portfolio management. A swap coupled with an existing asset or liability can radically modify effective risk and return. Individually and together with futures, options and other financial derivatives, they allow yield curve and currency risks, and liquidity and geographic market considerations, all to be managed separately – and also independently of underlying cash market stocks.

Swaps in their current form started in 1981 with the well-publicized currency swaps, and in the following year, with dollar interest-ate swaps. The initial deals were characterized by three critical features.

1. Barter – two counter parties with exactly offsetting exposures were introduced by a third party. If the credit risk were unequal, the third party – if a bank might interpose itself or arrange for a bank to do so for a small fee.

2. Arbitrage driven – the swap was driven by an arbitrage which gave some profit to all three parties. Generally, this was a credit arbitrage or market-access arbitrage.

3. Liability driven-almost all swaps were driven by the need to manage a debt issue on both sides.

The major, dramatic change has been the emergence of the large banks as aggressive market makers in dollar interest-rate swaps. Major US banks are in the business of taking credit risk and interest-rate risk. They therefore do not need counter parties to do dollar swaps. The net result is that spreads have collapsed and volume has exploded.

Swaps – The Laundry List

Dollar swaps

1. Plain vanilla
2. Alternate floating rate
3. Floating-floating
4. Variable principle
5. Options on swaps
6. Short date swaps
7. Syndicated swaps
8. Hi-tech swaps
9. Plain deal
10. Without exchange of principle
11. Amortizing swaps

12. Off-market deals
13. Cross-currency interest-rate swaps
14. Amortizing principle
15. Off-market deals
16. Assign ability and trade ability
17. Collateralized swaps and Schiock Swaps
18. Extendible swap
19. Puttable swap
20. Drawdown swap

Along with swap other important derivatives and institutional developments which came into prominence are:

Continuous Tender Panel: A compromise between sole-placing agency and tender panel. The CTP agent agrees on the issue price (the strike offered yield of SOY) with the issuer, at which price underwriting banks may request protection on their notional allocations. These allocations are calculated pro rate to their underwriting commitments, but are only exercisable to the extent that the CTP agent has not per-sold the issue tranche. The SOY can change during the bidding period and underwriters may be able to increase their initial allocations by bidding at, or under, the SOY.

Direct Bid Facility (Unsolicited bidding): An increasingly common provision in tender panel facilities whereby panel members may make unsolicited bids to the issuer for particular note amounts/maturities.

Euro-commercial paper: A non-under-written or uncommitted note issuance programme where typically two or three dealers place the issuer's papers.

Global Note Facility: The Banks' medium-term underwriting commitment is available to back up both the issue of US commercial paper and Euro notes. Should the issuer be unable to roll over USCP, his will trigger off a Euro note issuance process by tender panel. Bridging finance between the time of failed US CP roll-over and provision of funds from the Euro note facility is provided by a "Swingling" (below).

Global Commercial Paper: The growing concept of non-underwritten Euro note, issuance programme being old on a global basis with the book moving between time zones.

GUN: Grantor underwritten note: A floating rate note facility akin to a Euronote facility whereby a group of banks (grantors) commit to purchase any notes put back to them by investors on any FRN interest rate fixing date. Put notes are then auctioned out to the market between the grantors.

Issuer-Set Margin: Similar to continuous tender panel except that, underwriters are guaranteed the protection on their pro rata allocation of paper. Should they opt not to take notes at the issuer-set margin, the lead manager will instead.

MOF: **Multi-option facility:** Broader than the classic underwritten Euronots facility (NIF) in that the banks medium-term commitment is to backstop, not only the issuance of Euronotes, but a wide range

of other short-term instruments-i.e.-bankers acceptance and short-term advances in a variety of currencies.

NIF: **Note Issuance facility:** An addition to RUF and SNIF. Now widely regarded as a general description for all underwritten Euronote facilities.

PUF: **Prima underwriting facility:** Same as a RUF except that the maximum margin is expressed in relation to US prime.

RUF: **Revolving underwriting facility:** The acronym that started it all. Classically, a medium term commitment by a group of underwriting banks to purchase one, three or six-months. Euronotes at a fixed libor related margin should a safe-placing agents fail to sell the notes to investors at or under, that margin RUF has since been extended to tender panel placement facilities as well as sole-placing.

SNIF: Short-term note Insurance facility: Came after RUF as a method of distinguishing tender panel placement from the sole - placing of the RUF. Otherwise, structurally the same.

Specialized Tender Panel: Similar to the direct bid facility except that members of the STP are limited to a nucleus of houses with perceived note placement strength who are expected to make a market in the issuer's paper.

Stop Out Bid: A refinement of tender panel bidding where by one or more of the TP participants have an option to post a bid for all or part of an issue tranche at a price which other tender panel members must then better.

Striking Price Method: The issue price for the whole tranche is set at the level of the last accepted bid which caused the tranche to be filled-i.e.-notes are not priced at a sequential level from the most competitive bid upwards as in standard tender panel.

Swap Tender Panel: A further refinement of TP whereby the issues can ask for currency and /or interest rate swaps on a particular note issue tranche.

Swingline: Used in a global note facility or BONUS to allow the issuer to move from the US CP market to the Euronote market. Typically available for a maximum of seven days and priced over US prime.

TAP basis: The increasingly frequent method of issuance in Euro CP. The dealer approaches the issuer for paper in direct response to particular investor demand, rather than the issuer seeking bids from the dealer.

Tender Acceptance Facility: Precisely the same structure as an underwriting ten. Euronote facility using a tender panel except that the short-term instruments under auction are bankers acceptances, euro Euronotes.

Tender Panel: A group including Euronote facility under writers and additionally appointed banks and dealers, who are invited to bid on an issuer's paper in an open auction format. Notes are awarded to bidders in sequential order from the most competitive bid up wards until the full tranche is allocated.

TRUF: Transferable revolving underwriting facility: The underwriting banks stringent liability to purchase notes, in the event of non-placement, is fully transferable.

Although the swap market is now firmly established, there remains a wide divergence among current and potential users as to how exactly a given swap structure works, what risks are entailed when entering into swap transactions and precisely what 'the swap market" is and, for that matter, is not. Hence, among the many topics and controversies surround.

THE BASIC SWAP STRUCTURES

The growth and continued success of the swap market has been due in no small part to the creativity of its participants. As a result, the swap structures currently available and the future potential structures which will in time become just another market "norm" are limited only by the imagination and ingenuity of those participating in the market. None-the less, underlying the swap transactions seen in the market today are four basic structures which may now be considered as 'fundamental". These structures are:

- the interest Rate Swap
- the Fixed Rate Currency Swap
- the Currency Coupon Swap
- the Basis Rate Swap

RISK OF INVESTMENT

The Webster's New Collegiate Dictionary definition of risk includes the following meanings: "……*possibility of loss or injury*……*the degree or probability of such loss"*. This conforms to the connotations put on the term by most investors. Professionals often speak of "*downside risk"* and *"upside potential"*. The idea is straightforward enough: risk has to do with bad outcomes, potential with good ones.

In considering economic and political factors, investors commonly identify five kinds of hazards to which their investments are exposed. They are:

Business and Financial Risk

Business risk and financial risk are actually two separate types of risks, but since they are interrelated it would be wise to discuss them together. Business risk, which is sometimes called operating risk, is the risk associated with the normal day-to-day operations of the firm. Financial risk is created by the use of fixed cost securities (that is, debt and preference shares). Looking at the two categories in a sources and uses context, business risk represents the chance of loss and the variability of return created by a firm's uses of funds. Financial risk is the chance of loss and the variability of the owners' return created by a firm's sources of funds.

To clarify this important distinction between business and financial risk, let us examine the income statement contained in Exhibit I. Earnings before interest and taxes can be viewed as the operating profit of the firm; that is, the profit of the firm before deducting financing charges and taxes.

Business risk is concerned with earnings before interest and taxes and financial risk is concerned with earnings available to equity holders. The two components of business risk signify the chance that the firm will fail because of the inability of the assets of the firm to generate a sufficient level of earnings before interest and the variability of such earnings. The two components of financial risk reflect the chance that the firm will fail because of the inability to meet interest and/or principal payments on debt, and the variability of earnings available to equity holders caused by fixed financing changes (that is, interest expense and preferred dividends). Putting it in another way, this second component of financial risk is the extent to which earnings available to equity holders will vary at a greater rate than earnings before interest and taxes. In case the firm does not employ debt, there will be no financial risk.

An important aspect of financial risk is the interrelationship between financial risk and business risk. In effect, business risk is basic to the firm, but the firm's risk can be affected by the amount of debt financing used by the firm. Whatever be the amount of business risk associated with the firm, the firm's risk will be increased by the use of debt financing. As a result, it follows that the amount of debt financing used by the firm should be determined largely by the amount of business risk that the firm faces. If its business risk is low, then it can use more debt financing without fear or default, or a marked impact on the earnings available to the equity shareholders. Conversely, if the firm faces a lot of business risk, then the use of a lot of debt financing may jeopardize the firm's future operations.

EXHIBIT-I

XYZ CORPORATION LIMITED

INCOME AND EXPENDITURE STATEMENT FOR THE FINANCIAL YEAR ENDED 30TH JUNE, 199X

Income	(Rs. In crores)
Sales	60,52.70
Other income	1,04.19
	61,56.89
Expenditure	
Consumption of materials and stores, power and fuel	31,67.73
Payment to and provision for employees	7,43.21
Other operating expenses	3,86.68
Excise Duty	7,72.35
	5,069.97
EarningBeforeInterestand Taxes (EBIT)	10,86.92
Interest	1,62,09
Depreciation	1,45,02
EarningsBeforeTaxes	7,79.81
Provision for taxation	3,80.00
EarningsafterTaxation	3,99.81
Preferred Dividend	……
Earningsavailableto equity holders	3,99,81
Number of equity shares	43,77,060
Earnings per share	9,13421

Purchasing Power Risk

Whenever investors desire to preserve their economic position over time, they utilize investment outlets whose values vary with the price level. They select investments whose market values change with consumer prices which compensates them for cost of living increase. If they do not, they will find that their total wealth has been diminished. Inflation is an economic crippler that destroys the economic power of investors over goods and services. In essence, investors have to be concerned with the command that their invested money has over goods and services on a continuing basis. In fact, we have been living with increasing consumer prices for many years.

The relation between the market rate earned *r*, the rate of price change *AP/P,* and the investor's rate of change in real purchasing power X is shown in the equation (1) :

$$X = \frac{1 + r}{1 + AP/P} - 1.0$$

…(1)

X represents the percentage change in purchasing power resulting from an investment with a rate of return r. If the investor's rate of interest just equals the rate of inflation, r=AP/P, then the investor's real rate of return is zero, X = 0. In a more typical situation, the investor's rate of return r might be 12 per cent while inflation AP/P is 6 per cent. In this case the investor's purchasing power is increasing at (1.12/1.06) – 1 = 5.66 per cent; this is the investor's real rate of return after allowing for inflation. Stock brokers sometimes tell their customers

that equity shares are an inflation hedge which will more than protect them from purchasing power risk. This is a bit of overstatement. It is true that equity shares suffer less from purchasing power risk than fixed-income investments, but equity shares are only a hedge against inflation most of the time. It has not always yielded real increases in purchasing power during inflation.

Market Risk

This hazard arises from the fact that market prices and collateral values of securities and real property may vary substantially, even when their earning power does not change. The causes of these prices uncertainties are varied. At times many markets are simply thin that is, buyers and sellers appear only intermittently. More commonly, investment prices vary because investors vacillate in their preference for different forms of investment, or simply because they sometimes have money to invest and sometimes do not have it. But once the equity has developed a particular price pattern, it does not change this pattern quickly. The causes of changes in market price are usually beyond the control of the corporation. An unexpected war or the end of one, an election year, political activity, illness or death of a president, speculative activity in the market, the outflow of bullion – all are tremendous psychological factors in the market. The irrationality in the securities markets may cause losses unrelated to the basic risks discussed before. These losses are the result of changes in the general tenor of the market and are called market risks.

The market risk in equity shares is much greater than it is in bonds. Equity shares value and prices are related in some fashion to earnings. Current and prospective dividends, which are made possible by earnings, theoretically, should be capitalized at a rate that will provide yields to compensate for the basic risks. On the other hand, bond prices are closely related to changes in

interest rates on new debt. Equity prices are affected primarily by financial risk considerations which, in turn, affect earnings and dividends. However, equity prices may be strongly influenced by mass psychology, by abrupt changes in financial sentiment and by waves of optimism or pessimism. Whenever emotions run high, speculators and gamblers crave action. They cannot refrain from entering the market arena as their greed for profits becomes their overpowering motivation. They do not hesitate to analyze the market environment. They do not base their judgements on an accurate evaluation of the underlying factors. Instead, they rush into the market and distort prices beyond any semblance of value. Greed pushes prices up, and fear drives them down. In short, the crux of the market risk is the likelihood of incurring capital losses from price changes engendered by a speculative psychology.

Interest Rate Risk

A major source of risk to the holders of high quality bonds is changes in interest rates, commonly referred to as interest rate risk. These high-quality bonds are not subjected to either substantial business risk or financial risk. Consequently, they are referred to as high-quality bonds. But since they are high-quality bonds, their prices are determined mainly by the prevailing level of interest rate in the market. As a result, if interest rates fall, the prices of these bonds will rise, and vice versa.

Interest rate risk affects all investors in high quality bonds regardless of whether the investors hold short-term or long-term bonds. Changes in interest rate have the greatest impact on the market price of long-term bonds, since the longer the period before the bond matures, the greater the effect of a change in interest rates. On the other hand, changes in interest rates will not have much of an impact on the market price of short-term bonds portfolio may fluctuate

markedly from period to period, as interest rates change. Consequently, changes in interest rates affect investors in long-term as well as in short-term bonds.

Social or Regulatory Risk

The social or regulatory risk arises where an otherwise profitable investment is impaired as a result of adverse legislation, harsh regulatory climate, or in extreme instance nationalization by a socialistic government: The profits of industrial companies may be reduced by price controls, and rent controls may largely destroy the value of rental property held for income or as a price-level hedge. The social risk is really political and thus unpredictable, but under a system of representative government based on increasing government intervention in business affairs, no industry can expect to remain exempt from it.

Other Risks

Other types of risk, particularly those associated with investment in foreign securities, are the monetary value risk and the political environment risk. The investor who buys foreign government bonds or securities of foreign corporations often in an attempt to gain a slightly higher yield than obtained on domestic issues, runs the calculated risk of (1) a change in the foreign government and repudiation of outstanding debt, (2) nationalization of business, firms, that is, seizure by government, or (3) the desire but inability of the foreign government or corporation to handle its indebtedness. The investor should weigh carefully the possibility of the additional risks associated with foreign investments against his expected return, either in the form of interest or dividends or capital gains, when investing in foreign securities rather than domestic securities.

QUESTION

1. Discuss the growth of financial derivatives in the global financial markets.
2. Critically examine the impact of financial derivatives on the monetary policy.
3. "The changing nature of financial industry, especially as reflected in developments in the financial derivatives market, provides considerable opportunities for risk haring or inter-temporal smothering." What actions can be taken to control or plan for these risks? Can value be produced through risk management strategies? Explain.
4. Discuss the various financial derivatives instruments traded on organized exchanges in world financial markets.
5. Critically examine the global positions in OTC derivatives markets by type of risk instrument.
6. "Global networking is no longer a more metaphor for worldwide activities but now describes in very literal terms the advances in information and communication technology which have been a major driving force behind internationalization in many areas of life, but especially in the economy. Within the economic sector, in turn, it is in the financial markets that globalization has been particularly dynamic." Comment.
7. Examine the impact of growth of the financial derivatives on the financial system.

UNIT II

OPTIONS

Objectives of the study:

The objectives of this unit are to help one understand, in general

- The general frame work of Options as a financial derivative
- Importance and working of Options in the financial market

Syllabus

Options: Types of options; Option trading; Margins; Valuation of options; Binomial Option Pricing Model; Black-Schools model for Call Options; Valuation of put options; Index options; Option markets-exchange traded options, over-the-counter options, quotes, trading, margins, clearing, regulation and taxation; Warrants and convertibles.

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2.24. Activities

2.25. References

2.1. Introduction

Portfolio investments normally include mutual founds stocks and bonds. The type of securities not end here, as ‘options ‘present a world of opportunity to sophisticated investors, as another type of security with their veracity. Options can be as speculative or as conservative as one wants. They are complex securities and can be extremely risky.

But at the same time ignorant of this type of investment places one in a weak position. Without knowledge about options, one would not only forfeit having another item in ones investing toolbox but also lose insight into the workings of some of the world's largest corporations. Whether it is to hedge his risk of foreign-exchange transactions or to give employees ownership in the form of stock options, most multi-nationals today use options in some form or another.

2.2 Options-Meaning

An **option** is a contract whereby one party (the *holder* or buyer) has the right, but not the obligation, to exercise the contract (the option) on or before a future date (the exercise date or expiry). The other party (the *writer* or seller) has the obligation to honour the specified feature of the contract. Since the option gives the buyer a right and the seller an obligation, the buyer has received something of value. The amount the buyer pays the seller for the option is called the option premium.

Because this is a security whose value is determined by an underlying asset, it is classified as a derivative. The idea behind an option is present in everyday situations.

For example, you discover a house that you'd love to purchase. Unfortunately, you won't have the cash to buy it for another three months. You talk to the owner and negotiate a deal that gives you an option to buy the house in three months for a price of Rs.200, 000. The owner agrees, but for this option, you pay a price of Rs.3, 000.

Now, consider two theoretical situations that might arise:

1. It's discovered that the house is actually the true birthplace of a great man. As a result, the market value of the house skyrockets to Rs.1 crore. Because the owner sold you the option, he is obligated to sell you the house for Rs.200, 000. In the end, you stand to make a profit of Rs.97, 97,000 (Rs.1 Crore – Rs.200, 000 – Rs.3, 000).
2. While touring the house, you discover not only that the walls are chock-full of asbestos, but also that a ghost haunts the master bedroom; furthermore, a family of super-intelligent rats have built a fortress in the basement. Though you originally thought you had found the house of your dreams, you now consider it worthless. On the upside, because you bought an option, you are under no obligation to go through with the sale. Of course, you still lose the Rs.3, 000 price of the option.

This example demonstrates two very important points. First, when you buy an option, you have a right but not an obligation to do something. You can always let the expiration date go by, at which point the option becomes worthless. If this happens, you lose 100% of your investment, which is the money you used to pay for the option. Second, an option is merely a contract that deals with an underlying asset. For this reason, options are called

derivatives, which mean an option *derives* its value from something else. In our example, the house is the underlying asset. Most of the time, the underlying asset is a stock or an index.

2.3. Participants in the Options Market

There are four types of participants in options markets depending on the position they take: They are:

1. Buyers of calls
2. Sellers of calls
3. Buyers of puts
4. Sellers of puts

People who buy options are called holders and those who sell options are called writers: furthermore, buyers are said to have long positions, and sellers are said to have short positions.

-Call holders and put holders (buyers) are not obligated to buy or sell. They have the choice to exercise their rights if they choose.

-Call writers and put writers (sellers), however, are obligated to buy or sell. This means that a seller may be required to make good on a promise to buy or sell.

2.4. Reason for using Options.

Two main reasons why an investor would use options are:

a. Speculation

Speculation is the betting on the movement of a security. The advantage of options is that one isn't limited to making a profit only when the market goes

up. Because of the versatility of options, one can also make money when the market goes down or even sideways.

Speculation is the territory in which the big money is made - and lost. The use of options for making big money or less is the reason why they have the reputation of being risky. This is because when one buys an option; one has to be correct in determining not only the direction of the stock's movement, but also the magnitude and the timing of this movement. To succeed, one must correctly predict whether a stock will go up or down, and has to be right about how much the price will change as well as the time frame it will take for all this to happen commissions must also be taken into account.

b. **Hedging**

The other function of options is hedging. Think of this as an insurance policy. Just as one insures one's house or car, options can be used to insure the investments against a downturn. By using options, one would be able to restrict one's downslide while enjoying the full upside in a cost-effective way.

2.5. Working of options

In order to understand the working of options, an assumed firm by the name Justus Company, is taken Let's say that on May 1, the stock price of Justus Co. was Rs.75 and the premium (cost) was Rs.3.15 for a July 78 Call, which indicated that the expiration was the third Friday of July and the strike price was Rs.78. The total price of the contract was Rs.3.15 x 100 = Rs.315. In reality, you'd also have to take commissions into account, but we'll ignore them for this example.

Remember, a stock option contract is the option to buy 100 shares; that's why you must multiply the contract by 100 to get the total price. The strike price of Rs. 78 means that the stock price must rise above Rs.78 before the call option is worth anything; furthermore, because the contract is Rs.3.70 per share, the break-even price would beRs.81.

When the stock price is Rs.67, it's less than the Rs.70 strike price, so the option is worthless. But don't forget that you've paid Rs.315 for the option, so you are currently down by this amount.

Three weeks later the stock price is Rs.84. The options contract has increased along with the stock price and is now worth Rs.6 x 100 = Rs.600. Subtract what you paid for the contract, and your profit is (Rs.3) x 100 = Rs.300. You almost doubled the money in just three weeks! You could sell your options, which are called "closing your position," and take your profits - unless, of course, you think the stock price will continue to rise. For the sake of this example, let's say we let it ride. By the expiration date, the price drops to Rs.60. Because this is less than our Rs.78 strike price and there is no time left, the option contract is worthless. We are now down to the original investment of Rs.300. Putting it in the form of a table: here is what happened to our option investment:

Date	**May 1**	**May 21**	**Expiry Date**
Stock Price	Rs.78	Rs.84	Rs.60
Option Price	Rs.3	Rs.6	worthless
Contract Value	Rs.300	Rs.600	Rs.0
Paper Gain/Loss	Rs.0	Rs.300	-Rs.300

The price swing for the length of this contract from high to low was Rs.600, which would have given us over double our original investment.

This is leverage in action.

Option frameworks

- The buyer pays the price (premium) to the seller (writer).The buyer assumes a long position and the writer a corresponding short position. Thus the writer of a call option is "short a call" and has the obligation to sell to the holder, who is "long of a call option" and who has the right to buy. The writer of a put option is "on the short side of the position", and has the obligation to buy from the taker of the put option, who is "long a put".

- The option style determines when the buyer may exercise the option which will affect the valuation. Generally the contract will either be **American style** - which allows exercise up to the expiry date - or **European style** - where exercise is only allowed on the expiry date - or **Bermudian style** - where exercise is allowed on several, specific dates up to the expiry date. European contracts are easier to value.

- Buyers and sellers of exchange-traded options do not usually interact directly - the futures and options exchange acts as intermediary. The seller guarantees the exchange to fulfill his obligation if the buyer chooses to execute.

- The risk for the option holder is limited: he cannot lose more than the premium paid as he can "abandon the option". His potential gain with a call option is theoretically unlimited;

- The maximum loss for the writer of a put option is equal to the strike price. In general, the risk for the writer of a call option is unlimited. However, an option writer who owns the underlying instrument has created a covered position; he can always meet his obligations by using the actual underlying. Where the seller does not own the underlying on which he has written the option, he is called a "naked writer", and has created a "naked position".

- Options can be in-the-money, at-the-money or out-of-the-money. The "in-the-money" option has a positive intrinsic value, options in "at-the-money" or "out-of-the-money" has an intrinsic value of zero. Additional to the intrinsic value an option has a time value, which decreases when the option is closer to its expiry date.

2.6. Types of Options

There are two main types of options:

a. **American options** can be exercised at any time between the date of purchase and the expiration date.
b. **European options** can only be exercised at the end of their lives.
c. **Long-Term Options** are options with holding times of one, two or multiple years, which may be more appealing for long-term investors, which are called long-term equity anticipation securities (LEAPS). By providing opportunities to control and manage risk or even to speculate, LEAPS are virtually identical to regular options. LEAPS, however, provide these opportunities for much longer periods of time. Although they are not available on all stocks, LEAPS are available on most widely held issues.

d. **Real option** is a choice that an investor has when investing in the real economy - in the production of goods or services, rather than in financial contracts – which may be something as simple as the opportunity to expand production, or to change production inputs. They are an increasingly influential tool in corporate finance with typically difficult or impossible to trade

e. **Traded options** (also called "Exchange-Traded Options" or "Listed Options") are Exchange traded derivatives which have: standardized contracts; quick systematic pricing; and are settled through a clearing house (ensuring fulfillment.) These include: stock options; bond options; interest rate options; and swaption.

f. **Vanilla options** are 'simple', well understood and traded options, whereas an exotic option is more complex, or less easily understood and non-standard in nature. Asian options, look back options, barrier options are considered to be exotic, especially if the underlying instrument is more complex than simple equity or debt.

g. **Employee stock options** are issued by a company to its employees as compensation.

2.7. Option Styles

Settlement of options is based on the expiry date. However, there are three basic styles of options which affect settlement. The styles have geographical names but have nothing to do with the location where a contract is agreed. The styles are:

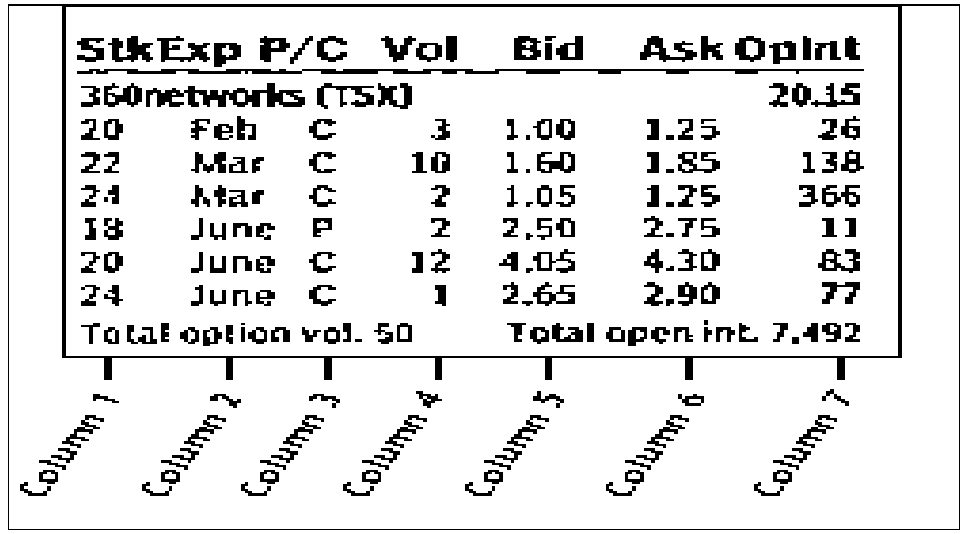
European: These options give the holder the right, but not the obligation, to buy or sell the underlying instrument only on the expiry date. This means that the option cannot be exercised early. Settlement is based on a particular strike price at expiration. Currently, in India only index options are European in nature.

American: These options give the holder the right, but not the obligation, to buy or sell the underlying instrument on or before the expiry date. This means that the option can be exercised early. Settlement is based on a particular strike price at expiration. Options in stocks that have been recently launched in the Indian market are "American Options". American style options tend to be more expensive than European style because they offer greater flexibility to the buyer.

Bermudian: These options give the holder the right, but not the obligation, to buy or sell the underlying instrument on several specific dates, on or before the expiry date.

Option Class & Series: An option "class" refers to all options of the same type (call or put) and style (American or European) that also have the same underlying. eg: All Nifty call options are referred to as one class. An option series refers to all options that are identical: they are the same type, have the same underlying, the same expiration date and the same exercise price.

2.8. Reading an Options Table



Column 1: Strike Price is the stated price per share for which an underlying stock may be purchased (for a call) or sold (for a put) upon the exercise of the option contract. Option strike prices typically move by increments.
Column 2: Expiry Date shows the termination date of an option contract.
Column 3: Call or Put column refers to whether the option is a call (C) or put (P).
Column 4: Volume indicates the total number of options contracts traded for the day. The total volume of all contracts is listed at the bottom of each table.
Column 5: Bid indicates the price someone is willing to pay for the options contract.
Column 6: Ask indicates the price at which someone is willing to sell an options contract.
Column 7: Open Interest is the number of options contracts that are open; these are contracts that have neither expired nor been exercised.

In India, option tables published in business newspaper and are fairly similar to the regular stock tables.

The following is the format of the options table published in India's business news papers:

Contracts	Expiry Date	Strike Price	Option Type	Open	High	Low	Traded Quantity	Number of Contracts	Traded Value

- Call options-American are depicted as 'CA' and Put options-American as 'PA'.
- The Open, High, Low, Close columns display the traded premium rates.

2.9.Uses of Options

When using options for insurance, the option holder reduces the risk he bears by paying the option seller a premium to assume it.

Because one can use options to assume risk, one can purchase options to create leverage. The payoff to purchasing an option can be much greater than by purchasing the underlying instrument directly. For example buying an at-the-money call option for 2 monetary units per share for a total of 200 units on a security priced at 20 units, will lead to a 100% return on premium if the option is exercised when the underlying security's price has risen by 2 units, whereas buying the security directly for 20 units per share, would have led to a 10% return. The greater leverage comes at the cost of greater risk of losing 100% of the option premium if the underlying security does not rise in price.

2.10. Advantages of options trading

a. Risk management: Put options allow investors holding shares to hedge against a possible fall in their value. This can be considered similar to taking out insurance against a fall in the share price.

b. Time to decide: By taking a call option the purchase price for the shares is locked in which gives the call option holder until the Expiry Day to decide whether or not to exercise the option and buy the shares. Likewise the taker of a put option has time to decide whether or not to sell the shares.

c. Speculation: The ease of trading in and out of an option position makes it possible to trade options with no intention of ever exercising them. If an investor expects the market to rise, they may decide to buy call options. If expecting a fall, they may decide to buy put options. Either way the holder can sell the option prior to expiry to take a profit or limit a loss. Trading options has a lower cost than shares, as there is no stamp duty payable unless and until options are exercised.

d. Leverage: Leverage provides the potential to make a higher return from a smaller initial outlay than investing directly. However, leverage usually involves more risks than a direct investment in the underlying shares. Trading in options can allow investors to benefit from a change in the price of the share without having to pay the full price of the share.

We can see below how one can leverage ones position by just paying the premium.

	Option Premium	Stock
Bought on Oct 15	Rs. 380	Rs.4000
Sold Dec 15	Rs. 670	Rs. 4500
Profit	Rs. 290	Rs. 500
ROI (Not annualized)	76.3%	12.5%

e. Income generation: Shareholders can earn extra income over and above dividends by writing call options against their shares. By writing an option they receive the option premium upfront. While they get to keep the option premium, there is a possibility that they could be exercised against and have to deliver their shares to the taker at the exercise price.

f. Strategies: By combining different options, investors can create a wide range of potential profit scenarios.

2.11. The basic traded stock options

2.11.1. Call option

A **call option** is a financial contract between the buyer and the seller , where the buyer of the option has the right, but not the obligation to buy an agreed quantity of a particular commodity or financial instrument (the underlying instrument) from the seller of the option at a certain time (the expiration date) for a certain price (the strike price). The seller (or "writer") has the obligation to sell the commodity or financial instrument should the buyer so decide. The buyer pays a fee (called a premium) for this right.

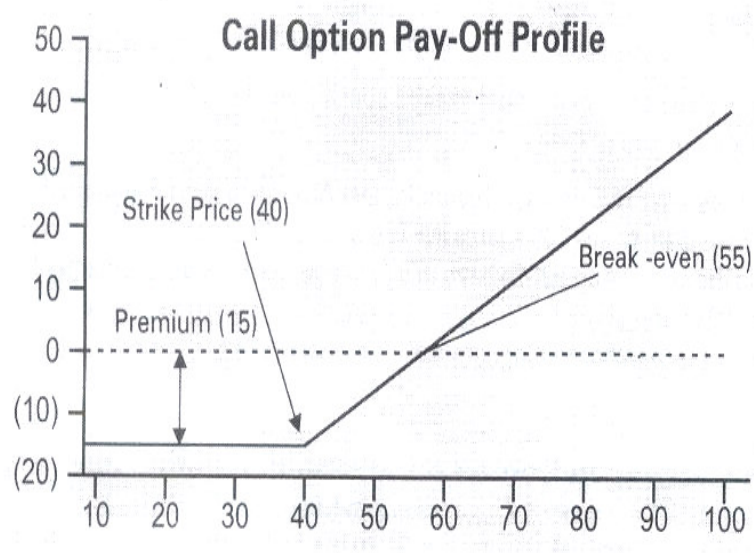
Illustration 1:

Raj purchases 1 Reliance (RELIND)OCT 1300 Call --Premium 10

This contract allows Raj to buy 100 shares of RELIND at Rs 150 per share at any time between the current date and the end of next August. For this privilege, Raj pays a fee of Rs 800 (Rs eight a share for 100 shares).

Now let us see how one can profit from buying an option.

Raj purchases a December call option at Rs.40 for a premium of Rs.15. Here, he has purchased the right to buy that share for Rs.40 in December. If the stock rises above Rs.55 (40 + 15) he will break even and he will start making a profit. Suppose the stock does not rise and instead falls, he will choose not to exercise the option and forego the premium of Rs.15 and thus limiting his loss to Rs.15.



Let us take another example of a call option on the Nifty to understand the concept better. Nifty is at 1310. The following are Nifty traded at following quotes.

Option Contract	Strike Price	Call Premium
Dec Nifty	1325	Rs.6,000
	1345	Rs. 2,000
Jan Nifty	1325	Rs.4,500
	1345	Rs.5,000

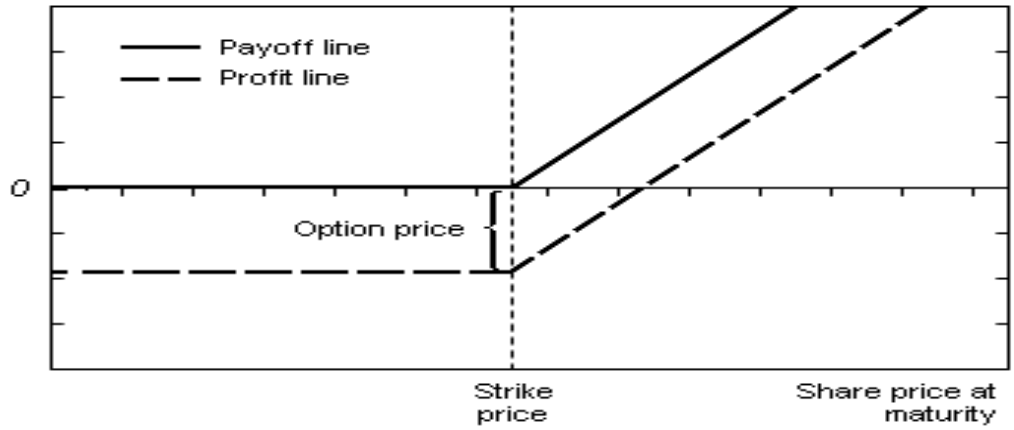
A trader is of the view that the index will go up to 1400 in Jan 2002 but does not want to take the risk of prices going down. Therefore, he buys 10 options of Jan contracts at 1345. He pays a ' premium for buying calls (the right to buy the contract) for 500*10= Rs 5,000/-.

In Jan 2002 the Nifty index goes up to 1365. He exercises the option and takes the difference in spot index price which is (1365-1345) * 200 (market lot) = 4000 per contract. Total profit = 40,000/- (4,000*10).

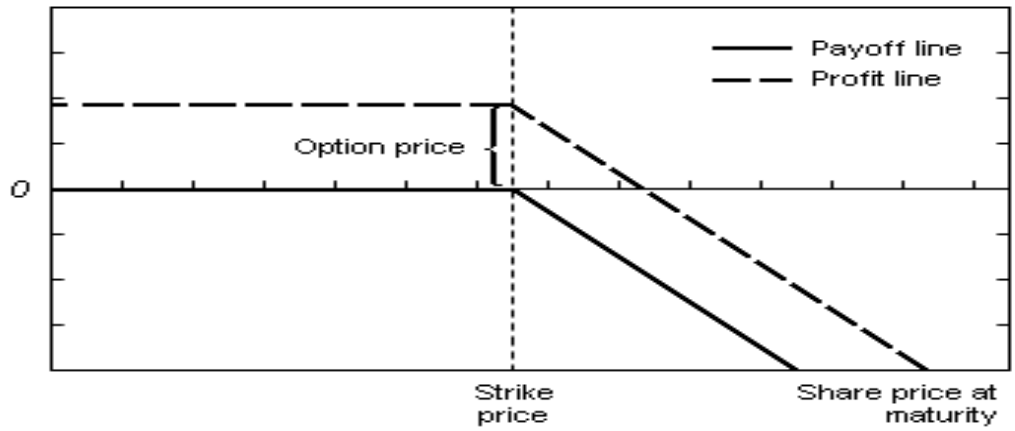
He had paid Rs 5,000/- premium for buying the call option. So he earns by buying call option is Rs 35,000/- (40,000-5000).

If the index falls below 1345 the trader will not exercise his right and will opt to forego his premium of Rs 5,000. So, in the event the index falls further his loss is limited to the premium he paid upfront, but the profit potential is unlimited.

If one is bullish and expects prices to rise, then he will take a long position by buying calls. If one is bearish and expects prices to fall, then he will take a short position by selling calls.



A graphical interpretation of the payoffs and profits generated by a call option buyer. A higher stock price means a higher profit. Eventually, the price of the underlying (e.g., stock) will be high enough to fully compensate the price of the option.



A graphical interpretation of the payoffs and profits generated by a call' option writer. Profit is maximized when the option expires worthless (when the strike price exceeds the price of the underlying), and the writer keeps the premium.

future; the seller either expects that it will not, or is willing to give up some of the upside (profit) from a price rise in return for (a) the premium (paid immediately) plus (b) retaining the opportunity to make a gain up to the strike price. Call options are most profitable for the buyer when the underlying instrument is moving up, making the price of the underlying instrument closer to the strike price. When the price of the underlying instrument surpasses the strike price, the option is said to be "**in the money**." The initial transaction in this context (buying/selling a call option) is not the supplying of a physical or financial asset (the underlying instrument). Rather it is the granting of the right to buy the underlying asset, in exchange for a fee - the option price or premium.

Call options can be purchased on many financial instruments other than stock in a corporation - options can be purchased on futures on interest rates, as well as on commodities such as gold or crude oil. A call option should not be confused with either Incentive stock options or with a warrant. An incentive stock option, the option to buy stock in a particular company, is a right granted by a corporation to a particular person (typically executives) to purchase treasury stock. When an incentive stock option is exercised, new shares are issued. Incentive stock options are not traded on the open market. In contrast, when a call option is exercised, the underlying asset is transferred from one owner to another.

It is clear that a call option has positive monetary value when the underlying instrument has a spot price (**S**) above the strike price (**K**). Since the option will not be exercised unless it is "in-the-money", the payoff for a call option is

Max[(S – K);0] or formally, $(S - K)^+$

where $(x)^+ = \begin{cases} x & if\ x \geq 0 \\ 0 & otherwise \end{cases}$

Prior to exercise of the option value, and therefore price, varies with the underlying price and with time. The call price must reflect the "likelihood" or chance of the option "finishing in-the-money". The price should thus be higher with more time to expiry (except in cases when a significant dividend is present), and with a more volatile underlying instrument.

2.11.2. Put Options

A **put option** (sometimes simply called a "put") is a financial contract between the buyer and the seller of the option which allows the buyer the *right but not the obligation* to sell a commodity or financial instrument (the underlying instrument) to the seller of the option at a certain time for a certain price (the strike price) and where the seller has the obligation to purchase at that strike price, if the buyer does choose to exercise the option.

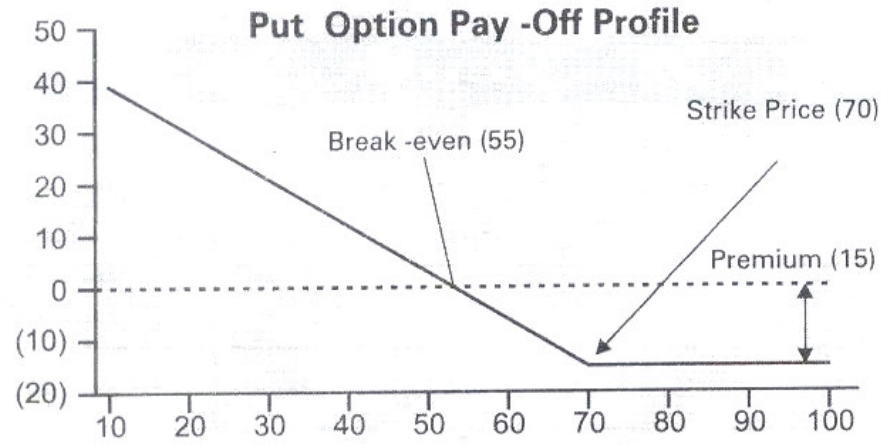
Eg.1 :

Raj purchases 1 RELIND (Reliance Industries) AUG 350 Put --Premium 20

This contract allows him to sell 100 shares RELIND at Rs 350 per share at any time between the current date and the end of August. To have this privilege, he pays a premium of Rs 2000 (Rs 20 a share for 100 shares).

e.g : 2 :

Raj is of the view that the a stock is overpriced and will fall in future, but he does not want to take the risk in the event of price rising so purchases a put option at Rs 70 on 'X'. By purchasing the put option Raj has the right to sell the stock at Rs 70 but he has to pay a fee of Rs 15 (premium). So he will breakeven only after the stock falls below Rs 55 (70-15) and will start making profit if the stock falls below Rs 55.



e.g.: 3:

An investor on Dec 15 is of the view that Wipro is overpriced and will fall in future but does not want to take the risk in the event the prices rise. So he purchases a Put option on Wipro. Quotes are as under: Spot Rs 1040; Jan Put at 1050 Rs 10; Jan Put at 1070 Rs 30

He purchases 1000 Wipro Put at strike price 1070 at Put price of Rs 30/-.

He pays Rs 30,000/- as Put premium.

His position in following price position is discussed below.

1. Jan Spot price of Wipro = 1020
2. 2. Jan Spot price of Wipro = 1080

In the first situation the investor is having the right to sell 1000 Wirpro shares at Rs.1,070/- the price of which is Rs.1020/- By exercise the option he

earns Rs.(1070-1020)= per Put, which totals Rs.50,000/-. His net income is Rs.(50000 – 30000) = Rs.20,000.

In the second price situation, the price is more in the spot market, so the investor will not sell at a lower price by exercising the Put. He will have to allow the Put option to expire unexercised. He loses the premium paid Rs. 30, 000.

If one is bearish and expects prices to fall, then he will take a long position by buying Puts. If one is bullish and expects prices to rise, then he will take a short position by selling Puts.

Note that the seller (the writer) of the option is agreeing to buy the underlying instrument if the buyer of the option so decides. In exchange for having this option, the buyer pays the seller a fee (the premium).

The most widely-known put option is for stock in a particular company. However, options are traded on many other assets: financial - such as interest rates and physical, such as gold or crude oil.

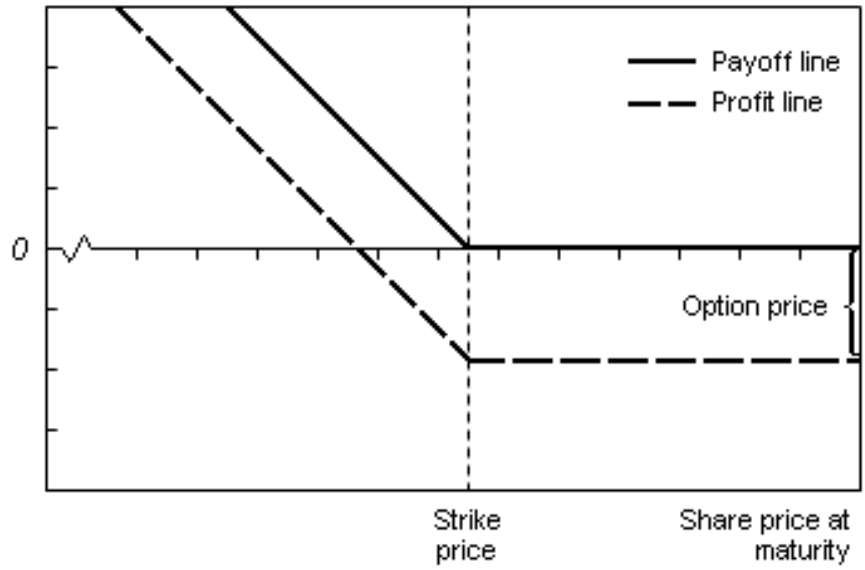
In general, the buyer of a put option expects the price of stock to fall significantly, but does not want to sell the stock short because that could result in large losses if the stock does go up anyway. (With a put option, the loss is limited to the purchase price of the option.) The seller of the put option generally feels that the stock in question is reasonably priced, and should the price fall, the seller may be willing to become the owner of the stock at a lower price, considering it to be a bargain. (On the other hand, the seller of the put may be merely gambling.)

The put option has positive monetary value when the underlying instrument has a spot price (**S**) below the strike price (**K**). Since the option will not be exercised unless it is "in-the-money", the payoff for a put option is max[(K – S) ; 0] or formally, $(K - S)^+$

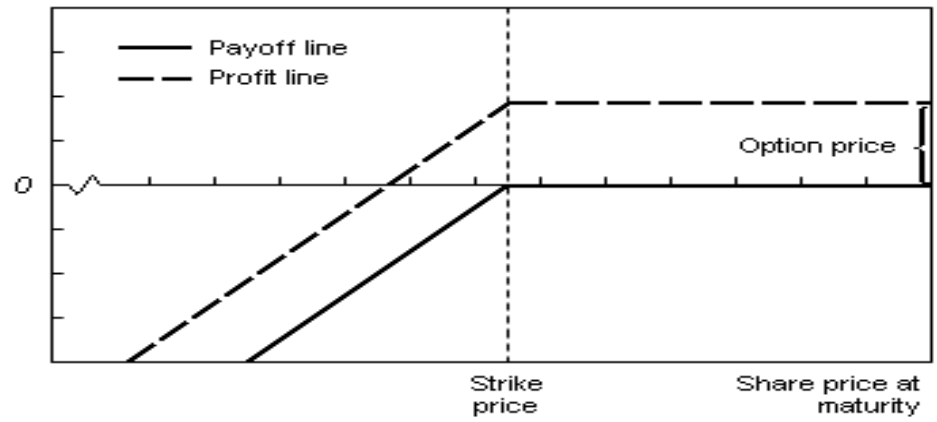
where : $$(x)^+ = \begin{cases} x & \text{if } x \geq 0, \\ 0 & \text{otherwise.} \end{cases}$$

Prior to exercise, the option value, and therefore price, varies with the underlying price and with time. The put price must reflect the "likelihood" or chance of the option "finishing in-the-money". The price should thus be higher with more time to expiry, and with a more volatile underlying instrument.

A graphical interpretation of the payoffs and profits generated by a *put* option as by the *writer* of the option. Profit is maximized when the option expires worthless (when the price of the underlying exceeds the strike price), and the writer keeps the premium.



Graphical interpretation of the payoffs and profits generated by a *put* option by the *purchaser* of the option. A lower stock price means a higher profit. Eventually, the price of the underlying (i.e. stock) will be low enough to fully compensate the price of the option.



	CALL OPTIONS	PUT OPTIONS
If one expects a fall in price (Bearish)	Short	Long
If one expects a rise in price (Bullish)	Long	Short

Summary:

PUT OPTION BUYER	CALL OPTION WRITER (Seller)
Pays premium	Receives premium
Right to exercise and buy the shares	Obligation to sell shares if exercised
Profits from rising prices	Profit from falling prices or remaining neutral
Limited losses, Potentially unlimited gain	Potentially unlimited losses, limited gain

2.12. PRICING OF OPTIONS

2.12.1. Factors affecting the Option premium:

Options are used as risk management tools and the valuation or pricing of the instruments is a careful balance of market factors.

There are four major factors affecting the Option premium:

- Price of Underlying
- Time to Expiry
- Exercise Price Time to Maturity
- Volatility of the Underlying

And two less important factors:

- Short – Term Interest Rates
- Dividends

a. The Intrinsic Value of an Option

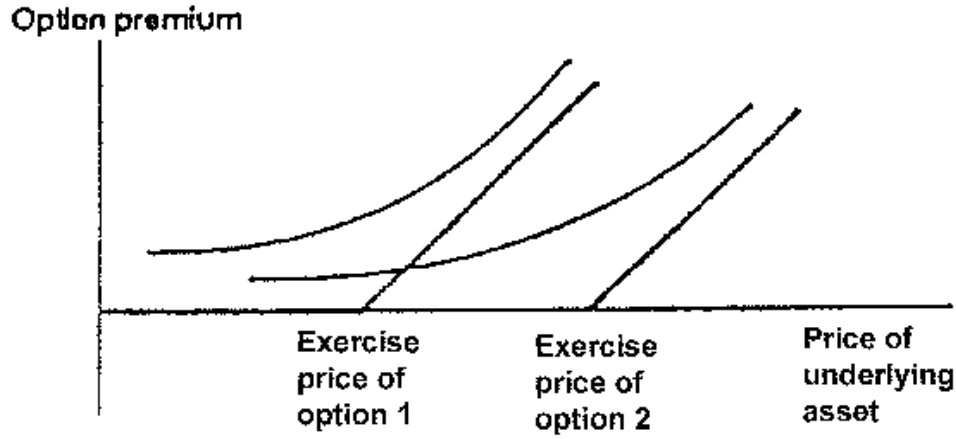
The intrinsic value of an option is defined as the amount by which an option is in-the immediate exercise value of the option when the underlying position is marked-to-market.

For a call option: Intrinsic Value = Spot Price – Strike Price

For a put option: Intrinsic Value = Strike Price – Spot Price

The intrinsic value of an option must be positive or zero. It cannot be negative. For a call option, the strike price must be less than the price of the underlying asset for the call to have an intrinsic value greater than 0. For a put option, the strike price must be greater than the underlying asset price for it to have intrinsic value.

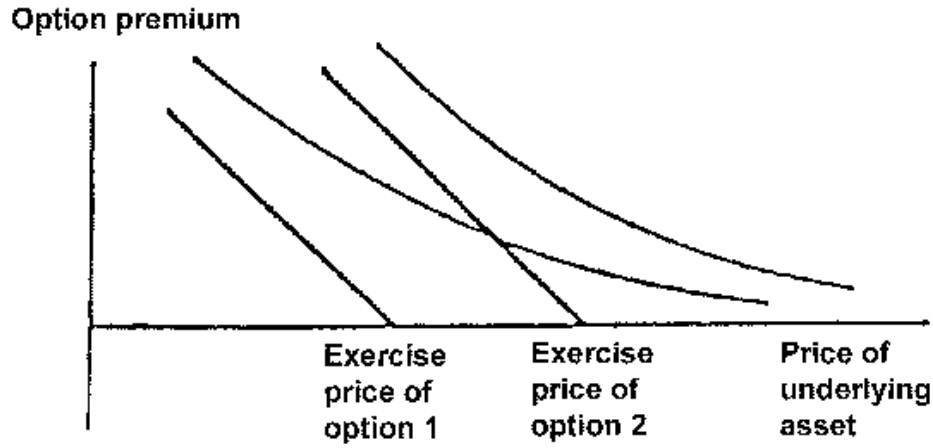
Comparing two calls with the same underlying asset, the higher the exercise price of a call, the *lower* its premium.



Call

Comparing two puts with the same underlying asset; the higher the exercise prices of a put, the *higher* its premium.

Put



b. Price of Underlying

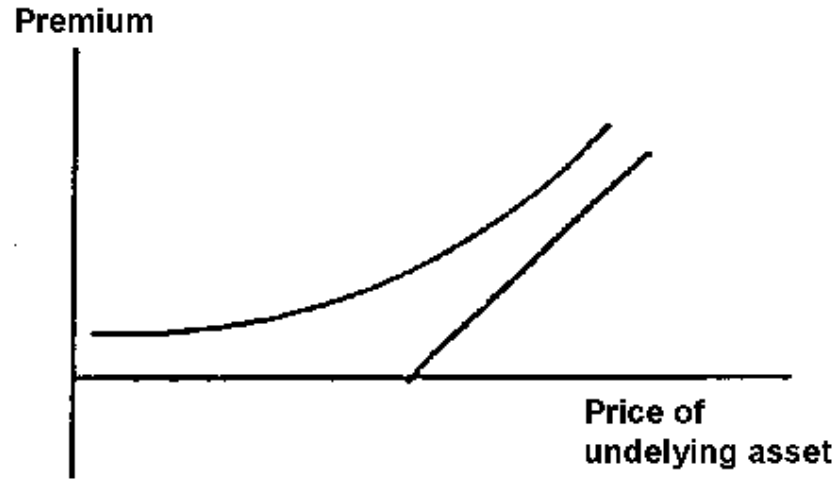
The premium is affected by the price movements in the underlying instrument. For Call options the right to buy the underlying at a fixed strike price – as the underlying price raises so does its premium. As the underlying price falls, so does the cost of the option premium. For put options – the right to sell the underlying at a fixed strike price as the underlying price rises, the premium falls; as the underlying price decreases the premium cost raises.

Call options become more valuable as the stock price increases and less valuable as the strike price increases. For a put option, the payoff on exercise is the amount by which the strike price exceeds the stock price. Put options, therefore, behave in the opposite way to call options. They become less valuable as the stock price increases and more valuable as the strike price increases.

The price of underlying asset

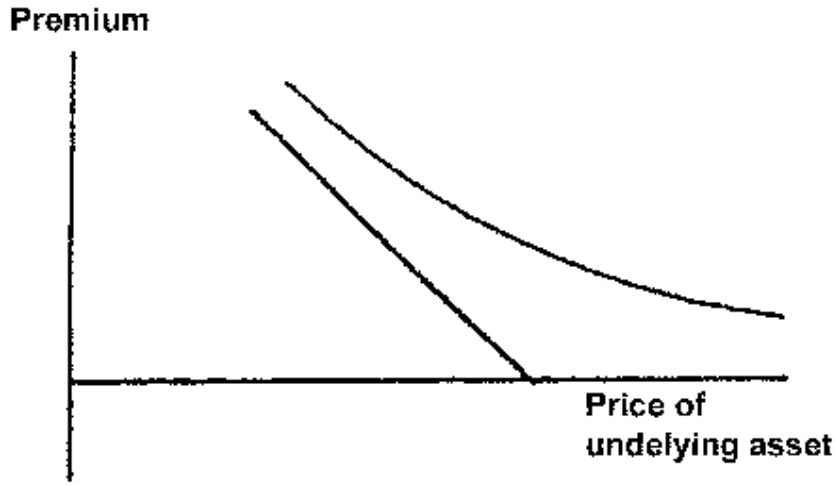
The option premium will be higher when the price of the underlying asset is higher.

Call



The option premium will be lower when the price of the underlying asset is lower .

Put



The more the options is in-the-money or out-of-the-money, the lower is its time value; i.e. the option premium is close to the intrinsic value of the option.

c. The Time Value of an Option

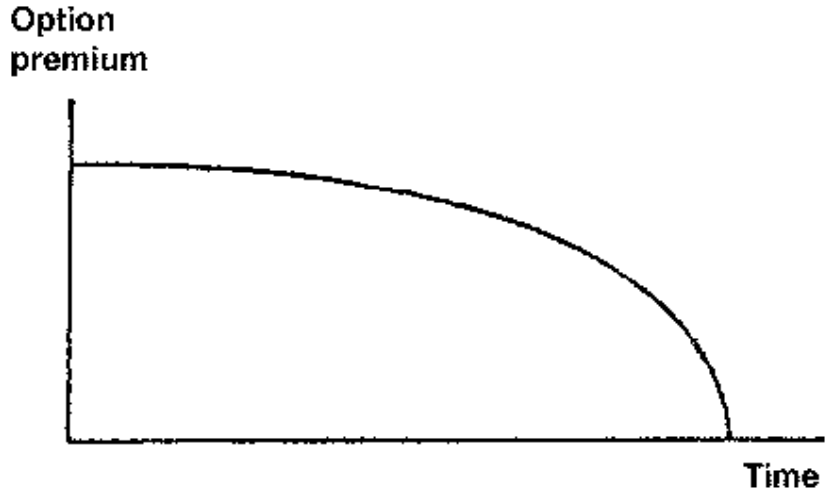
Generally, the longer the time remaining until an option's expiration, the higher will be its premium, because the longer an option's lifetimes, greater is the possibility that the underlying share price might move so as to make the option in-the-money. All other factors affecting an option's price remaining the same, the time value portion of an option's premium will decrease with the passage of time.

Both put and call American options become more valuable as the time to expiration increases. To see this, consider two options that differ only with respect to the expiration date. The owner of the long-life option has all the exercise opportunities open to that of the owner of the short-life on- and more.

The long-life option must, therefore, always be worth at least as much as the short-life option.

European put and call options do not necessarily become more valuable as the time to expiration increases. This is because the owner of a long-life European option does not have all the exercise opportunities open to the owner of a short-life European option. The owner of the long-life European option can exercise only at the maturity of that option. Consider two European call options on a stock, one with an expiration date in one month and the other with an expiration date in two months. Suppose that a very large dividend is expected in six weeks. The dividend will cause the stock price to decline. It is possible that this will lead to the short-life option being worth more than the long-life option.

The value of an option will be lower at the near closer of the expiration date, when all other factors remaining equal. The loss of time value is faster as the expiration date approaches.



d. Volatility

Volatility is the tendency of the underlying security's market price to fluctuate either up or down. It reflects a price change's magnitude; it does not imply a bias towards price movement in one direction or the other. Thus, it is a major factor in determining an option's premium. The higher the volatility of the underlying stock, the higher the premium because there is a greater possibility that the option will move in-the-money. Generally, as the volatility of an underlying stock increases, the premiums of both calls and puts overlying that stock increase, and vice versa.

Higher volatility = Higher premium

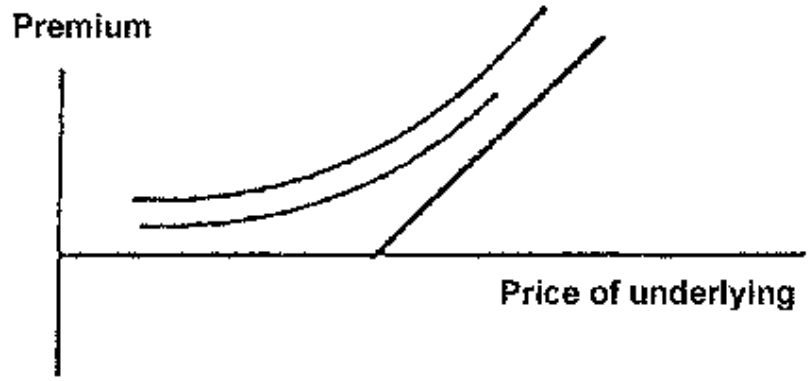
Lower volatility = Lower premium

The volatility of a stock price, σ is defined so that $\sigma\sqrt{\Delta t}$ is the Standard deviation of the return on the stock in a short length of time t. It is a measure of how uncertain we are about future stock price movements. As volatility increases the chance of the stock will do very well or very poorly increases. For the owner of a stock, these two outcomes tend to offset each other. However, this is not so for the owner of a call or put.

The owner of a call benefits from price increases but bas limited downslide *risk* in the event of price decreases because the most that the owner can lose is the price of the option. Similarly, the owner of a put benefits from price decreases but has limited downslide risk in the event of price increases. The value of both calls and puts, therefore, increases as volatility increase.

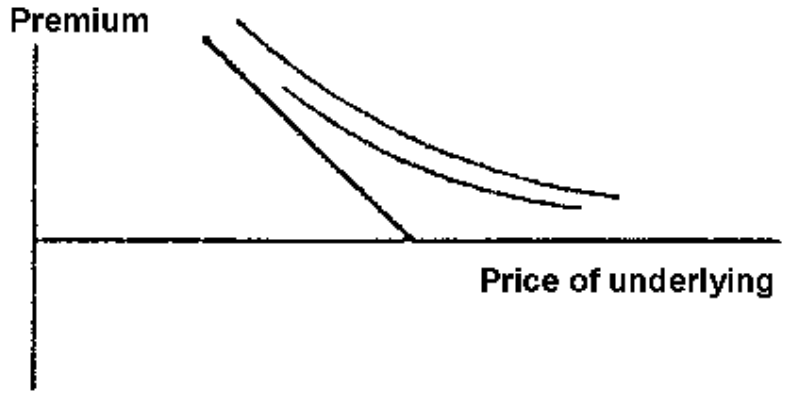
The higher the price volatility of the underlying asset, the higher the likelihood of the option will end up in-the-money; therefore, the higher the premium.

Call



The higher the price volatility of the underlying asset, the higher the likelihood that the option will end up out-of-the-money; therefore, the lower the premium.

Put

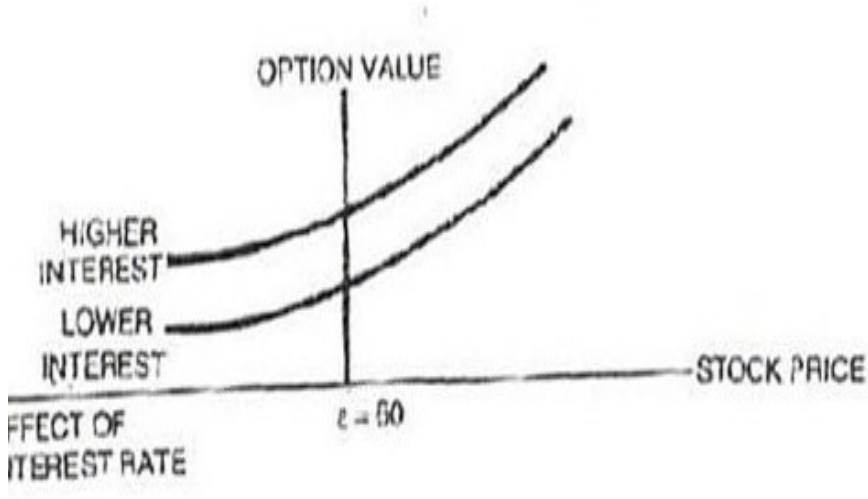


e. Interest rates

In general interest rates have the least influence on options and equate approximately to the cost of carry of a futures contract. If the size of the options contract is very large, then this factor may take on some importance. All other factors being equal as interest rates rise, premium costs fall and vice versa. The relationship can be thought of as an opportunity cost. In order to buy an option, the buyer must either borrow funds or use funds on deposit. Either way the buyer incurs an interest rate cost. If interest rates are rising, then the opportunity cost of buying options increases and to compensate the buyer premium costs fall. Why should the buyer be compensated? Because the option writer receiving the premium can place the funds on deposit and receive more interest than was previously anticipated. The situation is reversed when interest rates fall - premiums rise. This time it is the writer who needs to be compensated.

As interest rates in the economy increases, the expected growth rate of the stock price tends to increase and the present value of any future cash flows received by the holder of the option decreases. These two effects tend to decrease the value of a put option and hence, put option prices decline as the risk-free interest rate increases. In the case of calls, the first effect tends to increase the price and the second effect tends to decrease it. It can be shown that the first effect always dominates the second effect; that the price of a call always increases as the risk-free interest rate increases.

The higher the "risk less interest rate", the higher the call premium. The higher the "risk less interest rate", the lower the put premium



f. Dividends

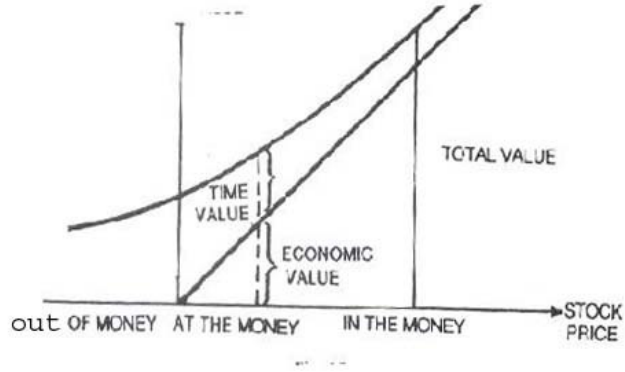
Dividends have the effect of reducing the stock price on the ex-dividend date. The value of a call option is negatively related to the size of any anticipated dividend and the value of a put option is positively related to the size of any anticipated dividend.

2.12.2. Option zones

The value of the stock option has three different zones, as shown below:

1. Out of the Money : Where the stock price is below the exercise price.
2. At the Money: Where it is close to or at the exercise price.
3. In the Money: Where the stock price is above the exercise price.

These zones are depicted in the chart below:



Say the exercise price is Rs.60. If the stock price is below 60, there is no economic value. There is only time value; if stock price starts above Rs.60 it will have been economic value and time value. As seen from the chart time value is maximum, when the exercise price and stock price are the same but is lower below the exercise price or above it. If the actual price is lower than the exercise price there is less change of profit on the call. If the actual price is above the exercise price, then there is a chance of profit, and there is less reason to pay a premium over the economic value (intrinsic value)

2.12.3. ASSUMPTIONS AND NOTATION

Some relationships have been derived between option price that do not require any assumptions about volatility and the probabilistic behavior of stock prices For this purposes it is, therefore, reasonable to assume that there are no arbitrage opportunities.

The following notations have been used: .

So: current stock price

ST: stock price at time *T*

X: strike price of option

T: time of expiration of option

r: risk-free rate of interest for maturity *T* (continuously compounded)

C: value of American call option to buy one share

P: value of American put option to sell one share

c: value of European all option to buy one share

p: value of European put option to sell one share

It should be noted that *r* is the nominal rate of interest, *not* the real rate of interest and assumed that $r > O$. Otherwise, a risk-free investment would provide no advantages over cash.

2.12.4. **UPPER AND LOWER BOUNDS FOR OPTION PRICES**

If the option price is above *the* upper bound or below *the* lower bound, there are profitable opportunities for arbitrageurs.

Upper Bounds:

An American or European call option gives the holder *the* right *to* buy one share of a stock for a certain price. No matter what happens, the option can never be worth more than the stock. Hence, the *stock* price is an upper bound *to* the option price:

$$c \leq So \text{ and } C \leq So$$

If these relationships do not hold, an arbitrageur can easily make a risk less profit by buying *the stock* and selling the call option.

An American or European *put* option gives *the* holder *the* right *to* sell one share of a stock for *X*. No matter how low the *stock* price becomes, the option can never be worth more than *X*. Hence

$$P < X \text{ and } P < X$$

For European p*ut* options, we know *that* at time *T* the option will not be *worth* more than *X*. *It* follows that its value today cannot be more than the present value of *X:*

$$P \leq Xe^{-rT}$$

If this were not true, an arbitrageur could make a risk less profit by selling the option and investing the proceeds of *the* sale at *the* risk-free Interest rate.

Lower Bound for European Calls on Non-Dividend-Paying Stocks

A lower bound for the price of a European call option on a non-dividend-paying stock is

$$S_o - Xe^{-rT}$$

First illustrated with a numerical example and then with a more formal argument.

Suppose that So = *Rs20, X* = Rs18, *r* = 10% per annum, and *T* = 1 year. In this case,

$$So - Xe^{-rT} = 20 - 18e^{-0\text{-}i} = 3.71$$

or Rs3.71. Consider the situation where the European call price is Rs3.00, which is less than the theoretical minimum of Rs3.71. An arbitrageur can buy the call and short the stock. This provides a cash inflow of Rs20.00 ~ Rs3.00 = Rs17.00. If invested for one year at 10% per annum, the Rs17.00 grows to Rs18.79. At the end of the year, the option expires. If the stock price is greater than Rs18, the arbitrageur exercises the option, closes out the short position, and makes a profit of

Rs18.79 -Rs18.00 = Rs0.79

If the stock price is less than Rs18, the stock is bought in the .market and the short (X) position is closed out. The arbitrageur then makes an even greater profit. For example, if the stock price is Rs17, the arbitrageur's profit is

Rs18.79 -Rs17.00 = l. 79

For a more formal argument, we consider the following two portfolios:

Portfolio *A:* one European call option plus an amount of cash equal to Xe^{-rT}

Portfolio B: one share)

In portfolio A, if the cash is invested at the risk-free interest rate, it will grow to *X* at time *T.* If $ST > X$, the call option is exercised at time *T* and portfolio A is worth S_T. If $S_T < X$, the call option expires worthless and the portfolio is worth *X.* Hence, at time *T por*tfolio A is worth

$$max(ST, X)$$

Portfolio B is worth *ST* at time *T.* Hence, portfolio A is always worth at least as much and is sometimes worth more than, portfolio B at time *T.* It follows that it must be , worth at least as much as portfolio B today. Hence

$$C + X e^{-rT} \geq So$$

or

$$C \geq S_o - Xe^{-rT}.$$

Because the worst that can happen to a call option is that it expires worthless, its value must be positive. This means that $c > 0$ and, therefore,

$$C + Xe^{-rT} \geq So$$

Or

$$C \geq \max (So - Xe^{-rT}, 0)$$

Lower Bound for European Puts on Non-Dividend-Paying Stocks

For a European put option on a non-dividend-paying stock, a lower bound for the price is

$$Xe^{-rT} - So$$

Suppose that So = Rs37, X = Rs40, r = 5% per annum, and T = 0.5 year. In this case

$$Xe^{-rT} - So = 4Oe^{-o.osxo.s} - 37 = 2.01$$

Rs2.01. Consider the situation where the European put price is Rs1.00, which is less In the theoretical minimum of Rs2.01. An arbitrageur can borrow Rs38.00 for six months to buy both the put and the stock. At the end of the six months, the arbitrageur will be required to repay $38^{-o.osxo.s}$ = Rs38.96. If the stock price is below Rs40.00, : arbitrageur exercises the option to sell the stock for Rs40.00, repays the loan, and makes a profit of

Rs40.00 -Rs38.96 = Rs1.04

If the stock price is greater than Rs40.00, the arbitrageur discards the option, sells and repays the loan for an even greater profit. For example, if the stock price is. 2.00, the arbitrageur's profit is

Rs42.00 -Rs38.9.6 = Rs3.04

For a more formal argument, we consider the following two portfolios:
Portfolio C: one European put option plus one share
Portfolio D: an amount of cash equal to Xe^{-rT}

If ST < X, the option in portfolio C is exercised at time *T,* and the portfolio becomes worth X. If ST > X, the put option expires worthless, and the portfolio is worth ST at time *T.* Hence portfolio C is worth max (ST. X) at time *T.* Assuming that the cash is invested at the risk-free interest rate, portfolio D is worth X at time *T.* Hence, portfolio C is always worth as much as, and is sometimes worth more than, portfolio D at time *T.* It follows that in the absence of arbitrage opportunities. Portfolio C must be worth at least as much as portfolio D today. Hence

$$p + \text{So} \geq Xe^{-rT}$$

or

$$p \geq Xe^{-rT} - \text{So}$$

Because the worst that can happen to a put option is that it expires worthless, value must be non-negative. This means that

$$p \geq \max (Xe^{-rT} - \text{So}. 0)$$

Summary - Factors affecting the option premium

	Call premium	**Put premium**
Longer time to expiration	**+**	**+**
Higher price of underlying	**+**	**-**
Higher volatility of underlying	**+**	**+**
Higher exercise price	**-**	**+**
Higher interest rate	**+**	**-**
Dividend	**-**	**+**

2.12.5. Greeks

The more sophisticated tools used to measure the potential variations of options premiums are as follows:

- Delta
- Gamma
- Vega
- Rho
- Delta

Delta

Delta is the measure of an option's sensitivity to changes in the price of the underlying asset. Therefore, it is the degree to which an option price will move given a change in the underlying stock or index price, all else being equal.

$$\text{Delta} = \frac{\text{Change in option premium}}{\text{Change in underlying price}}$$

For example, an option with a delta of 0.5 will move Rs 5 for every change of Rs 10 in the underlying stock or index.

Illustration:

A trader is considering buying a Call option on a futures contract, which has a price of As 19. The premium for the Call option with a strike price of As 19 is 0.80. The delta for this option is +0.5. This means that if the price of the underlying futures contract rises to As 20 -a rise of Rs.1 -then the premium will increase by 0.5 x 1.00 = 0.50. The new option premium will be 0.80 + 0.50 = As 1.30.

Far out-of-the-money calls will have a delta very close to zero, as the change in underlying price is not likely to make them valuable or cheap. At-the-money call would have a delta of 0.5 and a deeply in-the-money call would have a delta close to 1.

While Call deltas are positive, Put deltas are negative, reflecting the fact that the put option price and the underlying stock price are inversely related. This is because if one buys a put his view is bearish and expects the stock price to go down. However, if the stock price moves up it is contrary to his view

therefore, the value of the option decreases. The put delta equals the call delta minus 1.

It may be noted that if delta of one's position is positive, he desires the underlying asset to rise in price. On the contrary, if delta is negative, he wants the underlying asset's price to fall.

Uses: The knowledge of delta is of vital importance for option traders because this parameter is heavily used in margining and risk management strategies. The delta is often called the hedge ratio. e.g. if you have a portfolio of 'n' shares of a stock then 'n' divided by the delta gives you the number of calls you would need to be short (i.e. need to write) to create a riskless hedge -i.e. a portfolio which would be worth the same whether the stock price rose by a very small amount or fell by a very small amount.

In such a "delta neutral" portfolio any gain in the value of the shares held due to a rise in the share price would be exactly offset by a loss on the value of the calls written, and vice versa.

Note that as the delta changes with the stock price and time to expiration the number of shares would need to be continually adjusted to maintain the hedge. How quickly the delta changes with the stock price are given by gamma, which we shall learn subsequently.

Gamma

This is the rate at which the delta value of an option increases or decreases as a result of a move in the price of the underlying instrument.

$$\textbf{Gamma} = \frac{\text{Change in an option delta}}{\text{Change in underlying price}}$$

For example, if a Call option has a delta of 0.50 and a gamma of 0.05, then a rise of +/- 1 in the underlying means the delta will move to 0.55 for a price rise and 0.45 for a price fall. Gamma is rather like the rate of change in the speed of a car -its acceleration -in moving from a standstill, up to its cruising speed, and braking back to a standstill. Gamma is greatest for an A TM (at-the- money) option (cruising) and falls to zero as an option moves deeply ITM (in-the-money) and OTM (out-of-the-money) (standstill).

If you are hedging a portfolio using the delta-hedge technique described under "Delta", then you will want to keep gamma as small as possible as the smaller it is the less often you will have to adjust the hedge to maintain a delta neutral position. If gamma is too large a small change in stock price could wreck your hedge. Adjusting gamma, however, can be tricky and is generally done using options --unlike delta, it can't be done by buying or selling the underlying asset as the gamma of the underlying asset is, by definition, always zero so more or less of it won't affect the gamma of the total portfolio.

Theta

It is a measure of an option's sensitivity to time decay. Theta is the change in option price given a one-day decrease in time to expiration. It is a measure of time decay (or time shrunk). Theta is generally used to gain an idea of how time decay is affecting your portfolio.

$$\text{Theta} = \frac{\text{Change in an option premium}}{\text{Change in time to expiry}}$$

Theta is usually negative for an option as with a decrease in time, the option value decreases. This is due to the fact that the uncertainty element in the price decreases.

Assume an option has a premium of 3 and a theta of 0.06. After one day it will decline to 2.94, the second day to 2.88 and so on. Naturally other factors, such as changes in value of the underlying stock will alter the premium. Theta is only concerned with the time value. Unfortunately, we cannot predict with accuracy the change's in stock market's value, but we can measure exactly the time remaining until expiration.

Vega

This is a measure of the sensitivity of an option price to changes in market volatility. It is the change of an option premium for a given change - typically 1 % -in the underlying volatility.

$$\text{Vega} = \frac{\text{Change in an option premium}}{\text{Change in volatility}}$$

If for example, XYZ stock has a volatility factor of 30% and the current premium is 3, a Vega of .08 would indicate that the premium would increase to 3.08 if the volatility factor increased by 1 % to 31 %. As the stock becomes more volatile the changes in premium will increase in the same proportion. Vega measures the sensitivity of the premium to these changes in volatility.

What practical use is the Vega to a trader? If a trader maintains a delta neutral position, then it is possible to trade options purely in terms of volatility -the trader is not exposed to changes in underlying prices. "

Rho

Rho measures the change in an option's price per unit increase - typically 1 % -in the cost of funding the underlying.

$$\text{Rho} = \frac{\text{Change in an option premium}}{\text{Change in cost of funding underlying}}$$

Example:

Assume the value of Rho is 14.10. If the risk free interest rates go up by 1 % the price of the option will move by Rs 0.14109. To put this in another way: if the risk-free interest rate changes by a small amount, then the option value should change by 14.10 times that amount.

For example, if the risk-free interest rate increased by 0.01 (from 10% to 11 %), the option value would change by 14.10*0.01 = 0.14. For a put option, inverse relationship exists. If the interest rate goes up the option value decreases and therefore, Rho for a put option is negative. In general Rho tends to be small except for long-dated options.

2.13.Options Pricing Models

There are various option pricing models which traders use to arrive at the right value of the option. Some of the most popular models have been enumerated below.

2.13.1. Binomial options pricing model

The **binomial options pricing model** provides a generalisable numerical method for the valuation of options. The binomial model was first proposed by Cox, Ross and Rubinstein (1979). Essentially, the model uses a "discrete-time"

model of the varying price over time of the underlying financial instrument. Option valuation is then via application of the risk neutrality assumption over the life of the option, as the price of the underlying instrument evolves.

This model approach is widely used in a variety of conditions for which other models cannot be easily applied. This is used to value American options which can be exercised at any point and Bermudan options which can be exercised at various points. The model is also relatively simple, mathematically, and can therefore be readily implemented in a software (or even spreadsheet) environment. Although slower than the Black-Scholes model, it is considered more accurate, particularly for longer-dated options, and options on securities with dividend payments.

The Model

The binomial pricing model uses a "discrete-time framework" to trace the evolution of the option's key underlying variable via a binomial lattice (tree), for a given number of time steps between valuation date and option expiration.

Each node in the lattice, represents a *possible* price of the underlying, at a *particular* point in time. This price evolution forms the basis for the option valuation.

The valuation process is iterative, starting at each final node, and then working backwards through the tree to the first node (valuation date), where the calculated result is the value of the option.

Option valuation using this method is a three step process, which is as follows:

1. price tree generation
2. calculation of option value at each final node

3. progressive calculation of option value at each earlier node; the value at the first node is the value of the option.

The tree of prices is produced by working forward from valuation date to expiration. At each step, it is assumed that the underlying instrument will move up or down by a specific factor (*u* or *d*) per step of the tree. By definition, $u \geq 1$ and $0 < d \leq 1$.

If *S* is the current price, then in the next period the price will either be $S_{up} = S \cdot u$ or $S_{down} = S \cdot d$. The up and down factors are calculated using the underlying volatility, σ and the time duration of a step, *t*, measured in years (using the day count convention of the underlying instrument).

$$u = e^{\sigma\sqrt{t}}$$
$$d = e^{-\sigma\sqrt{t}} = \frac{1}{u}.$$

The above is the original Cox, Ross, & Rubinstein (CRR) method; there are other techniques for generating the lattice, such as "the equal probabilities" tree.

Option value at each final node

At each final node of the tree -- i.e. at expiration of the option -- the option value is simply its intrinsic, or exercise, value.

Max [(S – K), 0], for a call option
Max [(K – S), 0], for a put option:

(Where K is the Strike price and S is the spot price of the underlying asset)

Option value at earlier nodes

At each earlier node, the value of the option is calculated using the risk neutrality assumption.

Under this assumption, today's fair price of a derivative is equal to the discounted expected value of its future payoff. Expected value is therefore calculated using the option values from the later two nodes (*Option up* and *Option down*) weighted by their respective probabilities -- "probability" **p** of an up move in the underlying, and "probability" **(1-p)** of a down move.

The expected value is then discounted at **r**, the risk free rate corresponding to the life of the option. This result, the "Binomial Value", is thus the fair price of the derivative at a particular point in time (i.e. at each node), given the evolution in the price of the underlying to that point.

The Binomial Value is found for each node, starting at the penultimate time step, and working back to the first node of the tree, the valuation date, where the calculated result is the value of the option. For an American option, since the option may either be held or exercised prior to expiry, the value at each node is: Max (Binomial Value, Exercise Value).

The Binomial Value is calculated as follows.

Binomial Value = [p × Option up + (1-p)× Option down] × exp (- r × t)

$$p = \frac{e^{(r-q)t} - d}{u - d}$$

q is the dividend yield of the underlying corresponding to the life of the option.

Advantage: The big advantage is that it can be used to accurately price American options. This is because, with the binomial model it's possible to check at every point in an option's life (ie at every step of the binomial tree) for the possibility of early exercise (eg where, due to eg a dividend, or a put being deeply in the money the option price at that point is less than the its intrinsic value).

Where an early exercise point is found it is assumed that the option holder would elect to exercise and the option price can be adjusted to equal the intrinsic value at that point. This then flows into (the calculations higher up the tree and so on.

Limitation: As mentioned before the main disadvantage of the binomial model is its relatively slow speed. It's great for half a dozen calculations at a time but even with today's fastest PCs it's not a practical solution for the calculation of thousands of prices in a few seconds which is what's required for the production of the animated charts in strategy evaluation model.

2.13.2. Black-Scholes Model

The **Black–Scholes model** is a model of the evolving price of financial instruments, in particular stocks. It is a mathematical formula for the theoretical value of European put and call stock options derived from the assumptions of the model. The formula was derived by Fischer Black and Myron Scholes and published in 1973. They built on earlier research by Edward Thorpe, Paul Samuelson, and Robert C. Merton. The fundamental insight of Black and Scholes is that the option is implicitly priced if the stock is traded.

Merton and Scholes received the 1997 Nobel Prize in Economics for this and related work; Black was ineligible, having died in 1995.

The key assumptions of the Black–Scholes model are:

The price of the underlying instrument S_t follows a geometric Brownian motion with constant drift μ and volatility σ:

$$dS_t = \mu S_t\,dt + \sigma S_t\,dW_t$$

It is possible to short sell the underlying stock.

There are no arbitrage opportunities.

Trading in the stock is continuous.

There are no transaction costs or taxes.

All securities are perfectly divisible (e.g. it is possible to buy 1/100th of a share).

A constant risk-free interest rate exists and is the same for all maturity dates.

The formula

The above lead to the following formula for the price of a call option with exercise price *K* on a stock currently trading at price *S*,

i.e., the right to buy a share of the stock at price *K* after *T* years. The constant interest rate is *r*, and the constant stock volatility is σ.

$$C(S,T) = SN(d_1) - Ke^{-rT}N(d_2)$$

where

$$d_1 = \frac{\ln(S/K) + (r + \sigma^2/2)T}{\sigma\sqrt{T}}$$

$$d_2 = d_1 - \sigma\sqrt{T}.$$

Here *N* is the standard normal cumulative distribution function.

The price of a put option may be computed from this by put-call parity and simplifies to

$$P(S,T) = Ke^{-rT}N(-d_2) - SN(-d_1).$$

The Greeks under the Black–Scholes model are also easy to calculate:

	Calls	**Puts**
delta	$N(d_1)$	$N(d_1) - 1$
gamma	$\frac{\phi(d_1)}{S\sigma\sqrt{T}}$	
vega	$S\phi(d_1)\sqrt{T}$	
theta	$-\frac{S\phi(d_1)\sigma}{2\sqrt{T}} - rKe^{-rT}N(d_2)$	$-\frac{S\phi(d_1)\sigma}{2\sqrt{T}} + rKe^{-rT}N(-d_2)$
rho	$KTe^{-rT}N(d_2)$	$-KTe^{-rT}N(-d_2)$

Here, φ is the standard normal probability density function. Note that the gamma and vega formulas are the same for calls and puts.

Instruments paying continuous dividends

The dividend payment paid over the time period [*t*,*t* + *dt*] is then modelled as

$$qS_t\,dt$$

for some constant *q* (the dividend yield).

Under this formulation the arbitrage-free price implied by the Black–Scholes model can be shown to be

$$C(S_0, T) = e^{-rT}(FN(d_1) - KN(d_2))$$

where now

$$F = S_0 e^{(r-q)T}$$

is the modified forward price that occurs in the terms d_1 and d_2:

$$d_1 = \frac{\ln(F/K) + (\sigma^2/2)T}{\sigma\sqrt{T}}$$

$$d_2 = d_1 - \sigma\sqrt{T}.$$

Instruments paying discrete dividends

It is also possible to extend the Black–Scholes framework to options on instruments paying discrete dividends. This is useful when the option is struck on a single stock.

A typical model is to assume that a proportion δ of the stock price is paid out at pre-determined times T_1,T_2,.... The price of the stock is then modelled as

$$S_t = S_0(1-\delta)^{n(t)}e^{ut+\sigma W_t}$$

where $n(t)$ is the number of dividends that have been paid by time t.

The price of a call option on such a stock is again

$$C(S_0,T) = e^{-rT}(FN(d_1) - KN(d_2))$$

where now

$$F = S_0(1-\delta)^{n(T)}e^{rT}$$

is the forward price for the dividend paying stock.

While in practice more advanced models are often used, many of the key insights provided by the Black–Scholes formula have become an integral part of market conventions. For instance, it is common practice for the implied volatility rather than the price of an instrument to be quoted. (All the parameters in the model *other than the volatility*—that is the time to maturity, the strike, the risk-free rate, and the current underlying price—are unequivocally observable. This means there is one-to-one relationship between the option price and the volatility.) Traders prefer to think in terms of volatility as it allows them to evaluate and compare options of different maturities, strikes, and so on.

However, the Black–Scholes model cannot match option prices at different strikes and maturities observed on the market. If the Black–Scholes model held, then the implied volatility surface (the map from strike and maturity

to implied volatility) of an option on a particular stock would be constant. In practice, the volatility surface (the three-dimensional graph of implied volatility against strike and maturity) is not flat: for a fixed maturity it is typically smile-shaped (see volatility smile). That is, at-the-money (the option for which the underlying price and strike coincide) the implied volatility is lowest; out-of-the-money or in-the-money the implied volatility tends to be different, usually higher on the put side (low strikes), and call side (high strikes).

In fact, the volatility surface of a given underlying instrument depends on, among other things, its 'perceived' distribution and is constantly changing as investors, market-makers, and arbitrageurs re-evaluate the probability of the underlying instrument reaching a given strike and the risk-reward (including factors related to liquidity) associated to it.

Lognormal distribution: The model is based on a lognormal distribution of stock prices, as opposed to a normal, or bell-shaped, distribution. The lognormal distribution allows for a stock price distribution of between zero and infinity (ie no negative prices) and has an upward bias (representing the fact that a stock price can only drop 100 per cent but can rise by more than 100 per cent).

Risk-neutral valuation: The expected rate of return of the stock (ie the expected rate of growth of the underlying asset which equals the risk free rate plus a risk premium) is not one of the variables in the Black-Scholes model (or any other model for option valuation). The important implication is that the price of an option is completely independent of the expected growth of the underlying asset Thus, while any two investors may strongly disagree on the rate of return they expect on a stock they will, given agreement to the

assumptions of volatility and the risk free rate, always agree on the fair price of the option on that underlying asset.

The key concept underlying the valuation of all derivatives --the fact that price of an option is independent of the risk preferences of investors --is called risk-neutral valuation. It means that all derivatives can be valued by assuming that the return from their underlying assets is the risk free rate.

Advantage: The main advantage of the Black-Scholes model is speed --it lets you calculate a very large number of option prices in a very short time. Since, high accuracy is not critical for American option pricing (eg when animating a chart to show the effects of time decay) using' Black-Scholes is a good option. But, the option of using the binomial model is also advisable for the relatively few pricing and profitability numbers where accuracy may be important and speed is irrelevant. You can experiment with the Black-Scholes model using on-line options pricing calculator.

Limitation: Dividends are ignored in the basic Black-Scholes formula, but there are a number of widely used adaptations to the original formula, which enable it to handle both discrete and continuous dividends accurately.

However, despite these adaptations the Black-Scholes model has one major limitation: it cannot be used to accurately price options with an American-style exercise as it only calculates the option price at one point in time --at expiration. It does not consider the steps along the way where there could be the possibility of early exercise of an American option.

As all exchange traded equity options have American-style exercise (ie they can be exercised at any time as opposed to European options which can only be exercised at expiration) this is a significant limitation.

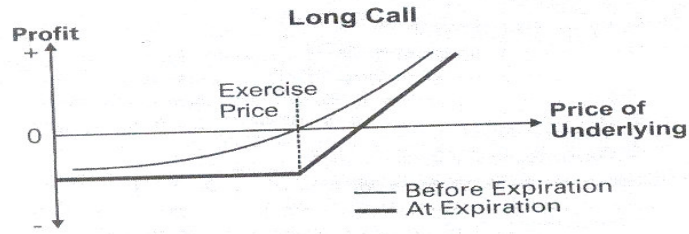
The exception to this is an American call on a non-dividend paying asset. In this case the call is always worth the same as its European equivalent as there is never any advantage in exercising early.

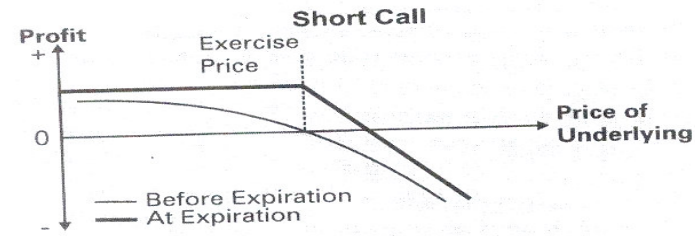
2.14. TRADING STRATEGIES

2.14.1. Bull Market Strategies

Call in a Bullish Strategy:

An investor with a bullish market outlook should buy call option. It one expects the market price of the underlying asset to rise, then, he would rather have the right to purchases at a specified price and sell later at a higher price than have the obligation to deliver later at a higher price.





The investor's profit potential on buying a call option is unlimited. His profit is the market price less the exercise price less the premium. The increase in price of the underlying increases the investor's profit.

The investor's potential loss is limited. Even if the market takes a drastic decline in price levels, the holder of a call is under no obligation to exercise the option and let the option expire worthless. The investor breaks even when the market price equals the exercise price plus the premium.

An increase in volatility will increase the value of call and thereby increases the return. Because of the increased likelihood that the option will become in- the-money, an increase in the underlying volatility (before expiration), will increase the value of a long options position.

Puts in a Bullish Strategy

An investor with a bullish market outlook can also go short on a Put option. Basically, an investor anticipating a bull market could write put options. If the market price increases and puts become out-of-the-money, investors with long put positions will let their options expire worthless.

By writing Puts, profit potential is limited. A Put writer profits when the price of the underlying asset increases and the option expires worthless. The maximum profit is limited to the premium received.

However, the potential loss is unlimited. Because a short put position holder has an obligation to purchase if exercised. He will be exposed to potentially large losses if the market moves against his position and declines.

The break-even point occurs when the market price equals the exercise price: minus the premium. At any price less than the exercise price minus the premium, the investor loses money on the transaction. At higher prices, his option is profitable.

An increase in volatility will increase the value of your put and decrease your return. As an option writer, the higher price you will be forced to pay in order to buy back the option at a later date, lower is the return.

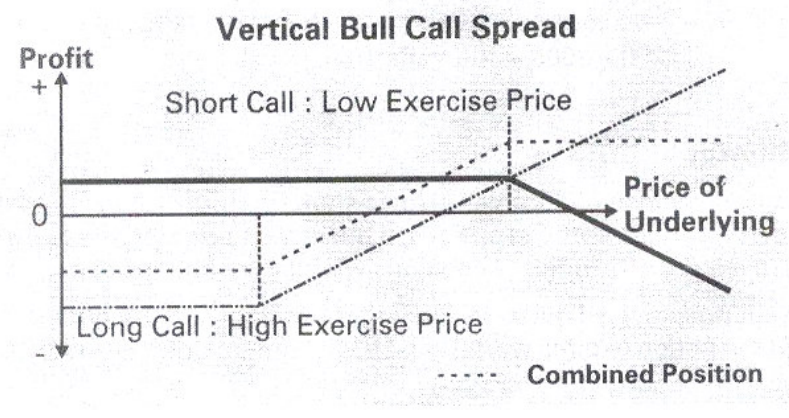
Bullish Call Spread Strategies

A vertical call spread is the simultaneous purchase and sale of identical call options but with different exercise prices.

To "buy a call spread" is to purchase a call with a lower exercise price and to write a call with a higher exercise price. The trader pays a net premium for the position.

To "sell a call spread" is the opposite, here the trader buys a call with a higher exercise price and writes a call with a lower exercise price, receiving a net premium for the position.

An investor with a bullish market outlook should buy a call spread. The "Bull Call Spread" allows the investor to participate to a limited extent in a bull market, while at the same time limiting risk exposure.



To put on a bull spread, the trader needs to buy the lower strike call and sell the higher strike call. The combination of these two options will result in a bought spread. The cost of Putting on this position will be the difference between the premium paid for the low strike call and the premium received for the high strike call.

The investor's profit potential is limited. When both calls are in-the-money, both will be exercised and the maximum profit will be realised. The investor delivers on his short call and receives a higher price than he is paid for receiving delivery on his long call.

The investor's potential loss is limited. At the most, the investor can lose is the net premium. He pays a higher premium for the lower exercise price call than he receives for writing the higher exercise price call than he receives for writing the higher exercise price call.

The investor breaks even when the market price equals the lower exercise price plus the net premium. At the most, an investor can lose is the net premium paid. To recover the premium, the market price must be as great as the lower exercise price plus the net premium.

An example of a Bullish call spread:

Let's assume that the cash price of scrip is Rs. 100 and one bought a November call option with a strike price of Rs. 90 and paid a premium of Rs. 14. At the same time he sold another November call option on scrip with a strike price of Rs.110 and received a premium of Rs.4. Here, he is buying a lower strike price option and selling a higher strike price option. This would result in a net outflow of Rs.10 at the time of establishing the spread.

Now let us look at the fundamental reason for this position. Since this is a bullish strategy, the first position established in the spread is the long lower strike price call option with unlimited profit potential. At the same time to reduce the cost of purchase of the long position a short position at a higher call strike price is established. While this not only reduces the outflow in terms of premium but also his profit potential and at the sometime the risk is limited. Based on the above figures the maximum profit, maximum loss and breakeven point of this spread would be as follows:

Maximum profit = Higher strike price -Lower strike price -Net premium paid

= 110-90-10

= 10

Maximum Loss = Lower strike premium -Higher strike premium

= 14-4 = 10

Breakeven Price = Lower strike price + Net premium paid

= 90 + 10 = 100

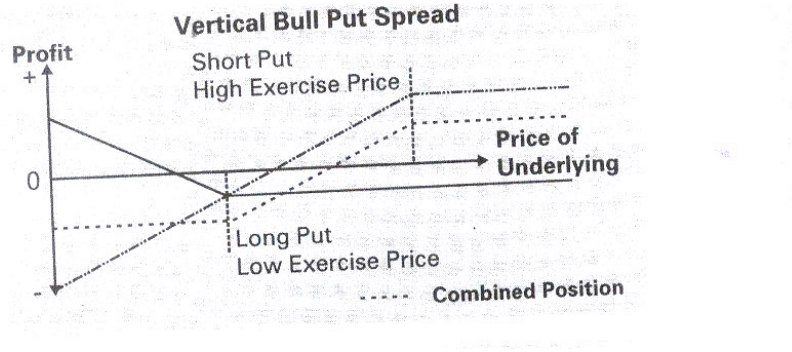
Bullish Put Spread Strategies

A vertical Put spread is the simultaneous purchase and sale of identical Put options but with different exercise prices.

To "buy a put spread" is to purchase a Put with a higher exercise price and to write a Put with a lower exercise price. The trader pays a net premium for the position.

To "sell a put spread" is the opposite: the trader buys a Put with a lower exercise price and writes a put with a higher exercise price, receiving a net premium for the position.

An investor with a bullish market outlook should sell a Put spread. The "vertical bull put spread" allows the investor to participate to a limited extent in a bull market, while at the same time limiting risk exposure.



To put on a bull spread can be created by buying the lower strike and selling the higher strike of either calls or put. The difference between the premiums paid and received makes up one leg of the spread.

The investor's profit potential is limited. When the market price reaches or exceeds the higher exercise price, both options will be out-of-the-money and will expire worthless. The trader will realize his maximum profit, the net premium.

The investor's potential loss is also limited. If the market falls, the options will be in-the-money. The puts will offset one another, but at different exercise prices.

The investor breaks-even when the market price equals the lower exercise price less the n premium. The investor achieves maximum profit i.e. the premium received; when the mark price moves up beyond the higher exercise price (both puts are then worthless).

An example of a bullish put spread.

Lets us assume that the cash price of the scrip is Rs.100. One now buys November put option scrip with a strike price of Rs.90 at a premium of Rs.5 and sells a put option with a strike price Rs.110 at a premium of Rs.15.

The first position is a short put at a higher strike price. This has resulted in some inflow in terms of premium. But here the trader is worried about risk and so caps his risk by buying another put option at the lower strike price. As such, a part of the premium received goes off and the ultimate position has limited risk and limited profit potential. Based on the above figures the maximum profit, maximum loss and breakeven point of this spread would be as follows:

Maximum profit = Net option premium income or net credit

= 15-5= 10

Maximum loss = Higher strike price -Lower strike price -Net premium received

= 110-90-10= 10

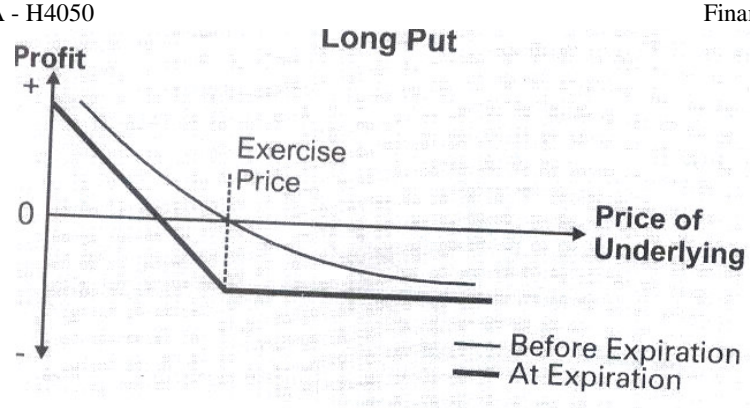
Breakeven Price = Higher Strike price -Net premium income

= 110-10= 100

2.14.2. Bear Market Strategies

Puts in a Bearish Strategy

When one purchases a put he is long and wants the market to fall. A put option is a bearish position which will increase in value if the market falls. By purchasing put options, the trader has the right to choose whether to sell the underlying asset at the exercise price. In a falling market, this choice is preferable to being obligated to buy the underlying at a price higher.



An investor's profit potential is practically unlimited. The higher the fall in price of the underlying asset, higher the profits.

The investor's potential loss is limited. If the price of the underlying asset rises instead of falling as' the investor has anticipated, he may let the option expire worthless. At the most, he may lose the premium for the option.

The trader's breakeven point is the exercise price minus the premium. To profit, the market price must be below the exercise price. Since the trader has paid a premium he must recover the premium he paid for the option.

An increase in volatility will increase the value of the put and increases the return. An increase in volatility will make it more likely that the price of the underlying instrument will move, increasing the value of the option.

Calls in a Bearish Strategy

Another option for a bearish investor is to go short on a call with the intent to purchase it back in the future. By selling a call, you have a net short position and needs to be bought back before expiration and cancel out your position.

For this an Investor needs to write a call option. If the market price falls, long call holders will let their out-of-the-money options expire worthless, because they could purchase the underlying asset at the lower market price.

The investor's profit potential is limited because the trader's maximum profit is limited to the premium received for writing the option.

Here the loss potential is unlimited because a short call position holder has an obligation to sell if exercised; he will be exposed to potentially large losses if the market rises against his position.

The investor breaks even when the market price equals the exercise price: plus the premium. At any price greater than the exercise price plus the premium, the trader is losing money. When the market price equals the exercise price plus the premium, the trader breaks even.

An increase in volatility will increase the value of call and decreases its return.

When the option writer has to buy back the option in order to cancel out his position, he will be forced to pay a higher price due to the increased value of the calls.

Bearish Put Spread Strategies

A vertical put spread is the simultaneous purchase and sale of identical put options but with different exercise prices.

To "buy a put spread" is to purchase a put with a higher exercise price and to write a put with a lower exercise price. The trader pays a net premium for the position.

To "sell a put spread" is the opposite. The trader buys a put with a lower exercise price and writes put with a higher exercise price, receiving a net premium for the position.

To put on a bear put spread buy the higher strike put and sell the lower strike put.

Sell the lower strike and buy the higher strike of either calls or puts to set up a bear spread.

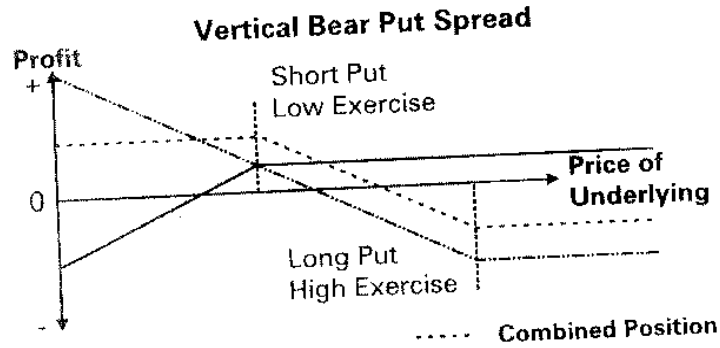
An investor with a bearish market outlook should: buy a put spread. The “Bear Put Spread” allows the investor to participate to a limited extent in a bear marker, while at the same time limiting risk exposure.

The investor's profit potential is limited. When the market price falls to or below the lower exercise price, both options will be in-the-money and the trader will realize his maximum profit when he recovers the net premium paid for the options.

The investor's potential loss is limited. The trader has offsetting positions at different exercise prices. If the market rises rather than falls, the options will be out-of-the-money and expire worthless. Since the trader has paid a net premium.

The investor breaks even when the market price equals the higher exercise price less the net premium. For the strategy to be profitable, the market

price must fall. When the market price falls to the high exercise price less the net premium, the trader breaks even. When the market falls beyond this point, the trader profits.



An example of a bearish put spread.

Let's assume that the cash price of the scrip is Rs 100. One buys a November put option on scrip with a strike price of Rs 110 at a premium of Rs 15 and sell a put option with a strike price of Rs 90 at a premium of Rs 5.

In this bearish position the put is taken as long *on* a higher strike price put with the *outgo of* some premium. *This* position has huge profit potential *on* downslide. The trader may recover a part *of* the premium paid by him by writing a lower strike price put option. *The* resulting position is a mildly bearish position with limited risk and limited profit profile. Though the trader has reduced the cost *of* taking a bearish position, he has also capped the profit potential as well. *The* maximum profit, maximum loss and breakeven point *of* this spread would be as *follows:*

Maximum profit =

Higher strike price option -Lower strike price option -Net premium paid

= 110-90-10= 10

Maximum loss = Net premium paid

= 15-5= 10

Breakeven Price = Higher strike price -Net premium paid

= 110-10= 100

Bearish Call Spread Strategies

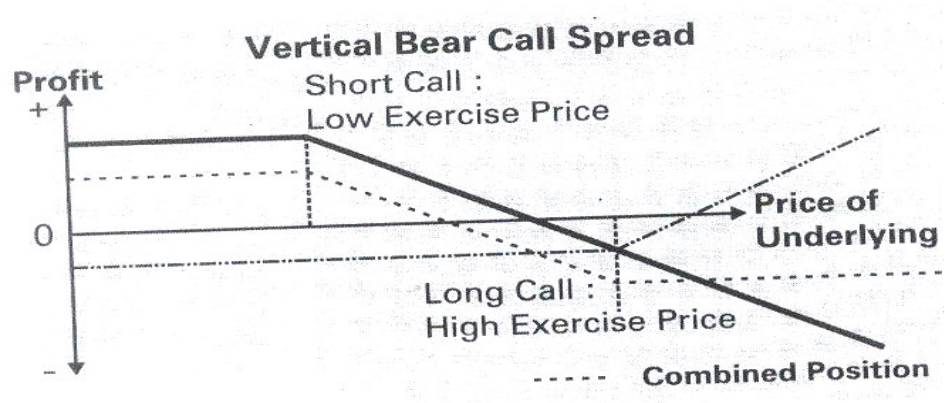
A vertical call spread is the simultaneous purchase and sale *of* identical call options but with different exercise prices.

To "buy a cal' spread" is to purchase a call with a lower exercise price and to write a call with a higher exercise price. *The* trader pays a net premium *for* the position.

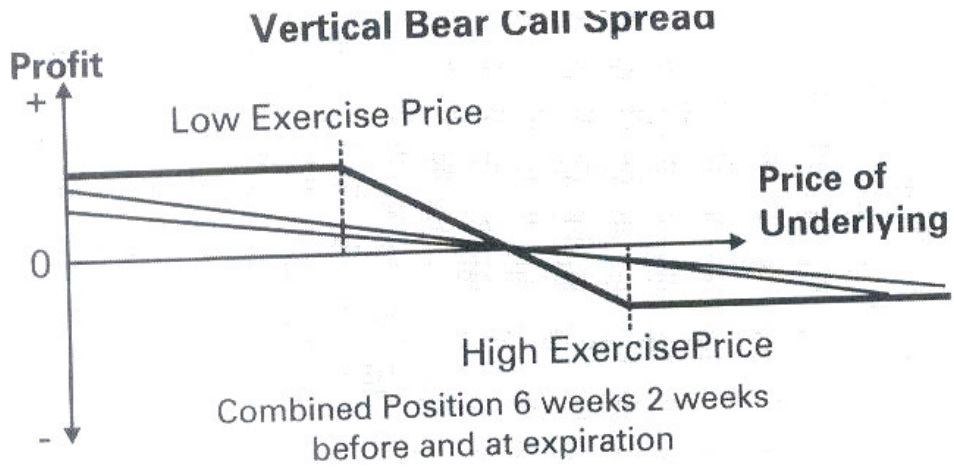
To "sell a call spread" is the opposite: the trader buys a call with a higher exercise price and writes a call with a lower exercise price, receiving a net premium *for* the position.

To put *on* a bear ca" spread you sell the lower strike call and buy the higher strike call. An investor sells the lower strike and buys the higher strike *of* either calls *or* puts to put *on* a bear spread.

An investor with a bearish market outlook should: sell a call spread. *The* "Bear Call Spread" allows f the investor to participate to a limited extent in a bear market, while at the same time limiting risk exposure.



The investor breaks even when the market price equals the lower exercise price plus the net premium. The strategy becomes profitable as the market price declines. Since the trader is receiving a net premium, the market price does not have to fall as low as the lower exercise price to breakeven.



An example of a bearish call spread.

Let us assume that the cash price of the scrip is Rs.100. One now buys a November call option on scrip with a strike price of Rs.110 at a premium of Rs.5 and sells a call option with a strike price of Rs.90 at a premium of Rs.15.

In this spread he has to buy a higher strike price call option and sell a lower strike price option. As the low strike price option is more expensive than the higher strike price option, it is a net credit strategy. The final position is left with limited risk and limited profit. The maximum profit, maximum loss and breakeven point of this spread would be as follows:

Maximum profit = Net premium received

= 15-5= 10

Maximum loss =

Higher strike price option -Lower strike price option -Net premium received

= 110-90-10= 10

Breakeven Price = Lower strike price + Net premium paid

= 90 + 10 = 100

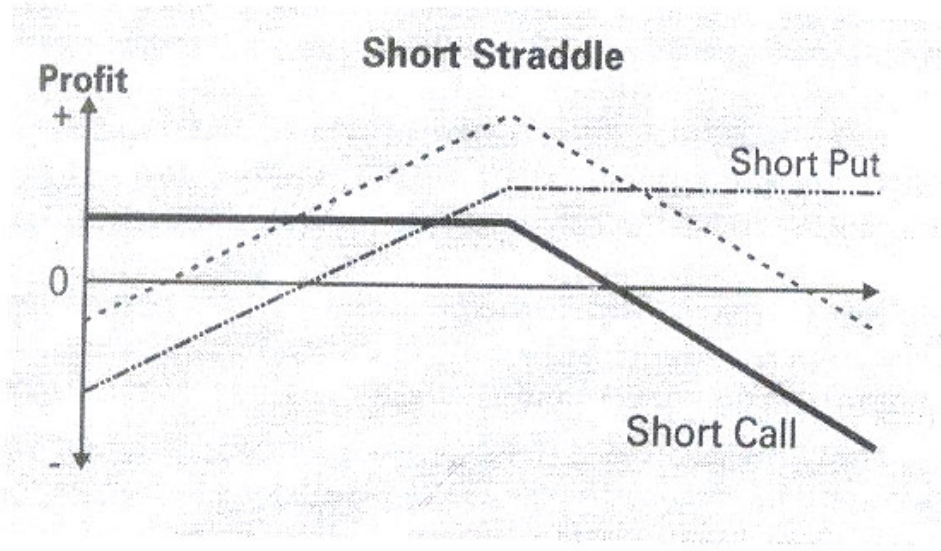
2.14.3 Volatile Market Strategies

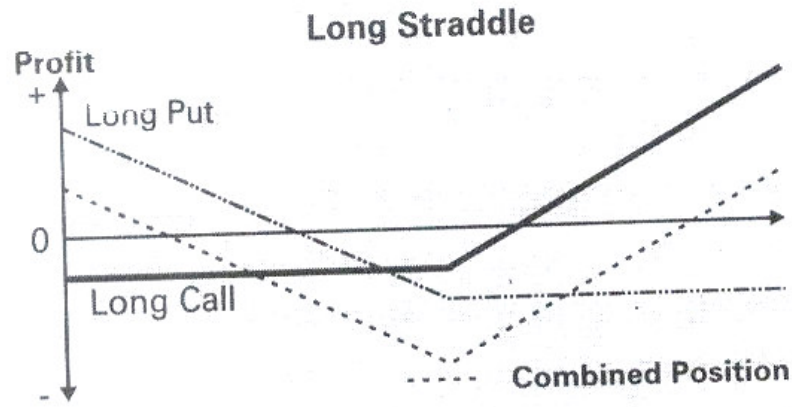
Straddles in a Volatile Market Outlook

Volatile market trading strategies are appropriate when the trader believes the market will move but does not have an opinion on the direction of movement of the market. As long as there is significant movement upwards or downwards, these strategies offer profit opportunities. A trader need not be bullish or bearish. He must simply be of the opinion that the market is volatile.

- A straddle is the simultaneous purchase (or sale) of two identical options, one a call and the other a put.
- To "buy a straddle" is to purchase a call and a put with the same exercise price and expiration date.
- To "sell a straddle" is the opposite: the trader sells a call and a put with the same exercise price and expiration date.

A trader, viewing a market as volatile, should buy option straddles. A "straddle purchase" allows the trader to profit from either a bull market or from a bear market.





Here the investor's profit potential is unlimited. If the market is volatile, the trader can profit from an up- or downward movement by exercising the appropriate option while letting the other option expire worthless. (Bull market, exercise the call; bear market, the put.)

If the price of the underlying asset remains stable instead of either rising or falling as the trader anticipated, the maximum he will lose is the premium he paid for the options.

In this case the trader has long two positions and thus, two breakeven points. One is for the call which is exercise price plus the premiums paid, and the other for the put, which is exercise price minus the premiums paid.

Strangles in a Volatile Market Outlook

A strangle is similar to a straddle, except that the call and the put have different exercise price usually, both the call and the put are out-of-the-money.

To "buy a strangle" is to purchase a call and a put with the same expiration date, but differ exercise prices.

To "sell a strangle" is to write a call and a put with the same expiration date, but different exercise prices.

A trader, viewing a market as volatile, should buy strangles. A "strangle purchase" allows the trader to profit from either a bull or bear market. Because the options are typically out-of-the money, the market must move to a greater degree than a straddle purchase to be profitable.

The trader's profit potential is unlimited. If the market is volatile, the trader can profit from up or downward movement by exercising the appropriate option, and letting the other expire worthless. (In a bull market, exercise the call; in a bear market exercise the put).

The investor's potential loss is limited. Should the price of the underlying remain stable, the most the trader would lose is the premium he paid for the options. Here the loss potential is also very minimal because, the more the options are out-of-the-money, the lesser the premiums.

Here the trader has two long positions and thus, two breakeven points. One for the call, which breakevens when the market price equal the high exercise price plus the premium paid, and the put, when the market price equals the low exercise price minus the premium paid.

The Short Butterfly Call Spread:

Like the volatility positions, the Short Butterfly position will realize a profit if the market makes a substantial move. It also uses a combination of puts

and calls to achieve its profit/loss profile -but combines them in such a manner that the maximum profit is limited.

The profit loss profile of a short butterfly spread looks like two short options coming together at the center Calls.

One's potential gains or losses are: limited on both the upside and the downside.

The Call Ratio Back spread

The call ratio back spread is similar in contraction to the short butterfly call spread. The only difference is that one omits one of the components (or legs) used to build the short butterfly when constructing a call ratio back spread.

When putting on a call ratio back spread, one is neutral but wants the market to move in either direction. The call ratio back spread will lose money if the market sits. The market outlook one would have in putting on this position would be for a volatile market, with greater probability that the market will rally.

To put on a call ratio back spread, one sells one of the lower strikes and buy two or more of the higher strike. By selling an expensive lower strike option and buying two less expensive high strike options, one receives an initial credit for this position. The maximum loss is then equal to the high strike price minus the low strike price minus the initial net premium received.

The profit on the downside is limited to the initial net premium received when setting up the spread. The upside profit is unlimited.

An increase in implied volatility will make the spread more profitable. Increased volatility increases a long option position's value. The greater number of long options will cause this spread to become more profitable when volatility increases.

The Put Ratio Back spread

In combination positions (e.g. bull spreads, butterflies, ratio spreads), one can use calls or puts to achieve similar, if not identical, profit profiles. Like its call counterpart, the put ratio backspread combines options to create a spread which has limited loss potential and a mixed profit potential.

It is created by combining long and short puts in a ratio *of* 2: 1 or 3: 1. In a 3: 1 spread, one would buy three puts at a low exercise price and write one put at a high exercise price. While one may, *of* course, extend this position out to six long and two short or nine long and three short, it is important that one respect the (in this case) 3: 1 ratio in order to maintain the put ratio backspread profitless profile.

When put on a put ratio backspread one is neutral but wants the market to move in either direction.

One’s market expectations here would be for a volatile market with a greater probability that the market will fall than rally.

Unlimited profit would be realized on the downside.

The two long puts offset the short put and result in practically unlimited profit on the bearish side *of* the market. The cost *of* the long puts is offset by the premium received for the (more expensive) short put, resulting in a net premium received.

To put on a put ratio backspread, one buy two or more *of* the lower strike and sell one *of* the higher strike.

One sells the more expensive put and buy two or more *of* the cheaper put. One usually receives an initial net premium for putting on this spread. The Maximum loss is equal to: High strike price -Low strike price -Initial net premium received.

2.14.4. Stable Market Strategies

Straddles in a Stable Market Outlook

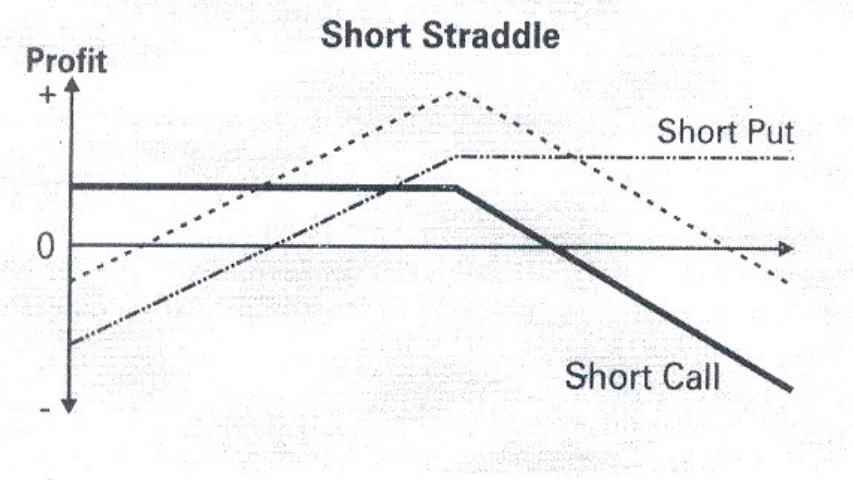
- A straddle is the simultaneous purchase (or sale) *of* two identical options, one a call and the other a put.
- To "buy a straddle" is to purchase a call and a put with the same exercise price and expiration date.
- To "sell a straddle" is the opposite: the trader sells a call and a put with the same exercise price and expiration date.

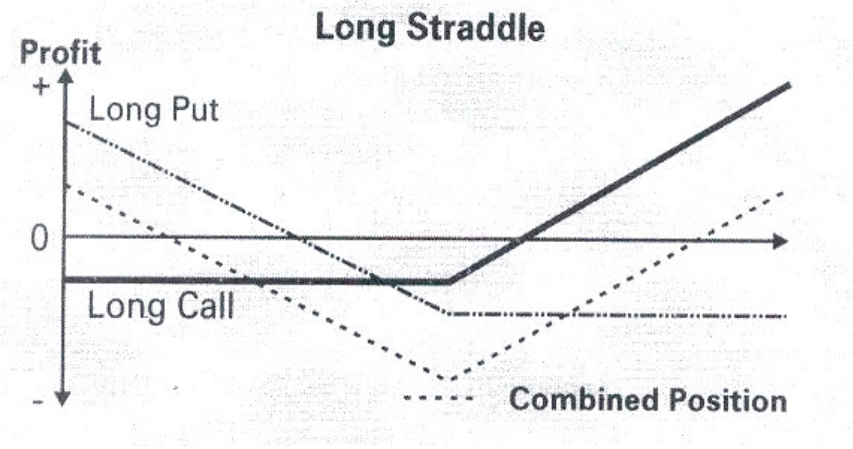
A trader, viewing a market as stable, should: write option straddles. A "straddle sale" allows the trader to profit from writing calls and puts in a stable market environment.

The investor's profit potential is limited. If the market remains stable, traders long out-of-the- money calls or puts will let their options expire worthless. Writers of these options will not called to deliver and will profit from the sum of the premiums received.

The investor's potential loss is unlimited. Should the price of the underlying rise or fall, the writer of a call or put would have to deliver,

exposing him to unlimited loss if he has to deliver on the call and practically unlimited loss if on the put.





The breakeven points occur when the market price at expiration equals the exercise price plus the premium and minus the premium. The trader is short two positions and thus, two breakeven points; One for the call (common exercise price plus the premiums paid), and one for the put (common exercise price minus the premiums paid).

Strangles in a Stable Market Outlook

A strangle is similar to a straddle, except that the call and the put have different exercise prices. Usually, both the call and the put are out-of-the-money.

To "buy a strangle" is to purchase a call and a put with the same expiration date, but different exercise prices. Usually the call strike price is higher than the put strike price.

To "sell a strangle" is to write a call and a put with the same expiration date, but different exercise prices.

A trader, viewing a market as stable, should: write strangles.

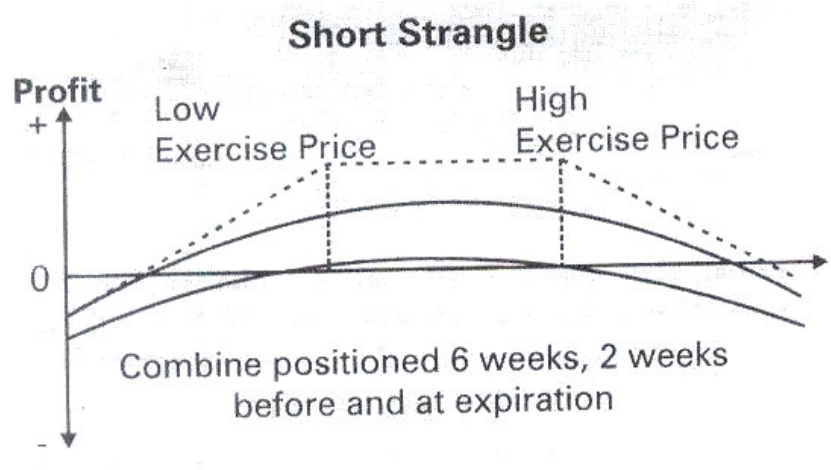
A "strangle sale" allows the trader to profit from a stable market.
The investor's profit potential is: limited.

If the market remains stable, investors having out-of-the-money long put or long call positions will let their options expire worthless and seller of the options will have limited Profit and will be equal to the premium received.
The investor's potential loss is: unlimited.

If the price of the underlying interest rises or falls instead of remaining stable as anticipated, he will have to deliver on the call or the put.

The breakeven points occur when market price at expiration equals the high exercise price the premium and the low exercise price minus the premium.

The trader is short two positions and thus, two breakeven points. One for the call (high exercise price plus the premiums paid), and one for the put (low exercise price minus the premiums paid).



The risk is lower with a strangle. Although the seller gives up a substantial amount of potential profit by selling a strangle rather than a straddle, he also holds less risk. Notice that the strangle requires more of a price move in both directions before it begins to lose money.

Long Butterfly Call Spread Strategy: The long butterfly call spread is a combination of a bull spread and a bear spread, utilizing calls and three different exercise prices.

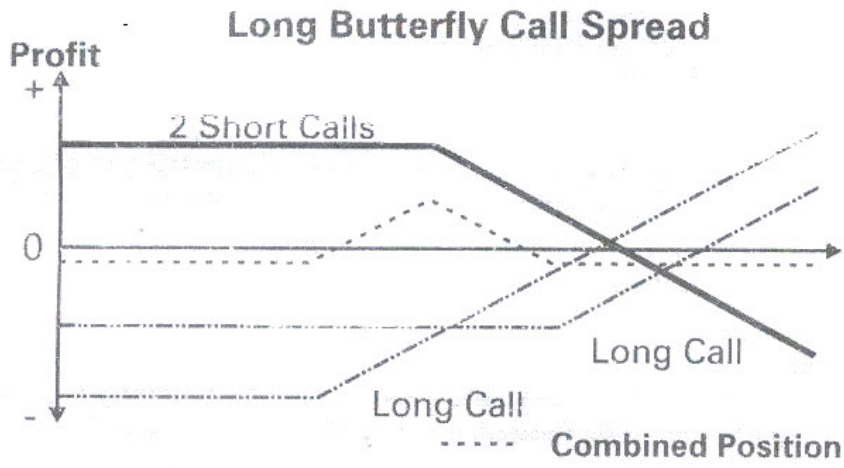
A long butterfly call spread involves:

- Buying a call with a low exercise price,
- Writing two calls with a mid-range exercise price,
- Buying a call with a high exercise price.

This spread is put on by purchasing one each of the outside strikes and selling two of the inside strike. To put on a short butterfly, you do just the opposite.

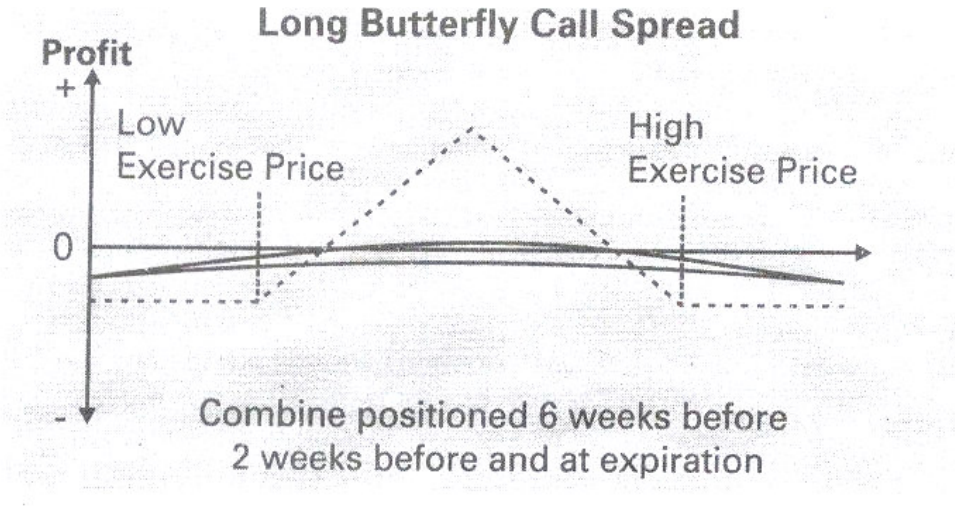
The investor's profit potential is limited.

Maximum profit is attained when the market price of the underlying interest equals the mid-range exercise price (if the exercise prices are symmetrical).



The investor's potential loss is limited.

The maximum loss is limited to the net premium paid and is realized when the market price underlying asset is higher than the high exercise price or lower than the low exercise price.

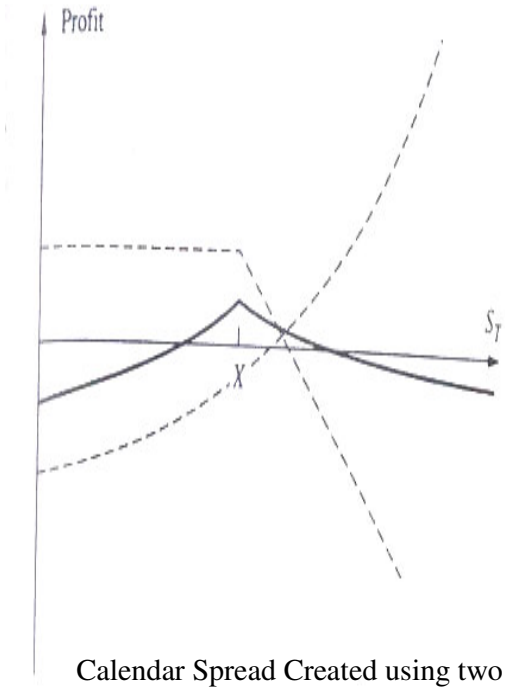


The breakeven points occur when the market price at expiration equals the high exercise minus the premium and the low exercise price plus the premium. The strategy is profitable when the market price is between the low exercise price plus the net premium and the high exercise price minus the net premium.

Calendar Spreads

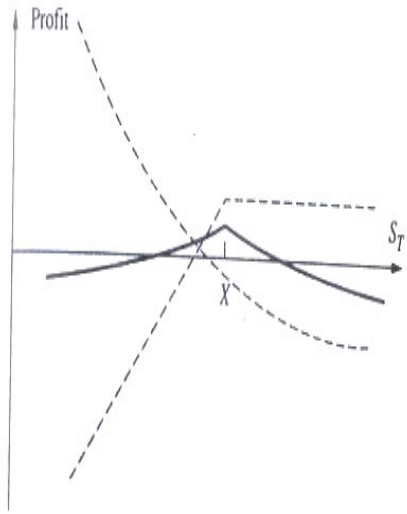
A calendar spread can be created by selling a call option with a certain strike price and buying a longer-maturity call option with the same strike price. The longer the maturity of an option the more experience its. A calendar spread, there fore required an initial investment. The following figure shows the: profit from a calendar spread at the time when the short-maturity option expires. (It is assumed that the long-maturity option is sold at this time.) The trader makes a profit if the stock price at the expiration of the short-maturity option is close to the strike price of the short-maturity option. However, a loss is incurred if the stock price is significantly above or significantly below this strike price.

To understand the profit pattern from a calendar spread, first consider what happens if the stock price is very low when the short-maturity option expires. The short-maturity option is worthless, and the value of the long-maturity option is close to zero. The trader, therefore, incurs a loss that is only a little less than the cost of setting up the spread initially. Consider next what happens if the stock price, *ST,* is very high when the short-maturity option expires. The short-maturity option costs the trader *ST* -' X, I and the long-maturity option is worth a little more than *ST* -$X_{l\ where}$ X_l is the strike price of die options. Again, the trader has a net loss that is a little less than the cost of setting up the spread initially. If ST is close to X, the short-maturity option costs the trader either a small amount or nothing at all. However, the long-maturity option is still quite valuable. In this case, a significant net profit is made.



Calendar Spread Created using two calls.

In a *neutral calendar spread* a strike price close to the current stock price is chosen. A *bullish calendar spread* involves a higher strike price, whereas a *bearish calendar spread, involves* a lower strike price.



Calendar spread created using two puts.

Calendar spreads can be created with put options as well as call options. The trader buys long maturity put option and sells a short-maturity put option. As shown in the above figure, the profit pattern is similar to that obtained from using calls.

A *reverse calendar spread* is the opposite trading strategy where the trader buys a short-maturity option and sells a long-maturity option. A small profit arises if the stock price at the expiration of the short-maturity option is well above or well below the strike price of the short-maturity option. However, a significant loss results if it is close to the strike price.

Diagonal Spreads

Bull, bear, and calendar spreads can all be created from a long position in one call (put) and a short position in another call (put). In the case of bull and rear spreads, the calls (puts) have different strike prices and the same expiration date. In the case of calendar spreads, the calls (puts) have the same strike price and different expiration dates. In it *diagonal spread* both the expiration dates and the strike prices of the call (puts) are different. There are several types of diagonal spreads. Their profit pattern is generally variations on the profit patterns from the corresponding bull or spreads.

COMBINATIONS

A *combination* is an option trading strategy that involves taking a position in both calls and puts on the same stock. We will consider straddles, strips, straps, and strangles.

Straddle

One popular combination is a *straddle,* which involves buying a call and a put with the same strike price and expiration date. The profit pattern is shown in Figure 8.10. The strike price is denoted by X. If the stock price is close to this strike price at expiration of the options, the straddle leads to a loss. However, if there is a sufficiently large move in either direction, a significant profit will result The payoff from a straddle is calculated in Table 8.4.

A straddle is appropriate when a trader is expecting a large move in a stock price but does not know in which direction the move will be. Consider a trader who feels that the price of a certain stock, currently valued at Rs69 by the market. Will move significantly in the next three months. The trader could

create astraddle by buying both a put and a call with a strike price of Rs70 and an expiration date in three months. Suppose that the call costs Rs4 and the put costs Rs3. If the stock price stays at Rs69, it is easy to see that the strategy costs the trader Rs6. (An up- Straddle front investment of Rs7 is required, the call expires worthless, and the put expires worth Rs1.) If the stock price moves to Rs70, a loss of Rs7 is experienced- (This is the worst that can happen.)

Range of Stock Price	Pay of From Call	Pay of From Put	Total Payoff
ST < X	0	X-ST	X – ST
ST > X	ST – X	0	ST - X

However, if the stock price jumps to Rs90, a profit ofRs13 is made; if the stock moves down to Rs55, a profit of'i; 8 is made; and so on.

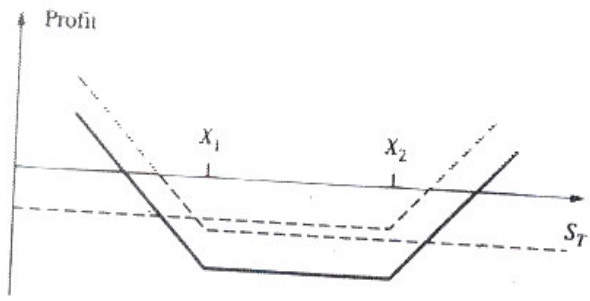
A straddle seems like a natural trading strategy when a big jump in the price of a company's stock is expected for example, when there is a takeover bid for the company or when the outcome of a major lawsuit is expected to be announced soon. However, this is not necessarily the case. If the general view of the market is that there will be a big jump in the stock price soon, that view will be reflected in the prices of options. A trader will find options on the stock to be significantly more expensive i than options on a similar stock for which no jump is expected. For a straddle to be a t effective strategy, the trader must believe that there are likely to be big movements in the stock price, and this belief must be different from those of most other market participants.

The straddle in Figure 8.10 is sometimes referred to as a *bottom straddle* or s*traddle purchase.* A *top straddle* or s*traddle write* is the reverse position. It is

created by selling a call and a put with the same exercise price and expiration date. It is a highly risky strategy. If the stock price on the expiration date is close to the strike price, a significant profit results. However, the loss arising from a large move in either direction is unlimited.

Strips and Strops

A strip consists of a long position in one call and two puts with the same strike price and one put with the same price and expiration data. A strap consists of a long position in two calls and one put with the same strike price and expiration data. The profit patterns from strips and straps are show in Figure 8.11. In a strip the trader is betting that there will be a big stock price move and considers a decrease in the stock price to be more likely than an increase. In a strap the trader is also betting that there will be a big stock price move. However, in a strap the trader is also betting that there will be a big stock price move. However, in this case, an increase in the stock price is considered to be more likely than a decrease.



Profit potentials from a strip and strap.

Option strategies – in brief

Combining any of the four basic kinds of option trades (possibly with different exercise prices) and the two basic kinds of stock trades (long and short) allows a variety of options strategies. Simple strategies usually combine only a few trades, while more complicated strategies can combine several.

- Covered call — Long the stock, short a call. This has essentially the same payoff as a short put.
- Straddle — Long a call and long a put with the same exercise prices (a long straddle), or short a call and short a put with the same exercise prices (a short straddle).
- Strangle — Long a call and long a put with different exercise prices (a long strangle), or short a call and short a put with different exercise prices (a short strangle).
- **Bull spread** — Long a call with a low exercise price and shorts a call with a higher exercise price, or long a put with a low exercise price and short a put with a higher exercise price.
- **Bear spread** — Short a call with a low exercise price and long a call with a higher exercise price, or short a put with a low exercise price and long a put with a higher exercise price.
- Butterfly — Butterflies require trading options with 3 different exercise prices. Assume exercise prices $X1 < X2 < X3$ and that $(X1 + X3)/2 = X2$
  - Long butterfly — long 1 call with exercise price X1, short 2 calls with exercise price X2, and long 1 call with exercise price X3. Alternatively, long 1 put with exercise price X1, short 2 puts with exercise price X2, and long 1 put with exercise price X3.
  - Short butterfly — short 1 call with exercise price X1, long 2 calls with exercise price X2, and short 1 call with exercise price X3. Alternatively,

short 1 put with exercise price X1, long 2 puts with exercise price X2, and short 1 put with exercise price X3.

- Box spreads — Any combination of options that has a constant payoff at expiry. For example combining a long butterfly made with calls, with a short butterfly made with puts will have a constant payoff of zero, and in equilibrium will cost zero. In practice any profit from these spreads will be eaten up by commissions (hence the name "alligator spreads").

2.15. Margin Money

The aim of margin money is to minimize the risk of default by either counter-party. The payment of margin ensures that the risk is limited to the previous day's price movement on each outstanding position. However, even this exposure is offset by the initial margin holdings. Margin money is like a security deposit or insurance against a possible future loss of value.

There are different types of margin:

Initial Margin - Based on 99% Value at Risk (VaR) and worst case loss over a specified horizon, which depends on the time in which Mark to Market margin is collected. The basic aim of Initial margin is to cover the largest potential loss in one day. Both buyer and seller have to deposit margins. The initial margin is deposited before the opening of the position in the Futures transaction

- **Mark to Market Margin (MTM)-** collected in cash for all futures contracts and adjusted against the available liquid net worth for option positions. In the case of Futures Contracts MTM may be considered as Mark to Market Settlement. All daily losses must be met by depositing of further collateral - known as variation margin, which is required by

the close of business, the following day. Any profits on the contract are credited to the client's variation margin account.

Maintenance Margin - Some exchanges work on the system of maintenance margin, which is set at a level slightly less than initial margin. The margin is required to be replenished to the level of initial margin, only if the margin level drops below the maintenance margin limit. For e.g.. If Initial Margin is fixed at 100 and Maintenance margin is at 80, then the broker is permitted to trade till such time that the balance in this initial margin account is 80 or more. If it drops below 80, say it drops to 70, then a margin of 30 (and not 10) is to be paid to replenish the levels of initial margin. This concept is not being followed in India.

Additional Margin - In case of sudden higher than expected volatility, additional margin may be called for by the exchange. This is generally imposed when the exchange fears that the markets have become too volatile and may result in some crisis, like payments crisis, etc. This is a preemptive move by exchange to prevent breakdown.

Cross Margining - This is a method of calculating margin after taking into account combined positions in futures, options, cash market etc. Hence, the total margin requirement reduces due to cross-hedges.

Margin calculation

A portfolio based margining approach which takes an integrated view of the risk involved in the portfolio of each individual client comprising of his positions in all Derivative Contracts i.e. Index Futures, Index Option, Stock Options and Single Stock Futures, has been prescribed. The initial margin

requirements are required to be based on the worst case loss of a portfolio of an individual client to cover 99% VaR over a specified time horizon.

The Initial Margin is Higher of

(Worst Scenario Loss + Calendar Spread Charges)

Or

Short Option Minimum Charge

The worst scenario loss are required to be computed for a portfolio of a client and is calculated by valuing the portfolio under the scenarios of probable changes in the value and the volatility of the Index/ Individual Stocks. The options and futures positions in a client's portfolio are required to be valued by predicting the price and the volatility of the underlying over a specified horizon so that 99% of times the price and volatility so predicted does not exceed the maximum and minimum price or volatility scenario. In this manner initial margin of 99% VaR is achieved. The specified horizon is dependent on the time of collection of mark to market margin by the exchange.

The probable change in the price of the underlying over the specified horizon i.e. 'price scan range', in the case of Index futures and Index option contracts are based on three standard deviation (3s) where 's ' is the volatility estimate of the Index. The volatility estimate 's ', is computed as per the Exponentially Weighted Moving Average methodology. This methodology has been prescribed by SEBI. In case of option and futures on individual stocks the price scan range is based on three and a half standard deviation (3.5s) where 's ' is the daily volatility estimate of individual stock.

For Index Futures and Stock futures it is specified that a minimum margin of 5% and 7.5% would be charged. This means if for stock futures the

3.5s value falls below 7.5% then a minimum of 7.5% should be charged. This could be achieved by adjusting the price scan range.

The probable change in the volatility of the underlying i.e. 'volatility scan range' is fixed at 4% for Index options and is fixed at 10% for options on Individual stocks. The volatility scan range is applicable only for option products.

Calendar spreads are offsetting positions in two contracts in the same underlying across different expiry. In a portfolio based margining approach all calendar-spread positions automatically get a margin offset. However, risk arising due to difference in cost of carry or the 'basis risk' needs to be addressed. It is therefore specified that a calendar spread charge would be added to the worst scenario loss for arriving at the initial margin. For computing calendar spread charge, the system first identifies spread positions and then the spread charge which is 0.5% per month on the far leg of the spread with a minimum of 1% and maximum of 3%. Further, in the last three days of the expiry of the near leg of spread, both the legs of the calendar spread would be treated as separate individual positions.

In a portfolio of futures and options, the non-linear nature of options make short option positions most risky. Especially, short deep out of the money options, which are highly susceptible to, changes in prices of the underlying. Therefore a short option minimum charge has been specified. The short option minimum charge is 5% and 7.5 % of the notional value of all short Index option and stock option contracts respectively. The short option minimum charge is the initial margin if the sum of the worst -scenario loss and calendar spread charge is lower than the short option minimum charge.

To calculate volatility estimates the exchange are required to uses the methodology specified in the Prof J.R Varma Committee Report on Risk Containment Measures for Index Futures. Further, to calculated the option value the exchanges can use standard option pricing models - Black-Scholes, Binomial, Merton, Adesi-Whaley.

The initial margin is required to be computed on a real time basis and has two components:-

- The first is creation of risk arrays taking prices at discreet times taking latest prices and volatility estimates at the discreet times, which have been specified.
- The second is the application of the risk arrays on the actual portfolio positions to compute the portfolio values and the initial margin on a real time basis.

The initial margin so computed is deducted form the available Liquid Net worth on a real time basis.

Mark to Market Margin

Options - The value of the option are calculated as the theoretical value of the option times the number of option contracts (positive for long options and negative for short options). This Net Option Value is added to the Liquid Net worth of the Clearing member. Thus MTM gains and losses on options are adjusted against the available liquid net worth. The net option value is computed using the closing price of the option and are applied the next day.

Futures - The system computes the closing price of each series, which is used for computing mark to market settlement for cumulative net position. This

margin is collected on T+1 in cash. Therefore, the exchange charges a higher initial margin by multiplying the price scan range of 3s & 3.5s with square root of 2, so that the initial margin is adequate to cover 99% VaR over a two days horizon.

MARGIN COLLECTION

Initial Margin - is adjusted from the available Liquid Networth of the Clearing Member on an online real time basis.

Marked to Market Margins

Futures contracts: The open positions (gross against clients and net of proprietary / self trading) in the futures contracts for each member are marked to market to the daily settlement price of the Futures contracts at the end of each trading day. The daily settlement price at the end of each day is the weighted average price of the last half an hour of the futures contract. The profits / losses arising from the difference between the trading price and the settlement price are collected / given to all the clearing members.

Option Contracts: The marked to market for Option contracts is computed and collected as part of the SPAN Margin in the form of Net Option Value. The SPAN Margin is collected on an online real time basis based on the data feeds given to the system at discrete time intervals.

Client Margins

Clearing Members and Trading Members are required to collect initial margins from all their clients. The collection of margins at client level in the derivative markets is essential as derivatives are leveraged products and non-collection of margins at the client level would provided zero cost leverage. In

the derivative markets all money paid by the client towards margins is kept in trust with the Clearing House / Clearing Corporation and in the event of default of the Trading or Clearing Member the amounts paid by the client towards margins are segregated and not utilized towards the default of the member.

Therefore, Clearing members are required to report on a daily basis details in respect of such margin amounts due and collected from their Trading members / clients clearing and settling through them. Trading members are also required to report on a daily basis details of the amount due and collected from their clients. The reporting of the collection of the margins by the clients is done electronically through the system at the end of each trading day. The reporting of collection of client level margins plays a crucial role not only in ensuring that members collect margin from clients but it also provides the clearing corporation with a record of the quantum of funds it has to keep in trust for the clients.

2.16. Index option

A stock index is a compilation of several stock prices into a single number. Indexes come in various shapes and sizes. Some are broad-based and measure moves in broad, diverse markets. Others are narrow-based and measure more specific industry sectors of the marketplace. Understand that it is not the number of stocks that comprise the average that determine if an index is broad-based or narrow-based, but rather the diversity of the underlying securities and their market coverage. Different stock indexes can be calculated in different ways. Accordingly, even where indexes are based on identical securities, they may measure the relevant market differently because of differences in methods of calculation.

a. Capitalization-Weighted

An index can be constructed so that weightings are biased toward the securities of larger companies, a method of calculation known as capitalization-weighted. In calculating the index value, the market price of each component security is multiplied by the number of shares outstanding. This will allow a security's size and capitalization to have a greater impact on the value of the index.

b. Equal Dollar-Weighted

Another type of index is known as equal dollar-weighted and assumes an equal number of shares of each component stock. This index is calculated by establishing an aggregate market value for every component security of the index and then determining the number of shares of each security by dividing this aggregate market value by the current market price of the security. This method of calculation does not give more weight to price changes of the more highly capitalized component securities.

c. Other Types

An index can also be a simple average: calculated by simply adding up the prices of the securities in the index and dividing by the number of securities, disregarding numbers of shares outstanding. Another type measures daily percentage movements of prices by averaging the percentage price changes of all securities included in the index.

Adjustments & Accuracy

Securities may be dropped from an index because of events such as mergers and liquidations or because a particular security is no longer thought to be representative of the types of stocks constituting the index. Securities may also be added to an index from time to time. Adjustments to indexes might be made because of such substitutions or due to the issuance of new stock by a component security. Such adjustments and other similar changes are within the discretion of the publisher of the index and will not ordinarily cause any adjustment in the terms of outstanding index options. However, an adjustment panel has authority to make adjustments if the publisher of the underlying index makes a change in the index's composition or method of calculation that, in the panel's determination, may cause significant discontinuity in the index level.

Finally, an equity index will be accurate only to the extent that:

- the component securities in the index are being traded
- the prices of these securities are being promptly reported
- the market prices of these securities, as measured by the index, reflect price movements in the relevant markets.

Equity vs. Index Options

An **equity index option** is an option whose underlying instrument is intangible - an equity index. The market value of an index **put** and **call** tends to rise and fall in relation to the underlying index. The price of an index call will generally increase as the level of its underlying index increases, and its purchaser has unlimited profit potential tied to the strength of these increases. The price of an index put will generally increase as the level of its underlying

index decreases, and its purchaser has substantial profit potential tied to the strength of these decreases.

Pricing Factors

Generally, the factors that affect the price of an index option are the same as those affecting the price of an equity option: value of the underlying instrument (an index in this case), strike price, volatility, time until expiration, interest rates and dividends paid by the component securities.

i. Underlying Instrument

The underlying instrument of an equity option is a number of shares of a specific stock, usually 100 shares. Cash-settled index options do not relate to a particular number of shares. Rather, the underlying instrument of an index option is usually the value of the underlying index of stocks times a multiplier.

ii. Volatility

Indexes, by their nature, are less volatile than their individual component stocks. The up and down movements of component stock prices tend to cancel one another out, lessening the volatility of the index as a whole. However, the volatility of an index can be influenced by factors more general than can affect individual equities. These can range from investors' expectations of changes in inflation, unemployment, interest rates or other economic indicators issued by the government and political for military situations.

iii. Risk

As with an equity option, an index option, buyer's risk is limited to the amount of the premium paid for the option. The premium received and kept by

the index option writer is the maximum profit a writer can realize from the sale of the option. However, the loss potential from writing an uncovered index option is generally unlimited. Any investor considering writing index options should recognize that there are significant risks involved.

iv. Cash Settlement

The differences between equity and index options occur primarily in the underlying instrument and the method of settlement. Generally, when an index option is exercised by its holder, and when an index option writer is assigned, cash changes hands. Only a representative amount of cash changes hands from the investor who is assigned on a written contract to the investor who exercises his purchased contract. This is known as cash settlement.

v. Purchasing Rights

Purchasing an index option does not give the investor the right to purchase or sell all of the stocks that are contained in the underlying index. Because an index is simply an intangible, representative number, you might view the purchase of an index option as buying a value that changes over time as market sentiment and prices fluctuate. An investor purchasing an index option obtains certain rights per the terms of the contract. In general, this includes the right to demand and receive a specified amount of cash from the writer of a contract with the same terms.

In-the-money, At-the-money, Out-of-the-money

An index call option is in-the-money when its strike price is less than the reported level of the underlying index. It is at-the-money when its strike price is

the same as the level of that index and out-of-the-money when its strike price is greater than that level.

An index put option is in-the-money when its strike price is greater than the reported level of the underlying index. It is at-the-money when its strike price is the same as the level of that index and out-of-the-money when its strike price is less than that level.

Exercise & Assignment

The exercise settlement value is an index value used to calculate how much money will change hands, the exercise settlement amount, when a given index option is exercised, either before or at expiration. The value of every index underlying an option, including the exercise settlement value, is the value of the index as determined by the reporting authority designated by the market where the option is traded.

AM & PM Settlement

The exercise settlement values of equity index options are determined by their reporting authorities in a variety of ways. The two most common are:

PM settlement - Exercise settlement values are based on the reported level of the index calculated with the last reported prices of the index's component stocks at the close of market hours on the day of exercise.

AM settlement - Exercise settlement values are based on the reported level of the index calculated with the opening prices of the index's component stocks on the day of exercise.

If a particular component security does not open for trading on the day the exercise settlement value is determined, the last reported price of that security is used.

Investors should be aware that the exercise settlement value of an index option that is derived from the opening prices of the component securities may not be reported for several hours following the opening of trading in those securities. A number of updated index levels may be reported at and after the opening before the exercise settlement value is reported. There could be a substantial divergence between those reported index levels and the reported exercise settlement value.

American vs. European Exercise

Although equity option contracts generally have only American-style expirations, index options can have either American- or European-style.

In the case of an American-style option, the holder of the option has the right to exercise it on or at any time before its expiration date. Otherwise, the option will expire worthless and cease to exist as a financial instrument. It follows that the writer of an American-style option can be assigned at any time, either when or before the option expires, although early assignment is not always predictable.

A European-style option is one that can only be exercised during a specified period of time prior to its expiration. This period may vary with different classes of index options. Likewise, the writer of a European-style option can be assigned only during this exercise period.

Exercise Settlement

The amount of cash received upon exercise of an index option or when it expires depends on the closing value of the underlying index in comparison to the strike price of the index option. The amount of cash changing hands is called the exercise settlement amount. This amount is calculated as the difference between the strike price of the option and the level of the underlying index reported as its exercise settlement value

In the case of a call, if the underlying index value is above the strike price, the holder may exercise the option and receive the exercise settlement amount. For example, with the settlement value of the index reported as 79.55, the holder of a long call contract with a 78 strike price would exercise and receive Rs155 [(79.55 - 78) x Rs100 = Rs155]. The writer of the option would pay the holder this cash amount.

In the case of a put, if the underlying index value is below the strike price, the holder may exercise the option and receive the exercise settlement amount. For example, with the settlement value of the index reported as 74.88 the holder of a long put contract with a 78 strike price would exercise and receive Rs312 [(78 - 74.88) x Rs100 = Rs312]. The writer of the option would pay the holder this cash amount.

Closing Transactions

As with equity options, an index option writer wishing to close out his position buys a contract with the same terms in the marketplace. In order to avoid assignment and its inherent obligations, the option writer must buy this contract before the close of the market on any given day to avoid notification of assignment on the next business day. To close out a long position, the purchaser

of an index option can either sell the contract in the marketplace or exercise it if profitable to do so.

Benefits of Listed Index Options

Index options offer the investor an opportunity to either capitalize on an expected market move or to protect holdings in the underlying instruments. The difference is that the underlying instruments are indexes. These indexes can reflect the characteristics of either the broad equity market as a whole or specific industry sectors within the marketplace.

a. Diversification

Index options enable investors to gain exposure to the market as a whole or to specific segments of the market with one trading decision and frequently with one transaction. To obtain the same level of diversification using individual stock issues or individual equity option classes, numerous decisions and transactions would be required. Employing index options can defray both the costs and complexities of doing so.

b. Predetermined Risk for Buyer

Unlike other investments where the risks may have no limit, index options offer a known risk to buyers. An index option buyer absolutely cannot lose more than the price of the option, the premium.

c. Leverage

Index options can provide leverage. This means an index option buyer can pay a relatively small premium for market exposure in relation to the contract value. An investor can see large percentage gains from relatively small,

favorable percentage moves in the underlying index. If the index does not move as anticipated, the buyer's risk is limited to the premium paid. However, because of this leverage, a small adverse move in the market can result in a substantial or complete loss of the buyer's premium. Writers of index options can bear substantially greater, if not unlimited, risk.

d. Guaranteed Contract Performance

An option holder is able to look to the system which includes the brokers and Clearing Members involved in a particular option transaction, rather than to any particular option writer for performance.

Index options give you exposure to the securities comprising a share market index.

They offer similar flexibility to that provided by options over individual stocks, while allowing trading a view on the market as a whole, or on the market sector covered by the particular index.

Whereas the value of a share option varies according to movements in the value of the underlying shares, an index option varies according to movements in the underlying index.

2.17.Exchange-Traded Option

An option traded on a regulated exchange where the terms of each option are standardized by the exchange so that underlying asset, contract volume, expiration date(mostly up to six months or one year, options with life spans of more than one year are rarely available) Delivery/settlement procedures (clearing house) and strike price are known in advance. Exchange-traded options are also known as "listed options".

The benefits to exchange-traded options are the liquidity of the options, standardized contracts, quick access to prices and the use of clearing houses by exchanges. The use of clearing houses guarantees that the option contract will be fulfilled.

Exchange traded options (ETOs) are versatile short dated financial products that allow investors to;

- Protect the value of individual shares or a portfolio
- Earn income
- Undertake to buy shares for less than their current price
- Lock in a buying price
- Get exposure to shares for limited risk

2.18.Over-The-Counter

Over-the-counter options are contracts that give clients the right to buy or sell a security at a fixed and predetermined rate (strike price) at a certain time in the future, if they pay a premium fee upfront.

A stock is traded over-the-counter usually because the company is small and unable to meet exchange listing requirements. Also known as "unlisted stock", these securities are traded by brokers/dealers who negotiate directly with one another over computer networks and by phone. Instruments such as bonds do not trade on a formal exchange and are thus considered over-the-counter securities. Most debt instruments are traded by investment banks making markets for specific issues. If someone wants to buy or sell a bond, they call the bank that makes the market in that bond and asks for quotes. Many derivative instruments such as forwards, swaps and most exotic derivatives are also traded OTC.

2.19. NATIONAL CLEARANCE AND DEPOSITORY SYSTEM

The new system which the Stock Holding Corporation of India is assigned to set up by the Ministry of Finance for clearance and depository functions of the Stock. Exchanges at the national level are called the National Clearance Settlement and Depositary System. It comprises of (a) National Depository System (b) National Trade Comparison & Reporting System and (c) National Clearance System.

From the world wide experience, there does not appear to be any single system which can be transplanted on Indian soil as it is. There is a complexity of legal hurdles, procedures and habit problems to face in India for a change of this type.

The new system will have to be based on a change in legal system, changes in banking practices, settlement and clearance system. To start with, a book entry system, for transfers as between broker members can be arranged as is done by the Bombay Stock Exchange with the Bank of India Holdings, set up separately for this purpose. At the national level, the National Depository was set up along with many participants: depositories. The Central depository system was accepted by the government and SEBI Guidelines were issued for the depositories and the Central Depository.

2.20. REGULATIONS

SEBIs L C Gupta Committee

SEBI appointed L.C.Gupta Committee on 18th November 1996 to develop appropriate regulatory framework for the derivatives trading and to recommend suggestive bye-laws for Regulation and Control of Trading and Settlement of

Derivatives Contracts. The Committee was also to focus on the financial derivatives and equity derivatives. The Committee submitted its report in March 1998.

The Board of SEBI in its meeting held on May 11, 1998 accepted the recommendations and approved the introduction of derivatives trading in India beginning with Stock Index Futures. The Board also approved the "Suggestive Bye-laws" recommended by the LC Gupta Committee for Regulation and Control of Trading and Settlement of Derivatives Contracts. SEBI circulated the contents of the Report in June 98.

Goals of Regulation - Regulatory Objectives

LCGC believes that regulation should be designed to achieve specific and well-defined goals. It is inclined towards positive regulation designed to encourage healthy activity and behaviour. The important recommendations of L.C.Gupta Committee are reproduced hereunder.

Need for coordinated development

To quote from the report of the Committee -"The Committee's main concern is with equity based derivatives but it has tried to examine the need for financial derivatives in a broader perspective. Financial transactions and asset-liability positions are exposed to three broad types of price risks, viz:

- "Equities "market risk", also called "systematic risk" (which cannot be diversified away because the stock market as a whole may go up or down from time to time).

- "Interest rate risk (as in the case of fixed-income securities, like treasury bond holdings, whose market price could fall heavily if interest rates shot up), and
- "Exchange rate risk (where the position involves a foreign currency, as in the case of imports, exports, foreign loans or investments).

"The above classification of price risks explains the emergence of (a) equity futures, (b) interest rate futures and (c) currency futures, respectively. Equity futures have been the last to emerge.

Derivatives Exchanges

The Committee strongly favoured the introduction of financial derivatives to facilitate hedging in a most cost-efficient way against market risk. There is a need for equity derivatives, interest rate derivatives and currency derivatives. There should be phased introduction of derivatives products. To start with, index futures to be introduced, which should be followed by options on index and later options on stocks. The derivative trading should take place on a separate segment of the existing stock exchanges with an independent governing council where the number of trading members should be limited to 40 percent of the total number. Common Governing Council and Governing Board members are not allowed. The Chairman of the governing council should not be permitted to trade (broking/dealing business) on any of the stock exchanges during his term. Trading to be based on On-line screen trading with disaster recovery site. Per half hour capacity should be 4-5 times the anticipated peak load. Percentage of broker-members in the council is to be prescribed by SEBI.

Regulatory framework

Regulatory control should envisage modern systems for fool-proof and fail-proof regulation. Regulatory framework for derivatives trading envisaged two-level regulation i.e. exchange-level and SEBI-level, with considerable emphasis on self-regulatory competence of derivative exchanges under the overall supervision and guidance of SEBI. There will be complete segregation of client money at the level of trading /clearing member and even at the level of clearing corporation. Other recommendations are as under:

Regulatory Role of SEBI

SEBI will approve rules, bye-laws and regulations. New derivative contracts to be approved by SEBI. Derivative exchanges to provide full details of proposed contract, like - economic purposes of the contract; likely contribution to the market's development; safeguards incorporated for investor protection and fair trading.

Specifications Regarding Trading

Stock Exchanges are to stipulate in advance trading days and hours. Each contract is to have pre-determined expiration date and time. Contract expiration period may not exceed 12 months. The last trading day of the trading cycle is to be stipulated in advance.

Membership Eligibility Criteria

The trading and clearing member will have stringent eligibility conditions. The Committee recommended for separate clearing and non-clearing members. There should be separate registration with SEBI in addition to registration with

the stock exchange. At least two persons should have passed the certification program approved by SEBI. A higher capital adequacy for Derivatives segment recommended than prescribed for cash market. The clearing members should deposit minimum Rs. 50 lakh with the clearing corporation and should have a net worth of Rs. 3 crore. A higher deposit proposed for Option writers.

Clearing Corporation

The Clearing System to be totally restructured. There should be no trading interests on board of the CC. The maximum exposure limit to be liked the deposit limit. To make the clearing system effective the Committee stressed stipulation of Initial and mark-to-market margins. Extent of Margin prescribed to co-relate to the level of volatility of particular Scrips traded. The Committee therefore recommended margins based on value at risk - 99% confidence (The initial margins should be large enough to cover the one day loss that can be encountered on the position on 99% of the days. The concept is identified as "Worst Scenario Loss"). It did not favour the system of Cross-margining (This is a method of calculating margin after taking into account combined positions in futures, options, cash market etc. Hence, the total margin requirement reduces due to cross-hedges). Since margins to be adjusted frequently based on market volatility margin payments to be remitted through EFT (Electronic Funds Transfer). To prevent brokers who fail/default to provide/restore adequate margin from trading further the stock exchange must have the power/facility to disable the defaulting member from further trading. Brokers/sub-brokers are also to collect margin collection from clients. Exposure limits to be on gross basis. Own/clients margin to be segregated. No set off permitted. Trading to be clearly indicated as own/clients and opening/closing out. In case of default, only own margin can be set off against members' dues and the CC should promptly transfer client's margin in separate account. CC to close out all open positions at

its option. CC can also ask members to close out excess positions or it may itself close out such positions. CC may however permit special margins on members. It can withhold margin or demand additional margin. CC may prescribed maximum long/short positions by members or exposure limit in quantity / value / % of base capital.

Mark to Market and Settlement

There should the system of daily settlement of futures contracts. Similarly the closing price of futures is to be settled on daily basis. The final settlement price is to be as per the closing price of underlying security. Sales Practices

- Risk disclosure document with each client mandatory
- Sales personnel to pass certification exam
- Specific authorisation from client's board of directors/trustees

Trading Parameters

- Each order - buy/sell and open/close
- Unique order identification number
- Regular market lot size, tick size
- Gross exposure limits to be specified
- Price bands for each derivative contract
- Maximum permissible open position
- Off line order entry permitted

Brokerage

- Prices on the system shall be exclusive of brokerage
- Maximum brokerage rates shall be prescribed by the exchange
- Brokerage to be separately indicated in the contract note

Margins From Clients

- Margins to be collected from all clients/trading members
- Daily margins to be further collected
- Right of clearing member to close out positions of clients/TMs not paying daily margins
- Losses if any to be charged to clients/TMs and adjusted against margins

Other Recommendations

- Removal of the regulatory prohibition on the use of derivatives by mutual funds while making the trustees responsible to restrict the use of derivatives by mutual funds only to hedging and portfolio balancing and not for speculation.
- Creation of derivatives Cell, a derivative Advisory Committee, and Economic Research Wing by SEBI.
- Declaration of derivatives as securities under section 2(h)(ii a) of the SCRA and suitable amendment in the notification issued by the Central Government in June 1969 under section 16 of the SCRA
- Consequent to the committee's recommendations the following legal amendments were carried out:

Legal Amendments

- Securities Contract Regulation Act
- Derivatives contract declared as a 'security' in Dec 1999
- Notification in June 1969 under section 16 of SCRA banning forward trading revoked in March 2000.

In order to recommend a guideline for effective implementation of the recommendations of LC Gupta Committee Report, SEBI entrusted the task to another Committee, i.e. JR Verma Committee appointed by it.

SEBIs J.R.Verma Committee

The group submitted its report in 1998. The group began by enumerating the risk containment issues that assumed importance in the Indian context while setting up an index futures market. The recommendations of the Group as covered by its report are as under

Estimation of Volatility (Clause 2.1)

Several issues arise in the estimation of volatility:

The Volatility in the Indian market is quite high compared to developed markets.

The volatility in the Indian market is not constant and is varying over time.

The statistics on the volatility of the index futures markets does not exist and therefore, in the initial period, reliance has to be made on the volatility in the underlying securities market. The LC Gupta Committee (LCGC) has

prescribed that no cross margining would be permitted and separate margins would be charged on the position in the futures and the underlying securities market. In the absence of cross margining, index arbitrage would be costly and therefore possibly will not be efficient.

Calendar Spreads (Clause 2.2)

In developed markets, calendar spreads are essentially a play on interest rates with negligible stock market exposure. As such margins for calendar spreads are very low. In India, the calendar basis risk could be high due to the absence of efficient index arbitrage and the lack of channels for the flow of funds from the organised money market to the index future market.

Trader Net Worth (Clause 2.3)

Even an accurate 99% "value at risk" model would give rise to end of day mark to market losses exceeding the margin of approximately once in every 6 months. Trader net worth provides an additional level of safety to markets and works as a deterrent to the incidence of defaults. A member with a high net worth would try harder to avoid defaults as his own net worth would be at stake.

Margin Collection and Enforcement (Clause 2.4)

Apart from the right calculation of margin, the actual collection of margin is also of equal importance. Since initial margins can be deposited in the form of bank guarantee and securities, the risk containment issues in regard to these need has to be tackled.

Clearing Corporation (Clause 2.5)

The clearing corporation provides innovation and becomes the counter party for every trade. In these circumstances, the credibility of the clearing corporation assumes the importance and issues of governance and transparency need to be addressed.

Position Limit (Clause 2.6)

It can be necessary to prescribe position limits for the market considering whole and for the individual clearing member / trading member / client.

Margining System (Clause 3) - Mandating a Margin Methodology not Specific Margins (Clause 3.1.1)

The LCGC recommended that margins in the derivatives markets would be based on a 99% (VAR) approach. The group discussed ways of operationalising this recommendation keeping in mind the issues relating to estimation of volatility discussed. It is decided that SEBI should authorise the use of a particular VAR estimation methodology but should not make compulsory a specific minimum margin level.

Initial Methodology (Clause 3.1.2)

The group has evaluated and approved a particular risk estimation methodology that is described in 3.2 below and discussed in further detail in Appendix 1. The derivatives exchange and clearing corporation should be

authorised to start index futures trading using this methodology for fixing margins.

Continuous Refining (Clause 3.1.3)

The derivatives exchange and clearing corporation should be encouraged to refine this methodology continuously on the basis of further experience. Any proposal for changes in the methodology should be filed with SEBI and released to the public for comments along with detailed comparative back testing results of the proposed methodology and the current methodology. The proposal shall specify the date from which the new methodology will become effective and this effective date shall not be less than three months after the date of filing with SEBI. At any time up to two weeks before the effective date, SEBI may instruct the derivatives exchange and clearing corporation not to implement the change, or the derivatives exchange and clearing corporation may on its own decide not to implement the change.

Initial Margin Fixation Methodology (Clause 3.2)

The group took on record the estimation and back testing results provided by Prof. Varma (see Appendix 1) from his ongoing research work on value at risk calculations in Indian financial markets. The group, being satisfied with these back testing results, recommends the following margin fixation methodology as the initial methodology for the purposes of 3.1.1 above. The exponential moving average method would be used to obtain the volatility estimate every day.

Daily Changes in Margins (Clause 3.3)

The group recommends that the volatility estimated at the end of the day's trading would be used in calculating margin calls at the end of the same day. This implies that during the course of trading, market participants would not know the exact margin that would apply to their position. It was agreed therefore that the volatility estimation and margin fixation methodology would be clearly made known to all market participants so that they can compute what the margin would be for any given closing level of the index. It was also agreed that the trading software would itself provide this information on a real time basis on the trading workstation screen.

Margining for Calendar Spreads (Clause 3.4)

The group took note of the international practice of levying very low margins on calendar spreads. A calendar spread is a position at one maturity which is hedged by an offsetting position at a different maturity: for example, a short position in the six month contract coupled with a long position in the nine month contract. The justification for low margins is that a calendar spread is not exposed to the market risk in the underlying at all. If the underlying rises, one leg of the spread loses money while the other gains money resulting in a hedged position. Standard futures pricing models state that the futures price is equal to the cash price plus a net cost of carry (interest cost reduced by dividend yield on the underlying). This means that the only risk in a calendar spread is the risk that the cost of carry might change; this is essentially an interest rate risk in a money market position. In fact, a calendar spread can be viewed as a synthetic money market position. The above example of a short position in the six month contract matched by a long position in the nine month contract can be regarded as a six

month future on a three month T-bill. In developed financial markets, the cost of carry is driven by a money market interest rate and the risk in calendar spreads is very low.

In India, however, unless banks and institutions enter the calendar spread in a big way, it is possible that the cost of carry would be driven by an unorganised money market rate as in the case of the badla market. These interest rates could be highly volatile.

Given the evidence that the cost of carry is not an efficient money market rate, prudence demands that the margin on calendar spreads be far higher than international practice. Moreover, the margin system should operate smoothly when a calendar spread is turned into a naked short or long position on the index either by the expiry of one of the legs or by the closing out of the position in one of the legs. The group therefore recommends that:

- The margin on calendar spreads is levied at a flat rate of 0.5% per month of spread on the far month contract of the spread subject to a minimum margin of 1% and a maximum margin of 3% on the far side of the spread for spreads with legs upto 1 year apart. A spread with the two legs three months apart would thus attract a margin of 1.5% on the far month contract.
- The margining of calendar spreads is reviewed at the end of six months of index futures trading.
- A calendar spread should be treated as a naked position in the far month contract as the near month contract approaches expiry. This change should be affected in gradual steps over the last few days of trading of the near month contract. Specifically, during the last five days of trading of the near month contract, the following percentages of a calendar

spread shall be treated as a naked position in the far month contract: 100% on day of expiry, 80% one day before expiry, 60% two days before expiry, 40% three days before expiry, 20% four days before expiry. The balance of the spread shall continue to be treated as a spread. This phasing in will apply both to margining and to the computation of exposure limits.

- If the closing out of one leg of a calendar spread causes the members' liquid net worth to fall below the minimum levels specified in 4.2 below, his terminal shall be disabled and the clearing corporation shall take steps to liquidate sufficient positions to restore the members' liquid net worth to the levels mandated in 4.2.
- The derivatives exchange should explore the possibility that the trading system could incorporate the ability to place a single order to buy or sell spreads without placing two separate orders for the two legs.
- For the purposes of the exposure limit in 4.2 (b), a calendar spread shall be regarded as an open position of one third of the mark to market value of the far month contract. As the near month contract approaches expiry, the spread shall be treated as a naked position in the far month contract in the same manner as in 3.4 (c).

Margin Collection and Enforcement (Clause 3.5)

Apart from the correct calculation of margin, the actual collection of margin is also of equal importance. The group recommends that the clearing corporation should lay down operational guidelines on collection of margin and standard guidelines for back office accounting at the clearing member and trading member level to facilitate the detection of non-compliance at each level.

Transparency and Disclosure (Clause 3.6)

The group recommends that the clearing corporation / clearing house shall be required to disclose the details of incidences of failures in collection of margin and / or the settlement dues at least on a quarterly basis. Failure for this purpose means a shortfall for three consecutive trading days of 50% or more of the liquid net worth of the member.

Key Regulations

In India the National Stock Exchange of India (NSE) and the Bombay Stock Exchange (BSE) offer options trading on stock indices as well as individual securities.

Options on stock indices are European in kind and settled only on the last of expiration of the underlying. NSE' offers index options trading on the NSE Fifty index called the Nifty, While BSE: offers index options on the country's widely used index Sensex, which consists of 30 stocks.

Options on individual securities are American. The number of stock options contracts to be traded on the exchanges will be based on the list of securities as specified by Securities and Exchange Board of India (SEBI). Additions/deletions in the list of securities eligible on which options contracts shall be made available shall be notified from time to time.

Underlying: Underlying for the options on individual securities contracts shall be the underlying security available for trading in the capital market segment of the exchange.

Security descriptor: The security descriptor for the options on individual securities shall be:

- Market type –N
- Instrument type –OPTSTK
- Underlying -Underlying security
- Expiry date -Date of contract expiry
- Option type -CA/PA
- .Exercise style -American Premium Settlement method:
- Premium Settled;
- CA -Call American
- PA -Put American.

Trading cycle: The contract cycle and availability of strike prices for options contracts on individual securities shall be as follows:

Options on individual securities contracts will have a maximum of three-month trading cycle. New contracts will be introduced on the trading day following the expiry of the near month contract.

On expiry of the near month contract, new contract shall be introduced at new strike prices for both call and put options, on the trading day following the expiry of the near month contract.

Strike price intervals: The exchange shall provide a minimum of five strike prices for every option type (i.e call & put) during the trading month. There shall be two contracts in the-money (ITM), two contracts out-of-the-money (OTM) and one contract at-the-money (ATM). The strike price interval for options on individual securities is given in the accompanying table.

New contracts with new strike prices for existing expiration date will be introduced for trading on the next working day based on the previous day's underlying close values and as and when -enquired. In order to fix on the at-the-money strike price for options on individual securities contracts the closing underlying value shall be rounded off to the nearest multiplier of the strike price interval. The in-the-money strike price and the out-of-the-money strike price shall be based on the at-the-money strike price interval.

Expiry day: Options contracts on individual securities as well as index options shall expire on the last Thursday of the expiry month. If the last Thursday is a trading holiday, the contracts shall expire on the previous trading day.

Order type: Regular lot order, stop loss order, immediate or cancel, good till day, good till cancelled good till date and spread order. Good till cancelled (GTC) orders shall be cancelled at the end of the period of 7 calendar days from the date of entering an order.

Permitted lot size: The value of the option contracts on individual securities shall not be less than Rs 2 lakh at the time of its introduction. The permitted lot size for the options contracts on individual securities shall be in multiples of 100 and fractions if any shall be rounded off to the next higher multiple of 100.

Price steps: The price steps in respect of all options contracts admitted to dealings on the exchange shall be Re 0.05.

Quantity freeze : Orders which may come to the exchange as a quantity freeze shall be the lesser of the following: 1 per cent of the market wide position limit stipulated of options on individual securities as given in (h) below or Notional value of the contract of around Rs 5 crore. In respect of such orders, which have come under quantity freeze, the member shall be required to confirm J the exchange that there is no inadvertent error in the order entry and that the order

is genuine. In such confirmation, the exchange at its discretion may approve such order subject to availability of turnover/exposure limits, etc.

Base price: Base price of the options contracts on introduction of new contracts shall be the theoretical value of the options contract arrived at based on Black-Scholes model of calculation of options premiums. The base price of the contracts on subsequent trading days will be the daily close price of the options contracts. However in such of those contracts where orders could not be placed because of application of price ranges, the bases prices may be modified at the discretion of the exchange and intimated to the members.

Price ranges: There will be no day minimum/maximum price ranges applicable for the options contract. The operating ranges and day minimum/maximum ranges for options contract shall be kept at 99 per cent of the base price. In view of this the members will not be able to place orders at prices which are beyond 99 per cent of the base price. The base prices for option contracts, may be modified, at the discretion of the exchange, based on the request received from trading; members as mentioned above.

Exposure limits: Gross open positions of a member at any point of time shall not exceed the' exposure limit as detailed hereunder:

- Index Options: Exposure Limit shall be 33.33 times the liquid net worth.
- Option contracts on individual Securities: Exposure Limit shall be 20 times the liquid net worth.

Member wise position limit: When the open position of a Clearing Member, Trading Member or Custodial Participant exceeds 15 per cent of the total open

interest of the market or Rs 100 crore, whichever is higher, in all the option contracts on the same underlying, at any time, including during trading hours.

For option contracts on individual securities, open interest shall be equivalent to the open positions multiplied by the notional value. Notional Value shall be the previous day's closing price of the underlying security or such other price as may be specified from time to time.

Market wide position limits: Market wide position limits for option contracts on individual for securities shall be lower of:

*20 times the average number of shares traded daily, during the previous calendar month, in the relevant underlying security in the underlying segment of the relevant exchange or, 10 per cent of the number of shares held by non-promoters in the relevant underlying security i.e. 10 per cent of the free float in terms of the number of shares of a company.

The relevant authority shall specify the market wide position limits once every month, on the expiration day of the near month contract, which shall be applicable till the expiry of the subsequent month contract.

Exercise settlement: Exercise type shall be American and final settlement in respect of options on individual securities contracts shall be cash settled for an initial period of 6 months and as per the provisions of National Securities Clearing Corporation Ltd (NSCCL) as may be stipulated from time to time.

2.21. Warrants and Convertibles

Warrant is a contract/option entered into by the issuing company giving the holder the right to purchase or subscribe to the stated number of equity shares of that company within a predetermined specified period of time at a

predetermined price. Warrants are somewhat similar to call options but they also have the following differences: While the warrants are issued by companies, options are created by investors, and, as was said earlier, the companies do not have to do anything with such a creation. Warrants usually have long maturities (of several years), while options expire in short periods of time such as nine months. Unlike options, warrants are not standardized, they are unique. Warrants help companies in raising fresh capital, options do Dot have such uses.

Warrants are typically issued as sweeteners attached to bonds/debentures and equity issues so that they are successful in terms of volume and price. Warrants can be detached and traded separately. It may be possible to issue callable warrants, and although all the conditions of warrants are specified at issuance, it may be possible t9 alter the expiration date if certain conditions transpire. The typical maturity of warrants is 3 to 10 years, but perpetual warrants also have existed abroad. Warrants can be traded on the exchanges or over the counter as in the case of equities. Many investors never exercise warrants; they simply buy and sell them for capital gains. Thus, investors are often interested in warrants because of their speculative and leverage opportunities.

Convertible bonds/debentures and convertible preference shares are the other types of equity derivative securities. They can be fully or partially converted into equity of the issuing company on specified terms with regard to the timing, the price and the ratio of conversion. They carry a claim on the common stock of the same company (issuer). The claim can be exercised at the owner's initiative. Many convertible bonds cannot be exercised for certain initial period, say 6 to 24 months. If conversion is not effected, convertibles remain in existence till maturity (in the case of bonds) or for perpetuity (in the

case of preference shares). Unlike options and warrants, convertibles are valuable in their own rights; only a part of their value is derived from the option feature. Similarly, while the option feature is not inseparable from convertibles, warrants can be detachable. Unlike convertibles, warrants can be issued independently; they need not be tied with some other instrument. While warrants can be exercised for cash, convertibles do not have such a feature.

In India, the SEBI has issued the following guidelines with regard to the provisions applicable to the fully and partially convertible debentures: (a) the conversion premium and the conversion timing is to be predetermined and stated in the prospectus. (b) Any conversion has to be optional i.e., at the volition of the debenture holder if it takes place at or after 18 months but before 36 months from the date of allotment. (c) A conversion period of more than 36 months is not permitted unless conversion is made with put or call options. (d) Compulsory credit rating is required if the conversion period for fully convertible debentures exceeds 18 months.

2.22. Important Terms

Annualised return: The return or profit, expressed on an annual basis, the writer of the option contract receives for buying the shares and writing that particular option.

Assignment The holder of a long American-style option contract can exercise the option at any time until the option expires. It follows that an option writer may be assigned an exercise notice on a short option position at any time until that option expires. If an option writer is short an option that expires in-the-money, assignment on that contract should be expected, call or put. In fact, some option writers are assigned on such short contracts when they expire exactly at-

the-money. This occurrence is usually not predictable. To avoid assignment on a written option contract on a given day, the position must be closed out before that day's market close. Once assignment has been received, an investor has absolutely no alternative but to fulfill his obligations from the assignment per the terms of the contract. An option writer cannot designate a day when assignments are preferable. There is generally no exercise or assignment activity on options that expire out-of-the-money. Owners generally let them expire with no value.

At-the-Money : The option with strike price equal to that of the market price of the stock, it is considered as being "At-the-Money" or Near-the-Money

Buy and write: The simultaneous purchase of shares and sale of an equivalent number of option contracts.

Class of options : Option contracts of the same type -either calls or puts - covering the same underlying security.

Close

- Closing purchase — a transaction in which the purchaser's intention is to reduce or eliminate a short position in a given series of options. This transaction is frequently referred to as "covering" a short position.
- Closing sale — a transaction in which the seller's intention is to reduce or eliminate a long position in a given series of options.

Covered Call Option

Covered option helps the writer to minimize his loss. In a covered call option, the writer of the call option takes a corresponding long position in the stock in the cash market; this will cover his loss in his option position if there is

a sharp increase in price of the stock.. Further, he is able to bring down his average cost of acquisition in the cash market (which will be the cost of acquisition less the option premium collected).

Covered Put Option

A writer of a Put Option can create a covered position by selling the underlying security (if it is already owned). The effective selling price will increase by the premium amount (if the option is not exercised at maturity). Here again, the investor is not in a position to take advantage of any sharp increase in the price of the asset as the underlying asset has already been sold. If there is a sharp decline in the price of the underlying asset, the option will be exercised and the investor will be left only with the premium amount. The loss in the option exercised will be equal to the gain in the short position of the asset.

Delta: The rate in change of option premium due to a change in price of the underlying securities,

Derivative: An instrument which derives its value from the value of an underlying instrument (such as shares, share price indices, fixed interest securities, commodities, currencies, etc.)" Warrants and options are types of derivative.

Early exercise and Assignment

For call contracts, owners might make an early exercise in order to take possession of the underlying stock in order to receive a dividend. It is therefore extremely important to realize that assignment of exercise notices can occur early - days or weeks in advance of expiration day. As expiration nears, with a

call considerably in-the-money and a sizeable dividend payment approaching, this can be expected. Call writers should be aware of dividend dates, and the possibility of an early assignment. When puts become deep in-the-money, most professional option traders will exercise them before expiry. Therefore, investors with short positions in deep in-the-money puts should be prepared for the possibility of early assignment on these contracts.

Exercise If the holder of an American-style option decides to exercise his right to buy (in the case of a call) or to sell (in the case of a put) the underlying shares of stock, the holder must direct their broker to submit an exercise notice to ASX. In order to ensure that an option is exercised on a particular day, the holder must notify their broker before its exercise cut-off time for accepting exercise instructions on that day. Once ASX has been notified that an option holder wishes to exercise an option, it will assign the exercise notice randomly among customers with written (and not covered) an option contract with the same terms. ASX notify the seller's broker the next morning and they in turn notify the client that was randomly selected.

Exercise price: The amount of money which must be paid by the taker (in the case of a call option) or the writer (in the case of a put option) for the transfer of each of the underlying securities upon exercise of the option.

Expiry day: The date on which all unexercised options in a particular series expire.

Hedge: A transaction, which reduces or offsets the risk of a current holding. For example, a put option may act as a hedge for a current holding in the underlying instrument.

Implied volatility: A measure of volatility assigned to a series by the current market price.

In-the-money: A Call Option is said to be "In-the-Money" if the strike price is less than the market price of the underlying stock. A Put Option is In- The-Money when the strike price is greater than the market price.

Intrinsic price The different between the market value of the underlying securities and the excise price of the option. Usually it is not less then zero. It represents advantage the taker had over the current market price if the option is exercised.

Leverage is the feature of options that allows for higher returns from movements in the underlying shares trading options rather than the underlying shares themselves. Options provide leverage because they trade for a fraction of the price of the underlying shares.

Long: "Long" describes a position (in stock and/or options) in which one has purchased and own that security in one's brokerage account. For example, if you have purchased the right to buy 1000 shares of a stock, and are holding that right in your account, you are long a call contract. If you have purchased the right to sell 1000 shares of a stock, and are holding that right in your brokerage account, you are long a put contract. If you have purchased 1,000 shares of stock and are holding that stock in your brokerage account, or elsewhere, you are long 1,000 shares of stock.

Long-term option: An option with a term to expiry of two or three years from the date the series was first listed. (This is not available currently in India)

Multiplier: Is used when considering index options. The strike price and premium of an index option are usually expressed in points.

Open: An opening transaction is one that adds to, or creates a new trading position. It can be either a purchase or a sale. With respect to an option transaction, consider both:

- Opening purchase — a transaction in which the purchaser's intention is to create or increase a long position in a given series of options.
- Opening sale — a transaction in which the seller's intention is to create or increase a short position in a given series of options.

Open interest: The number of outstanding contracts in a particular class or series existing in the; option market. Also called the "open position".

Out-of-the-Money : A Call Option is said to be "Out-of-the-Money" if the strike price is greater than the market price of the stock. A Put option is Out-Of-Money if the strike price is less than the market price.

Premium is the term used for the price of an option. It varies as the underlying security's price fluctuates as well as with the passage of time. The premium is dependant on other factors including the volatility of the underlying security, dividends and interest rates. Option premiums are calculated based on models that take these factors into account and take the guess work out of valuing options. The most common models are the Black & Scholes and the Binomial option pricing models.

Put option: An option contract that entitles the taker (buyer) to sell a fixed number of underlying securities at a stated price on or before a fixed Expiry Day.

Random selection: The method by which an exercise of an option is allocated to a writer in that series of option.

Series of options: All contracts of the same class having the same Expiry Day and the same exercise price.

Short: It describes a position in options in which one has written a contract (sold one that you did not own). In return, now he has the obligations inherent in the terms of that option contract. If one has sold the right to buy 1000 shares of a stock to someone else, it is a short call contract. If one has sold the right to sell 1000 shares of a stock to someone else, it is a short put contract. The writer of an option collects and keeps the premium received from its initial sale.

Strike price: The Strike Price denotes the price at which the buyer of the option has a right to purchase or sell the underlying. Five different strike prices will be available at any point of time. The strike price interval will be of 20. If the index is currently at 1,410, the strike prices available will be 1,370, 1,390, 1,410, 1,430, 1,450. The strike price is also called Exercise Price. This price is fixed by the exchange for the entire duration of the option depending on the movement of the underlying stock or index in the cash market.

Time decay is the cost of holding an option from one day to the next. As options exist for a limited time only their value diminishes as the expiry approaches in much the same way as insurance policies lose value as they come to an end. Time decay is quantifiable and is known by the Greek term "theta".

Time value: The amount investors are willing to pay for the possibility that they could make a profit from their option position. It is influenced by time to expiry, dividends, interest rates, volatility .and market expectations.

Underlying securities: The shares or other securities subject to purchase or sale upon exercise of the option.

Writer: The seller of an option contract.

2.23. Self analysis Questions

1. What are options? Explain the features of any two options?

2. Explain the advantages of options?

3. "Call options and Put options are nothing but the opposites". Do you agree? Support your answer.

4. "Option prices are affected by a number of factors" Discuss.

5. Compare and Contrast the two major pricing models?

6. Discuss fully the different market strategies followed in the option trading?

7. Write short notes on: a. margin b. over the counter option c. warrant option

8. Discuss fully the rules and regulations that are followed in option trading?

2.24. Activities

1. Visit the web trading sites like icicidirect.com and go through the domo sites on Option trading, so that a preliminary knowledge can be gathered.

2. Open a demat account with a depository participant and do some option trading on your own with of course with little money as well as with little risk taking.

3. Meet a stock broker in your locality and gather as much information as possible with a lot of patience.

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UNIT III

Lesson 1

Futures : An Introduction

Objectives of the Lesson:

1. What is a Futures Contract?
2. Difference between Futures & Forwards
3. An Introduction to Futures Trading
4. A Brief account of Futures Settlements, Margin details
5. Futures Pricing: A theoretical Idea.

Learning Objectives:

After reading this lesson, the student should be able to :

- Understand the Meaning of Forward and Futures contracts
- Identify the basic characteristics of a standardized Future contract
- Distinguish between OTC traded contracts and Exchange Traded Contracts
- Margin requirements to participate in the Futures Markets
- Settlement procedures associated with Index or Stock Futures

Futures : An Introduction

In finance, a **futures contract** is a standardized contract, traded on a futures exchange, to buy or sell a certain underlying instrument at a certain date in the future, at a specified price. The future date is called the **delivery date** or **final settlement date**. The pre-set price is called the **futures price**. The price of the underlying asset on the delivery date is called the **settlement price**. The settlement price, normally, converges towards the futures price on the delivery date.

A futures contract gives the holder *the obligation* to buy or sell, which differs from an options contract, which gives the holder *the right, but not the obligation*. In other words, the owner of an options contract **may exercise** the contract. If it is an American-style option, it can be exercised on or before the expiration date; a European option can only be exercised at expiration. Thus, a Futures contract is more like an European option. Both parties of a "futures contract" **must** fulfill the contract on the settlement date. The seller delivers the commodity to the buyer, or, if it is a cash-settled future, then cash is transferred from the futures trader who sustained a loss to the one who made a profit. To exit the commitment prior to the settlement date, the holder of a futures position has to offset his position by either selling a long position or buying back a short position, effectively closing out the futures position and its contract obligations.

Futures contracts, or simply *futures*, are exchange traded derivatives. The exchange's clearinghouse acts as counterparty on all contracts, sets margin requirements, etc.

Futures vs. Forwards

While futures and forward contracts are both a contract to deliver a commodity on a future date, key differences include:

- Futures are always traded on an exchange, whereas forwards always trade over-the-counter, or can simply be a signed contract between two parties.
- Futures are highly standardized, whereas each forward is unique
- The price at which the contract is finally settled is different:
    - Futures are settled at the *settlement price* fixed on the last trading date of the contract (i.e. at the end)
    - Forwards are settled by the delivery of the commodity at the specified contract price.
- The credit risk of futures is much lower than that of forwards:
    - Traders are not subject to credit risk because the clearinghouse always takes the other side of the trade. The day's profit or loss on a futures position is marked-to-market in the trader's account. If the mark to market results in a balance that is less than the margin requirement, then the trader is issued a margin call.
    - The risk of a forward contract is that the supplier will be unable to deliver the grade and quantity of the commodity, or the buyer may be unable to pay for it on the delivery day.
- In case of physical delivery, the forward contract specifies to whom to make the delivery. The counterparty on a futures contract is chosen randomly by the exchange.
- In a forward there are no cash flows until delivery, whereas in futures there are margin requirements and a daily mark to market of the traders' accounts.

Standardization

Futures contracts ensure their liquidity by being highly standardized, usually by specifying:

- The *underlying*. This can be anything from a barrel of crude oil to a short term interest rate.
- The type of settlement, either cash settlement or physical settlement.
- The *amount* and units of the underlying asset per contract. This can be the notional amount of bonds, a fixed number of barrels of oil, units of foreign currency, the notional amount of the deposit over which the short term interest rate is traded, etc.
- The currency in which the futures contract is quoted.
- The *grade* of the deliverable. In the case of bonds, this specifies which bonds can be delivered. In the case of physical commodities, this specifies not only the quality of the underlying goods but also the manner and location of delivery. For example, the NYMEX Light **Sweet Crude Oil contract** specifies the acceptable sulfur content and API specific gravity, as well as the location where delivery must be made.
- The delivery month.
- The last trading date.
- Other details such as the commodity tick, the minimum permissible price fluctuation.

Margin

To minimize credit risk to the exchange, traders must post margin or a performance bond, typically 5%-15% of the contract's value.

Margin requirements are waived or reduced in some cases for hedgers who have physical ownership of the covered commodity or spread traders who have offsetting contracts balancing the position.

Initial margin is paid by both buyer and seller. It represents the loss on that contract, as determined by historical price changes, that is not likely to be exceeded on a usual day's trading.

A futures account is marked to market daily. If the margin drops below the margin maintenance requirement established by the exchange listing the futures, a margin call will be issued to bring the account back up to the required level.

Margin-equity ratio is a term used by speculators, representing the amount of their trading capital that is being held as margin at any particular time. The low margin requirements of futures results in substantial leverage of the investment. However, the exchanges require a minimum amount that varies depending on the contract and the trader. The broker may set the requirement higher, but may not set it lower. A trader, of course, can set it above that, if he doesn't want to be subject to margin calls.

Settlement

Settlement is the act of consummating the contract, and can be done in one of two ways, as specified per type of futures contract:

- '***Physical delivery***' - the amount specified of the underlying asset of the contract is delivered by the seller of the contract to the exchange, and by the exchange to the buyers of the contract. Physical delivery is common with commodities and bonds. In practice, it occurs only on a minority of contracts. Most are cancelled out by purchasing a covering position - that is, buying a contract to cancel out an earlier sale (covering a short), or selling a contract to liquidate an earlier purchase (covering a long). The Nymex crude futures contract uses this method of settlement upon expiration.

- **Cash settlement** - a cash payment is made based on the underlying reference rate, such as a short term interest rate index such as Euribor, or the closing value of a stock market index. A futures contract might also opt to settle against an index based on trade in a related spot market. Ice Brent futures use this method.

- **Expiry** is the time when the final prices of the future is determined. For many equity index and interest rate futures contracts (as well as for most equity options), this happens on the third Friday of certain trading month. On this day the *t+1* futures contract becomes the *t* forward contract. For example, for most CME and CBOT contracts, at the expiry on December, the March futures become the nearest contract. This is an exciting time for arbitrage desks, as they will try to make rapid gains during the short period (normally 30 minutes) where the final prices are averaged from. At this moment the futures and the underlying assets are extremely liquid and any mispricing between an index and an underlying

asset is quickly traded by arbitrageurs. At this moment also, the increase in volume is caused by traders rolling over positions to the next contract or, in the case of equity index futures, purchasing underlying components of those indexes to hedge against current index positions. On the expiry date, a European equity arbitrage trading desk in London or Frankfurt will see positions expire in as many as eight major markets almost every half an hour.

Futures contracts and exchanges

There are many different kinds of futures contract, reflecting the many different kinds of tradable assets of which they are derivatives. For information on futures markets exists in the following specific underlying commodities

- Foreign exchange market
- Money market
- Bond market
- Equity index market
- Soft Commodities market

Trading on commodities began in Japan in the 18th century with the trading of rice and silk, and similarly in Holland with tulip bulbs. Trading in the US began in the mid 19th century, when central grain markets were established and a marketplace was created for farmers to bring their commodities and sell them either for immediate delivery (also called spot or cash market) or for forward delivery. These forward contracts were private contracts between buyers and sellers and became the forerunner to today's exchange-traded futures contracts. Although contract trading began with traditional commodities such grains, meat and livestock, exchange trading has expanded to include metals,

energy, currency and currency indexes, equities and equity indexes, government interest rates and private interest rates.

Contracts on financial instruments was introduced in the 1970s by the Chicago Mercantile Exchange(CME) and these instruments became hugely successful and quickly overtook commodities futures in terms of trading volume and global accessibility to the markets. This innovation led to the introduction of many new futures exchanges worldwide, such as the London International Financial Futures Exchange in 1982 (now Euronext.liffe), Deutsche Terminbörse (now Eurex) and the Tokyo Commodity Exchange (TOCOM). Today, there are more than 75 futures and futures options exchanges worldwide trading to include:

- Chicago Board of Trade (CBOT) -- Interest Rate derivatives (US Bonds); Agricultural (Corn, Soybeans, Soy Products, Wheat); Index (Dow Jones Industrial Average); Metals (Gold, Silver)
- Chicago Mercantile Exchange -- Currencies, Agricultural (Pork, Cattle, Butter, Milk); Index (NASDAQ, S&P, etc); Various Interest Rate Products
- ICE Futures - the International Petroleum Exchange trades energy including crude oil, heating oil, natural gas and unleaded gas and merged with Intercontinental Exchange(ICE)to form ICE Futures.
- Euronext.liffe
- London Commodity Exchange - softs: grains and meats. Inactive market in Baltic Exchange shipping.
- Tokyo Commodity Exchange TOCOM

- London Metal Exchange - metals: copper, aluminium, lead, zinc, nickel and tin.
- New York Board of Trade - softs: cocoa, coffee, cotton, orange juice, sugar
- New York Mercantile Exchange - energy and metals: crude oil, gasoline, heating oil, natural gas, coal, propane, gold, silver, platinum, copper, aluminum and palladium

Who trades futures?

Futures traders are traditionally placed in one of two groups: hedgers, who have an interest in the underlying commodity and are seeking to *hedge out* the risk of price changes; and speculators, who seek to make a profit by predicting market moves and buying a commodity "on paper" for which they have no practical use.

Hedgers typically include producers and consumers of a commodity.

For example, in traditional commodities markets farmers often sell futures contracts for the crops and livestock they produce to guarantee a certain price, making it easier for them to plan. Similarly, livestock producers often purchase futures to cover their feed costs, so that they can plan on a fixed cost for feed. In modern (financial) markets, "producers" of interest rate swaps or equity derivative products will use financial futures or equity index futures to reduce or remove the risk on the swap.

The social utility of futures markets is considered to be mainly in the transfer of risk, and increase liquidity between traders with different risk and time preferences, from a hedger to a speculator for example.

Options on futures

In many cases, *options* are traded on futures. A put is the option to sell a futures contract, and a call is the option to buy a futures contract. For both, the option strike price is the specified futures price at which the future is traded if the option is exercised. See the Black model, which is the most popular method for pricing these option contracts.

Futures Contract Regulations

All futures transactions in the United States are regulated by the Commodity Futures Trading Commission (CFTC), an independent agency of the United States Government. The Commission has the right to hand out fines and other punishments for an individual or company who breaks any rule. Although by law the commission regulates all transactions, each exchange can have their own rule, and under contract can fine companies for different things or extend the fine that the CFTC hands out.

The CFTC publishes weekly reports containing details of the open interest of market participants for each market-segment, which has more than 20 participants. These reports are released every Friday (including data from the previous Tuesday) and contain data on open interest split by reportable and non-reportable open interest as well as commercial and non-commercial open interest. This type of report is referred to as 'Commitments-Of-Traders'-Report, COT-Report or simply COTR.

Pricing of Futures : A Theoretical Introduction

When the deliverable asset exists in plentiful supply, or may be freely created, then the price of a future is determined via arbitrage arguments. The

forward price represents the expected future value of the underlying discounted at the risk free rate—as any deviation from the theoretical price will afford investors a riskless profit opportunity and should be arbitraged away; see rational pricing of futures.

Thus, for a simple, non-dividend paying asset, the value of the future/forward, *F(t)*, will be found by discounting the present value *S(t)* at time *t* to maturity *T* by the rate of risk-free return *r*.

$$F(t) = S(t) \times (1 + r)^{(T-t)}$$

or, with *continuous compounding*

$$F(t) = S(t)e^{r(T-t)}$$

This relationship may be modified for storage costs, dividends, dividend yields, and convenience yields.

In a perfect market the relationship between futures and spot prices depends only on the above variables; in practice there are various market imperfections (transaction costs, differential borrowing and lending rates, restrictions on short selling) that prevent complete arbitrage. Thus, the futures price in fact varies within arbitrage boundaries around the theoretical price.

The above relationship, therefore, is typical for stock index futures, treasury bond futures, and futures on physical commodities when they are in supply (e.g. on corn after the harvest). However, when the deliverable commodity is not in plentiful supply or when it does not yet exist, for example on wheat before the harvest or on Eurodollar Futures or Federal Funds Rate futures (in which the supposed underlying instrument is to created upon the

delivery date), the futures price cannot be fixed by arbitrage. In this scenario there is only one forces setting the price which is simple supply and demand for the future asset as expressed by supply and demand for the futures contract.

In a deep and liquid market, this supply and demand would be expected to balance out at a price which represents an unbiased expectation of the future price of the actual asset and so be given by the simple relationship

$$F(t) = E_t \{S(T)\} .$$

With this pricing rule, a speculator is expected to break even when the futures market fairly prices the deliverable commodity.

In a shallow and illiquid market, or in a market in which large quantities of the deliverable asset have been deliberately withheld from market participants (an illegal action known as a corner), the market clearing price for the future may still represent the balance between supply and demand but the relationship between this price and the expected future price of the asset can break down.

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Exercises:

1. What is a Futures Contract? How does it differ from a Forward Contract?

2. What are the basic features of a Futures Contract?
3. Briefly explain the Margin and settlement issues relating to Futures Trading
4. List out different types of Futures Contracts and Exchanges associated with trading them

Lesson 2

Pricing of Futures

Objectives of the Lesson:

This lesson introduces:

1. What is Futures Price and Spot Price
2. What is Cost of Carry Model
3. What is Basis?
4. What is Arbitrage benefit
5. How are commodities are priced against Security Futures?
6. What is the Role of Interest Rates in determination of Futures Prices?

Learning Objectives:

After reading this lesson, the students should be able to understand

1. How are prices for Futures are determined?
2. How one can spot Arbitrage benefits in futures markets
3. What is the Cost of Carry model and its relevance in finance markets
4. Understand the quotations in ET newspaper for Futures segment

Unit III: Lesson 2 : Pricing of Futures

There are two popular models of pricing of futures. Understanding these pricing models would help the users of futures markets to know about the factors involved in the pricing process, linkage between the spot market price and future prices, role of prevailing interest rates and the future expectations in the market, etc. In this lesson a brief description about the following popular models are given:

1. Cost of Carry Model
2. Expectations Model

Cost of carry model:

Cost of carry model basically assumes the time value of money. Future value of any asset is expected to be closer to spot price and interest for the holding period. In case of any deviation, there is a possibility of arbitrage between the markets. An asset may be cheep in spot market and costly in futures market, thus giving an arbitrage profit to some body who buys the asset today in the spot market and sells the same in futures market on a future date. Theoretically, it is expected that the futures markets are likely to price the assets in such a way that there should not be any motivation on the part of players to look for arbitrage gains. Futures are expected to be used only as hedge tools. This is the principle idea behind the cost of carry model

The basic assumptions behind the cost of carry model principally around the existence of perfect market. More specifically, the following are assumptions :

- Presence of large number of buyers and sellers
- Availability of perfect information to all players
- Decisions by players are expected to be mostly on economic grounds
- Absence of transaction costs and restrictions between markets

When markets are perfect, there may not be any opportunity for arbitrage gains. But in reality no market is so perfect in respect of most of the above said assumptions. Number of players may not be many in futures market compared to spot market. Further, the size of transaction may differ between markets and only large players likely to enter into the futures market. Equal information between players is also always not possible. The big players may be able to invest on data mining and understanding patterns, etc. Similarly, the objectives of different players may differ in their decision making. While hedgers are likely to look for risk reduction, the speculators and arbitrages spend their time in identifying the mis pricing in the given market. Further, the margin requirements, market infrastructure, knowledge base required to play between markets differ giving rise to the total absence of above said assumptions

What is arbitrage ?

Arbitrage refers to shifting or participating in two different markets or places simultaneously at a given point of time in search of possible profitable opportunities. In an idealized situation, arbitrage may not possess any additional risk as well as any investment. Such arbitrage is often refered to as “risk less arbitrage”. However, arbitrage need not always expected to give only positive gain. Participants may resort to arbitrage for purposes like headging, speculation, etc as well.

An arbitrager is one who engages in arbitrage activity. In a risk less arbitrage, it is possible to trade and generate riskless profit with out any investment. For example, assume that the shares of Infosys Technologies being traded at Rs 12,000 in cash market and Rs 12,100 in futures (near futures) market at NSE simultaneously. It should be possible for the arbitrager to simultaneously purchase the scrip in cash market and sell the same in futures market to generate a riskless profit of Rs 100 (minus interest for the days of expiry) per share. Since both the trades are assumed to be done simultaneously, there is no investment. In an efficient market such opportunities are expected not to exist. If they exist, there is a possibility of making abnormal gains by many.

However, in the above example, we have to assume that there are no transaction costs, no taxes and there are no frictions or restrictions of any kind to enter into markets. These idealized conditions are to be kept in mind in comparing the spot and futures price before drawing inferences in the arbitrage possibilities. When markets are not that perfect, naturally, there is will be distortion in the prices to that extent .

Cost of carry model :

The cost of carry or carrying charges is the cost associated with carrying a storable good forward in time. To explain let us take an example from commodity market. For instance, Paddy from Kharif crop in December can be carried forward to, or stored until next June or December or until the next crop or even beyond. In such a case, the following carrying costs are be incurred:

- Storage costs
- Insurance costs
- Transaction costs
- Financing costs

The above said carrying costs play a crucial role in the determination of pricing between the spot and futures prices as well as the relationship among the prices of futures contracts of different maturities. While assuming that all other costs as absent, the major determining factor would be the financing cost, ie., interest cost of financing the transaction.

In such a case, the futures price of a commodity or an asset is expected to be equal to the spot price of the commodity plus the carrying charges necessary to carry the spot commodity forward to delivery. This is the fundamental rule of the cost of carry concept. It can be expressed as follows:

F = S + C

Where:

F = Futures price
S = Spot Price
C = Holding cost or carrying cost

This can also be expressed as:

F = S (1 + r) t

Where:

r : Cost of financing
t : time to expiration

In case the prices do not confirm to the above equation, a trader can borrow funds, buy the spot commodity with the borrowed funds and sell the futures contract in futures market and carry the commodity forward in time to deliver the same against the futures contract. These transactions generate arbitrage profit. Such opportunities are short lived as many arbitragers will get into the market attracted by the arbitrage profit and consequently the demand either in the spot or futures market rises or declines to such an extent that the price arbitrage stops futurer.

Example from Index Futures:

A futures contract on the stock market index gives its owner the right and obligation to buy or sell the portfolio of stocks characterized by the index. Stock index futures are cash settled; there is no delivery of the underlying asset.

The main differences between commodity and equity index futures are:

- There is no costs of storage involved in holding equity
- Equity comes with dividend stream, which is a negative cost if the holder is long on stock and the same is positive if the holder is short on the stock

Then,

Cost of carry = Financing cost – Dividends

The crucial aspect of dealing with equity futures as opposed to commodity futures is an accurate forecast of dividends.

Then pricing of an index future on the basis of cost of carry model is the carrying cost i.e, cost of financing the purchase of portfolio underling the index, minus the present value of dividends obtained from the stocks in the index portfolio.

For example,

Nifty Futures are traded on NSE in its F&O segment for one, two and three month contracts. Let us assume the money market interest rates at present is 15% per annum. Then the most likely price of a two month futures on Nifty is:

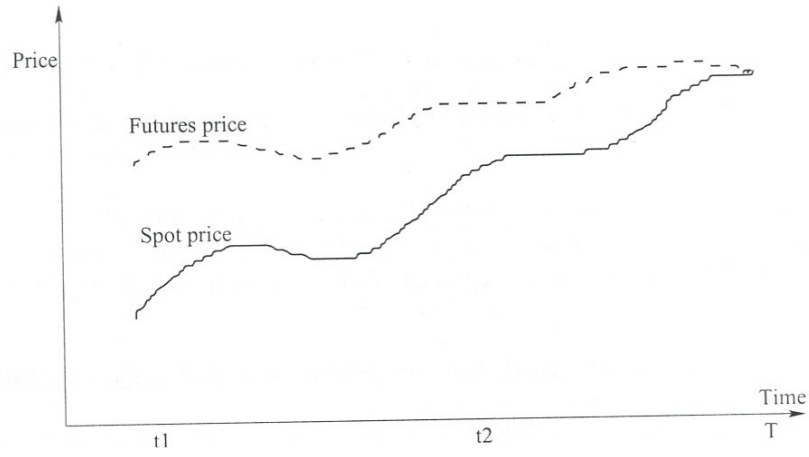
Say:

- The ACC, a component in Nifty is declaring a dividend of Rs 10 per share after fifteen days of purchasing the futures contract
- Current value of Nifty is 3000 and Nifty trades in multiples of 200
- Since the Nifty is traded in multiples of 200, the value of the contract is 200*3000 = Rs 600000
- Suppose the ACC has a weight of 10% in Nifty, its value of Nifty is Rs 60,000
- If the market price of ACC share is Rs 600, then a traded unit of Nifty involves 100 shares of ACC
- In order to calculate the futures price, we need to reduce the cost of carry to the extent of dividends received. The amount of dividend received, say 10% (10*100) is Rs 1000.
- Since dividend is received after 15 days of holding the futures contract, it would be compounded for remaining 45 days only
- The calculated Futures Price would be as follows:

- $F = 3000\ (1.15)^{60/365} - (100*10\ (1.15)^{45/365} / 200)$

  $= 3064.6$

The difference between the spot price and futures price is often referred to as "basis" in finance markets. As the time to expiration of a contract reduces, the basis reduces. Towards the close of trading on the day of settlement, the futures price and spot price converge. On the date of expiration, the basis is zero. If it is not, then there is an arbitrage opportunity. Arbitrage opportunities can also arise when the basis (difference between spot and futures price) or the spreads (difference between prices of two futures contracts) during the life of a contract are incorrect. The **following figures shows** how basis changes over time.



Expectations Model of Futures Pricing:

The cost of carry model can explain the pricing of futures in the case of storable commodities. However, it cannot be applied to perishable goods. For example, a tropical fruit, which can be harvested only during a particular season / period of the year. Not only that the fruit is be harvested during a particular point of time and it is also be consumed within a short period of time. Other

wise it will get spoiled. In such a case, the spot price and futures price is not linked via the cost of carry model. What determines the futures prices in such a case is the expectations of the market participants about the future spot price.

Assuming that the market participants expect that price of the fruit in the next harvest to be Rs 10 each. In this event, the futures price must be equal, or at least closely approximate, the expected future spot price. If, that was not so, profitable speculative strategies would arise. This logic has been extended to securities as well when the market is not able to predict the direction of changes in share prices or the quantum of dividend expected. Further, volatile interest rates prevailing in the money market and quantum of liquidity available in the market also determines the carrying cost. In the absence of possible trends and darkness associated with estimating different elements in the cost of carry model, most analysts consider this expectations model as the basis for understanding the Futures pricing.

Points to remember:

Futures are priced based on the spot price
Carrying costs basically determine the Futures price
The basis involved in between the Futures Price and Spot Price reduces as the time to expiration declines
There is two popular theoretical models to understand the Futures prices
The assumption of existence of perfect markets indicate that there should not be any arbitrage possibility between markets
Futures price discovery mostly depends on the extent of interdependence between markets and entry restrictions, etc

In the absence of clear knowledge about future expected changes in interest rates and dividend pattern, expectations theory is being used by analysts as an alternative to cost of carry model

Exercises:

1. What is Cost of Carry Model? What are the components of it in determining the Futures Price?
2. What is arbitrage benefit? How one can spot the arbitrage possibilities in between spot and futures markets
3. Make out an exercise to find the relationship between spot and futures prices for near month based on Nifty Index Futures from the quotations given in Economic Times.

LESSON 3

FUTURES TRADING AT NSE : A PREMIER

Objectives of the Lesson:

1. What is the Trading Platform for trading Futures at NSE?
2. Basic features of Futures traded in India
3. Lot sizes, order forms, margins, etc
4. Distinction between Index Futures Vs Stock Futures
5. Features of NEAT F& O Screen

Learning Objectives:

After reading this lesson, student should be able to understand

1. How are Futures traded in India?
2. What are the basic features of Futures traded at NSE
3. What is the Lot size, number cycles, etc
4. Features of NEAT F&O Screen
5. Margin requirements, etc for trading in Futures

LESSON : 3 FUTURES TRADING AT NSE : A PREMIER

The derivatives trading on National Stock Exchange (NSE) has commenced with S&P CNX Nifty Index futures on June 12, 2000. Single stock futures were launched on November 9, 2001. Currently, the futures contracts have a maximum of 3 months expiration cycles. Three contracts are available for trading with 1 month, 2 month and 3 month expiry. A new contract is introduced on the next trading day following the expiry of the near month contract

Trading Mechanism:

The Futures and Options trading system of NSE is called NEAT – F&O trading system. It provides a fully automated screen based trading for Nifty Futures and Options on a nation wide basis as well as an online monitoring and surveillance mechanism. It supports an order driven market ad provides complete transparency of trading operations. It is similar to that of the trading of equities in cash market segment

Basis of trading:

The NEAT – F&O segment supports an order driven market, wherein orders match automatically. Order matching is essentially on the basis of security, its price, time and quantity. All quantity fields are in units and price in rupees. The lot size on the futures market is for 200 Nifities. The exchange notifies the regular lot size and tick size for each of the contracts traded on this segment from time to time. When an order enters the trading system, it is an active order. It tries to find a match on the other side of the book. If it finds a

match, a trade is generated. If it does not find a match, the order becomes passive and goes and sits in the respective outstanding order book in the system

Order types and Conditions:

The NEAT – F& O allows different types of orders with various conditions attached to them to meet out the requirements of players. Based on the type of conditions, the orders may have:

- Time conditions
- Price conditions
- Other conditions

Further, a combinations of above conditions create a wide variety of flexibility to players . Based on the above said conditions, the order types differ. A list of them are as follows:

Time conditions:

Based on time conditions, the orders may be classified as:

- Day order: This order is valid for the day. If the order is not executed, the system cancels the order automatically at the end of the day
- Good till cancelled: GTC order remains in the system until it is cancelled by the player. There fore, such orders are likely to be active for few days. The maximum of number of days an order is allowed to be active is notified by the Exchange from time to time after which the order is automatically gets cancelled

- Good till a specific date / days: GTD orders are allowed to be in the system until specified number of days or upto a specific day desired by the user
- Immediate or Cancel (IOC) : These orders are for immediate buy or sell at the current rate. The user does not want to continue such orders, if an immediate order match not found.

Price conditions: Based on the price conditions, following forms of orders emerge:

- Stop – Loss order: This type of order allows the user to release an order into the system when the price of the security reaches a specific price limit. For example, a trader has placed a stop loss buy order with a price trigger of Rs 3327 and Rs 3330 (limit price), his order will be executed the moment the market price reaches the level of Rs 3327 and it would be stopped when the price goes beyond Rs 3330

Other conditions: Based on other conditions, the orders may be classified as follows:

- Market Price Orders – For these orders no specific price is mentioned by the buyer or seller at the time of entering. The prevailing market price is considered for these types of orders
- Trigger Price: Trigger price refers to that price at which an order gets triggered from the stop loss book

- Limit price order: Limit price is the price of the orders after triggering from stop – loss book

Components of Trading Window:

The NEAT – F&O trading windows are two types:

- The Market Watch window
- The Inquiry Window

The Market Watch window is displayed on the traders workstation screen with the following components

- Title bar
- Ticker Window of F&O segment
- Ticker Window of Underlying Market
- Tool bar
- Market Watch window
- Inquiry window
- Snap quote
- Order / trade window
- System message window

For greater clarity, students advised to visit nearby stock broker who is dealing with F&O segment and see the live trading window

The purpose of market watch window is to allow continuous monitoring of contracts or securities that are of specific interest to the users. It displays the trading information for contracts selected by the users. The user also gets the information about the cash market securities on the screen

Inquiry window: This window enables the user to view information as to Market by Order, Market by price, previous trades, outstanding orders, snap quotes, order status, Market movement, Market Inquiry, Net Position, etc

Placing orders on the Trading System:

The Futures market is always a zero sum game. The total number of buy positions should be equal to total number of sell positions. Total number of outstanding contracts (long/short) at any point of time is called "Open Interest" . It is an important indicator of the liquidity in every contract. Usually, the open interest would be high in case of near month futures

Members can enter their orders on the trading system, however, they have to identify the order as that of their own or for their clients. The account numbers of the trading members and clients are to be specified

Futures on NSE

The F&O segment of NSE provides the following trading facility in case of Futures:

1. Index based futures
2. Individual stock futures

Index Futures : Contract specifications:

NSE trades Nifty Futures with one month, two month, three month expiry cycles. All contacts expire on the last Thursday of every month. On the

Friday following the Thursday a new contract having 3 month expiry would be introduced for trading.

All index futures contracts on NSE' futures trading system are coded. Each futures contract has a separate limit order book. All passive orders are stacked in the system in terms of price-time priority and trades take place at the passive order price. The best buy order for a given futures contract will be the order to buy at the index at the highest index level where as the best sell order will be the order to sell the index at the lowest index level.

Trade specifications of a Nifty Futures:

Underlying asset	: S&P CNX Nifty
Exchange of Trading	: NSE
Security Descriptor	: N FUTIDX NIFTY
Contract size	: Permitted lot size is 200 and multiples thereof
Price steps	: Rs 0.05
Price bands	: Not applicable
Trading Cycle	: Near month Next Month Far month
Expiry day	: Last Thursday of the month
Settlement basis	: Mark to Market and final settlement will be cash settled on T+1 basis
Settlement Price	: Daily settlement price will be closing price of futures contracts for the trading day and the final settlement price shall be the closing value of the underlying index on the last trading day.

Contract Specifications for stock Futures:

Trading in individual stock futures have commenced on NSE from November 2001. These contracts are cash settled on a T+1 basis. The expiration cycle for stock futures is the same as for index futures. A new contract is introduced on the trading day following the expiry of the near month contract

Charges:

The maximum brokerage chargeable by a trading member in relation to trades effected in the contracts admitted to dealing on the F& O segment of NSE is 2.5% of the contract value. The transaction charges payable by a TM for the trades executed by him on the F&O segments are fixed at Rs 2 per lakh of turnover (0.002%)(each side) or Rs 1 lakh annually, which ever is higher. The trading members also contribute o the Investor Protection Fund of F&O segment at the rate of Rs 10 per crore of business done

Exercises:

1. What are the basic features of Futures traded at NSE?
2. Give an account of Margin requirements, other charges relating to trading in Futures?
3. How are the Futures settled?

UNIT – IV

I) Hedging – Introduction

We have seen how one can take a view on the market with the help of index futures. The other benefit of trading in index futures is to hedge your portfolio against the risk of trading. In order to understand how one can protect his portfolio from value erosion let us take an example.

Illustration:

Amp enters into a contract with Saru roopa that six months from now he will sell to Saru roopa 10 dresses for Rs 4000. The cost of manufacturing for Amp is only Rs 1000 and he will make a profit of Rs 3000 if the sale is completed.

Cost (Rs)	Selling price	Profit
1000	4000	3000

However, Amp fears that Saru roopa may not honour his contract six months from now. So he inserts a new clause in the contract that if Saru roopa fails to honour the contract she will have to pay a penalty of Rs 1000. And if Saru roopa honours the contract Amp will offer a discount of Rs 1000 as incentive.

On Saru roopa's default	If Saru roopa honours
1000 (Initial Investment)	3000 (Initial profit)
1000 (penalty from Saru roopa)	(-1000) discount given to Saru roopa
- (No gain/loss)	2000 (Net gain)

As we see above if Saru roopa defaults Amp will get a penalty of Rs 1000 but he will recover his initial investment. If Saru roopa honours the contract, Amp will still make a profit of Rs 2000. Thus, Amp has hedged his risk against default and protected his initial investment.

The above example explains the concept of hedging. Let us try understanding how one can use hedging in a real life scenario.

Stocks carry two types of risk – company specific and market risk. While company risk can be minimized by diversifying your portfolio market risk cannot be diversified but has to be hedged. So how does one measure the market risk? Market risk can be known from Beta.

Beta measures the relationship between movements of the index to the movement of the stock. The beta measures the percentage impact on the stock prices for 1% change in the index. Therefore, for a portfolio whose value goes down by 11% when the index goes down by 10%, the beta would be 1.1. When the index increases by 10%, the value of the portfolio increases 11%. The idea is to make beta of your portfolio zero to nullify your losses.

Hedging involves protecting an existing asset position from future adverse price movements. In order to hedge a position, a market player needs to take an equal and opposite position in the futures market to the one held in the cash market. Every portfolio has a hidden exposure to the index, which is denoted by the beta. Assuming you have a portfolio of Rs 1 million, which has a beta of 1.2, you can factor a complete hedge by selling Rs 1.2 mn of S&P CNX Nifty futures.

Steps:

1. Determine the beta of the portfolio. If the beta of any stock is not known, it is safe to assume that it is 1.
2. Short sell the index in such a quantum that the gain on a unit decrease in the index would offset the losses on the rest of his portfolio. This is achieved by multiplying the relative volatility of the portfolio by the market value of his holdings.

Therefore in the above scenario we have to shortsell 1.2 * 1 million = 1.2 million worth of Nifty.

Now let us study the impact on the overall gain/loss that accrues:

	Index up 10%	**Index down 10%**
Gain/(Loss) in Portfolio	Rs 120,000	(Rs 120,000)
Gain/(Loss) in Futures	(Rs 120,000)	Rs 120,000
Net Effect	Nil	Nil

As we see, that portfolio is completely insulated from any losses arising out of a fall in market sentiment. But as a cost, one has to forego any gains that arise out of improvement in the overall sentiment. Then why does one invest in equities if all the gains will be offset by losses in futures market. The idea is that everyone expects his portfolio to outperform the market. Irrespective of whether the market goes up or not, his portfolio value would increase.

The same methodology can be applied to a single stock by deriving the beta of the scrip and taking a reverse position in the futures market.

Thus, we have seen how one can use hedging in the futures market to offset losses in the cash market.

Speculation

Speculators are those who do not have any position on which they enter in futures and options market. They only have a particular view on the market, stock, commodity etc. In short, speculators put their money at risk in the hope of profiting from an anticipated price change. They consider various factors such as demand supply, market positions, open interests, economic fundamentals and other data to take their positions.

Illustration:

Amp is a trader but has no time to track and analyze stocks. However, he fancies his chances in predicting the market trend. So instead of buying different stocks he buys Sensex Futures.

On May 1, 2001, he buys 100 Sensex futures @ 3600 on expectations that the index will rise in future. On June 1, 2001, the Sensex rises to 4000 and at that time he sells an equal number of contracts to close out his position.

Selling Price : 4000*100 = Rs 4,00,000

Less: Purchase Cost: 3600*100 = Rs 3,60,000

Net gain Rs 40,000

Amp has made a profit of Rs 40,000 by taking a call on the future value of the Sensex. However, if the Sensex had fallen he would have made a loss. Similarly, if would have been bearish he could have sold Sensex futures and made a profit from a falling profit. In index futures players can have a long-term view of the market up to at least 3 months.

Arbitrage

An arbitrageur is basically risk averse. He enters into those contracts were he can earn riskless profits. When markets are imperfect, buying in one market and simultaneously selling in other market gives riskless profit. Arbitrageurs are always in the look out for such imperfections.

In the futures market one can take advantages of arbitrage opportunities by buying from lower priced market and selling at the higher priced market. In index futures arbitrage is possible between the spot market and the futures market (NSE has provided special software for buying all 50 Nifty stocks in the spot market.

- Take the case of the NSE Nifty.
- Assume that Nifty is at 1200 and 3 month's Nifty futures is at 1300.
- The futures price of Nifty futures can be worked out by taking the interest cost of 3 months into account.
- If there is a difference then arbitrage opportunity exists.

Let us take the example of single stock to understand the concept better. If Wipro is quoted at Rs 1000 per share and the 3 months futures of Wipro is Rs

1070 then one can purchase ITC at Rs 1000 in spot by borrowing @ 12% annum for 3 months and sell Wipro futures for 3 months at Rs 1070.

Sale = 1070

Cost= 1000+30 = 1030

Arbitrage profit = 40

These kinds of imperfections continue to exist in the markets but one has to be alert to the opportunities as they tend to get exhausted very fast.

Pricing of options

Options are used as risk management tools and the valuation or pricing of the instruments are a careful balance of market factors.

There are four major factors affecting the Option premium:

- Price of Underlying
- Time to Expiry
- Exercise Price Time to Maturity
- Volatility of the Underlying

And two less important factors:

- Short-Term Interest Rates
- Dividends

Review of Options Pricing Factors

The Intrinsic Value of an Option

The intrinsic value of an option is defined as the amount by which an option is in-the-money or the immediate exercise value of the option when the underlying position is marked-to-market.

For a call option: Intrinsic Value = Spot Price – Strike Price

For a put option: Intrinsic Value = Strike Price – Spot Price

The intrinsic value of an option must be positive or zero. It cannot be negative. For a call option, the strike price must be less than the price of the underlying asset for the call to have an intrinsic value greater than 0. For a put option, the strike price must be greater than the underlying asset price for it to have intrinsic value.

1) **Price of underlying**

The premium is affected by the price movements in the underlying instrument. For Call options – the right to buy the underlying at a fixed strike

price – as the underlying price rises so does its premium. As the underlying price falls, so does the cost of the option premium. For Put options – the right to sell the underlying at a fixed strike

price – as the underlying price rises, the premium falls; as the underlying price falls the premium cost rises.

2) The Time Value of an Option

Generally, the longer the time remaining until an option's expiration, the higher its premium will be. This is because the longer an option's lifetime, greater is the possibility that the underlying share price might move so as to make the option in-the-money. All other factors affecting an option's price remaining the same, the time value portion of an option's premium will decrease (or decay) with the passage of time.

Note: This time decay increases rapidly in the last several weeks of an option's life. When an option expires in-the-money, it is generally worth only its intrinsic value.

3) Volatility

Volatility is the tendency of the underlying security's market price to fluctuate either up or down. It reflects a price change's magnitude; it does not imply a bias toward price movement in one direction or the other. Thus, it is a major factor in determining an option's premium. The higher the volatility of the underlying stock, the higher the premium because there is a greater possibility that the option will move in-the-money. Generally, as the volatility of an underlying stock increases, the premiums of both calls and puts overlying that stock increase, and vice versa.

Higher volatility=Higher premium

Lower volatility = Lower premium

Interest rates

In general interest rates have the least influence on options and equate approximately to the cost of carry of a futures contract. If the size of the options contract is very large, then this factor may take on some importance. All other factors being equal as interest rates rise, premium costs fall and vice versa. The relationship can be thought of as an **opportunity cos**t. In order to buy an option, the buyer must either borrow funds or use funds on deposit. Either way the buyer incurs an interest rate cost. If interest rates are rising, then the opportunity cost of buying options increases and to compensate the buyer premium costs fall. Why should the buyer be compensated? Because the option writer receiving the premium can place the funds on deposit and receive more interest than was previously anticipated. The situation is reversed when interest rates fall – premiums rise. This time it is the writer who needs to be compensated.

Perfect Hedge

A position undertaken by an investor that would eliminate the risk of an existing position or a position that eliminates all market risk from a portfolio in order to be a perfect hedge, a position would need to have a 100% inverse correlation to the initial position. As such, the perfect hedge is rarely found.

A common example of a near-perfect hedge would be an investor using a combination of held stock and opposing options positions to self-insure against any loss in the stock position. The cost of this strategy is that it also limits the upside potential of the stock position.

Hedge Fund

An aggressively managed portfolio of investments that uses advanced investment Strategies such as leverage, long, short derivative positions in both domestic and international markets with the goal of generating high returns (either in an absolute sense or over a specified market benchmark). Legally, hedge funds are most often set up as private investment partnerships that are open to a limited number of investors and require a very large initial minimum investment. Investments in hedge funds are illiquid as they often require investors keep their money in the fund for a minimum period of at least one year.

For the most part, hedge funds (unlike mutual funds) are unregulated because they cater to sophisticated investors. In the U.S., laws require that the majority of investors in the fund be accredited. That is, they must earn a minimum amount of money annually and have a net worth of over Rs.1 million, along with a significant amount of investment knowledge. You can think of hedge funds as mutual funds for the super-rich. They are similar to mutual funds in that investments are pooled and professionally managed, but differ in that the fund has far more flexibility in its investment

Strategies.

It is important to note that hedging is actually the practice of attempting to reduce risk, but the goal of most hedge funds is to maximize return on investment. The name is mostly historical, as the first hedge funds tried to hedge against the downside risk of a bear market with their ability to short the market (mutual funds generally can't enter into short positions as one of their primary goals). Nowadays, hedge funds use dozens of different strategies, so it isn't accurate to say that hedge funds just "hedge risk". In fact, because hedge fund

managers make speculative investments, these funds can carry more risk than the overall market.

Buying Hedge

A transaction that commodities investors undertake to hedge against possible increase in the prices of the actuals underlying the futures contracts. Also called a long hedge, this particular strategy protects investors from increasing prices by means of purchasing futures contracts. Many companies will attempt to use a long hedge strategy in order to reduce the uncertainty associated with future prices.

Long Hedge

A situation where an investor has to take a long position in futures contracts in order to hedge against future price volatility. A long hedge is beneficial for a company that knows it has to purchase an asset in the future and wants to lock in the purchase price. A long hedge can also be used to hedge against a short position that has already been taken by the investor.

For example, assume it is January and an aluminum manufacturer needs 25,000 pounds of copper to manufacture aluminum and fulfill a contract in May. The current spot price is Rs.1.50 per pound, but the May futures price is Rs.1.40 per pound. In January the aluminum manufacturer would take a long position in 1 May futures contract on copper. These locks in the price the manufacturer will pay.

If in May the spot price of copper is Rs.1.45 per pound the manufacturer has benefited from taking the long position, because the hedger is actually paying Rs.0.05/pound of copper compared to the current market price. However

if the price of copper was anywhere below Rs.1.40 per pound the manufacturer would be in a worse position than where they would have been if they did not enter into the futures contract.

Selling Hedge

A hedging strategy with which the sale of futures contracts are meant to offset a long underlying commodity position. Also known as a "short hedge." This type of hedging strategy is typically used for the purpose of insuring against a possible decrease in commodity prices. By selling a futures contract an investor can guarantee the sale price for a specific commodity and eliminate the uncertainty associated with such goods.

Micro-Hedge

An investment technique used to eliminate the risk of a single asset. In most cases, this means taking an offsetting position in that single asset. If this asset is part of a larger portfolio, the hedge will eliminate the risk of the one asset but will have less of an effect on the risk associated with the portfolio.

Say you are holding the stock of a company and want to eliminate the price risks associated with that stock. To offset your position in the company, you could take a short position in the futures market, thereby securing the stock price for the period of the futures contract. This strategy is used when an investor feels very uncertain about the future movement of a single asset.

II) HEDGING SCHEMES

Most option traders use more sophisticated hedging schemes than those that have been described so far. As a first step, they attempt to make their portfolio immune to small changes in the price of the underlying asset in the next small interval of time. This is known as *delta hedging*. They then look. at what are known as *gamma* and *vega.* Gamma is the rate of change of the value of the portfolio with respect to delta; vega is the rate of change of the portfolio with respect to the asset's volatility. By keeping gamma close to zero, a portfolio can be made relatively insensitive to fairly large changes in the price of the asset; by keeping vega close to zero, it can be made insensitive to changes in the asset's volatility. Option traders may also look at *theta* and *rho.* Theta is the rate of change of the option portfolio with the passage of time; rho is its rate of change with respect to the risk-free interest rate. They may also carry out a *scenario analysis* investigating how the value of their position will be impacted by alternative future scenarios. In the next few sections we discuss these approaches in more detail.

A. DELTA HEDGING

The *delta* of a derivative, Δ. It is defined as the rate of change of its price with respect to the price of the underlying asset [⊕]. It is the slope of the curve that relates the derivative's price to the underlying asset price.

$$\text{Delta} = \frac{\text{Change in option premium}}{\text{Change in underlying price}}$$

[⊕] More formally, $\Delta = \partial f / \partial S$. where f is the price of the derivative and S is the price of the underlying asset.

For example, an option with a delta of 0.5 will move Rs 5 for every change of Rs 10 in the underlying stock or index.

Illustration:

A trader is considering buying a Call option on a futures contract, which has a price of Rs 19. The premium for the Call option with a strike price of Rs 19 is 0.80. The delta for this option is +0.5. This means that if the price of the underlying futures contract rises to Rs 20 – a rise of Re 1 – then the premium will increase by 0.5 x 1.00 = 0.50. The new option premium will be 0.80 + 0.50 = Rs 1.30.

Consider a call option on a stock. Figure 4.1 shows the relationship between the call price and the underlying stock price. When the stock price corresponds to point A, the option price corresponds to point B and the Δ of the call is the slope of the line indicated. As an approximation,

$$\Delta = \frac{\Delta c}{\Delta S}$$

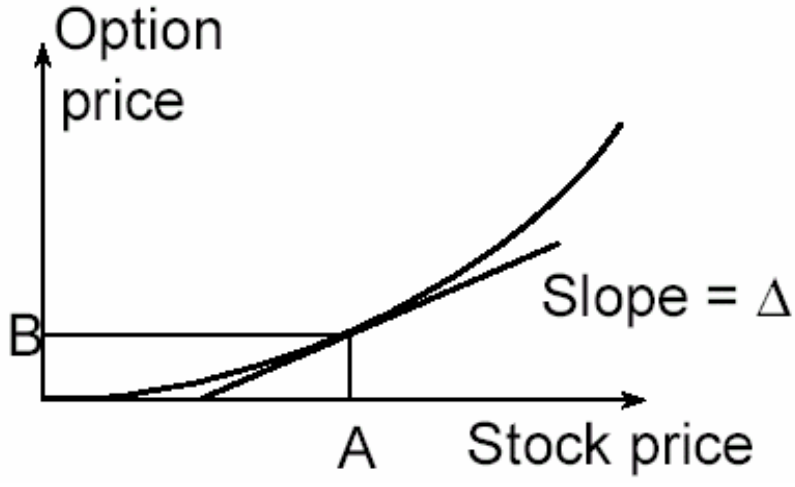


Figure 4.1 Calculation of delta.

where ΔS is a small change in the stock price and Δc is the corresponding change in the call price.

Assume that the delta of the call option is 0.6. This means that when the stock price changes by a small amount, the option price changes by about 60% of that amount. Suppose that the option price is Rs. 10 and the stock price is Rs. 100. Imagine an investor who has sold 20 option contracts, that is, options to buy 2,000 shares. The investor's position could be hedged by buying 0.6 x 2,000 = 1,200 shares. The gain (loss) on the option position would tend to be offset by the loss (gain) on the stock position. For example, if the stock price goes up by Rs. 1 (producing a gain of Rs. 1 ,200 on the shares purchased), the option price will tend to go up by 0.6 x Rs. 1 = Rs. 0.60 (producing a loss of Rs. 1,200 on the options written); if the stock price goes down by Rs. 1 (producing a loss of Rs. 1 ,200 on the shares purchased), the option price will tend to go down by Rs. 0.60 (producing a gain of Rs. 1,200 on the options written).

In this example, the delta of the investor's option position is 0.6 x (-2,000) = -1,200. In other words, the investor loses 1,200 ΔS on the options when the stock price increases by ΔS. The delta of the stock is by definition 1.0 and the long position in 1,200 shares has a delta of + 1,200. The delta of the investor's total position (short 2,000 call options; long 1,200 shares) is therefore zero. The delta of the position in the underlying asset offsets the delta of the option position. A position with a delta of zero is referred to as being *delta neutral.*

It is important to realize that the investor's position remains delta hedged (or delta neutral) for only a relatively short period of time. This is because delta changes with both changes in the stock price and the passage of time. In practice, when delta hedging is implemented, the hedge has to be adjusted

periodically. This is known as *rebalancing.* In our example, the stock price might increase to Rs. 110 by the end of three days. As indicated by Figure 4.1, an increase in the stock price leads to an increase in delta. Suppose that delta rises from 0.60 to 0.65. This would mean that an extra 0.05 x 2,000 = 100 shares would have to be purchased to maintain the hedge. Hedging schemes such as this that involve frequent adjustments are known as *dynamic hedging schemes.*

Delta is closely related to the Black-Scholes analysis. Black and Scholes showed that it is possible to set up a riskless portfolio consisting of a position in a derivative on a stock and a position in the stock. Expressed in terms of Δ, their portfolio is

-1: derivative

+ Δ : shares of the stock

Using our new terminology, we can say that Black and Scholes valued options by setting up a delta-neutral position and arguing that the return on the position in a short period of time equals the risk-free interest rate.

Uses:

The knowledge of delta is of vital importance for option traders because this parameter is heavily used in margining and risk management strategies. The delta is often called the *hedge ratio*. e.g. if you have a portfolio of 'n' shares of a stock then 'n' divided by the delta gives you the number of calls you would need to be short (i.e. need to write) to create a riskless hedge – i.e. a portfolio which would be worth the same whether the stock price rose by a very small amount or fell by a very small amount.

In such a "delta neutral" portfolio any gain in the value of the shares held due to a rise in the share price would be exactly offset by a loss on the value of the calls written, and vice versa.

Note that as the delta changes with the stock price and time to expiration the number of shares would need to be continually adjusted to maintain the hedge. How quickly the delta changes with the stock price are given by gamma, which we shall learn subsequently.

Delta of Forward Contracts

Equation (3.6) shows that when the price of a non-dividend-paying stock changes by ΔS, with all else remaining the same; the value of a forward contract on the stock also changes by ΔS. The delta of a forward contract on one share of a non-dividend-paying stock is therefore 1.0. This means that a short forward contract on one share can be hedged by purchasing one share, while a long forward contract on one share can be hedged by shorting one share. These two hedging schemes are "hedge and forget" schemes in the sense that no changes need to be made to the position in the stock during the life of the contract. As already mentioned, when an option or other more complicated derivative is being hedged, delta hedging is not a hedge-and-forget scheme. If the hedge is to be effective, the position in the stock must be rebalanced frequently.

Deltas of European Calls and Puts

For a European call option on a non-dividend-paying stock, it can be shown that

$$\Delta = N(d_1)$$

where d_1 is defined in Black-Scholes Pricing formula. Using delta hedging for a short position in a European call option therefore involves keeping

a long position of $N(d_1)$shares at any given time. Similarly, using delta hedging for a long position in a European call option involves maintaining a short position of $N(d_1)$shares at any given time.

For a European on a non-dividend-paying stock, delta is given by

$$\Delta=N(d_1) - 1$$

This is negative, which means that a long position in a put option should be hedged with a long position in the underlying stock, and a short position in a put option should be hedged with a short position in the underlying stock. The variation of the delta of a call option and a put option with the stock price is shown in Figure 4.2a & 4.2 b and Figure 4.3 shows typical patterns for the variation of delta with time to maturity for at-the-money, in-the-money, and out-of-the-money options.

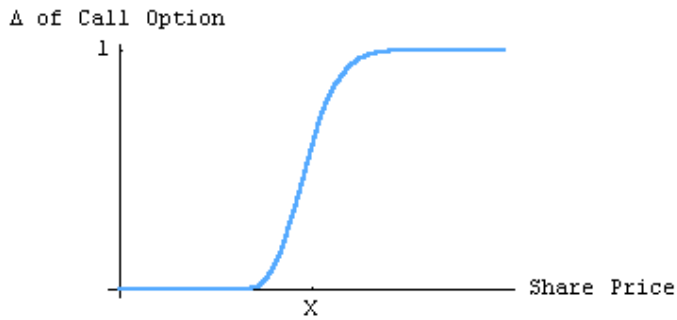


Figure 4.2a: Variation of delta with the stock price for a call option

on a non dividend paying stock

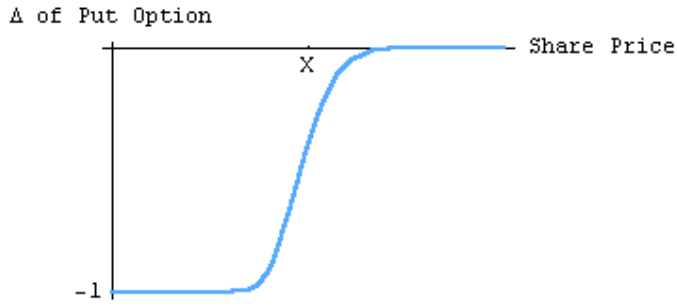
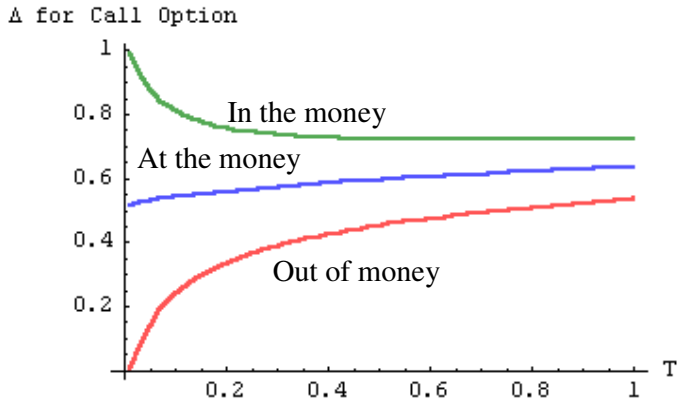


Figure 4.2b Variation of delta with the stock price for a put option on a non-dividend-paying stock.

Variation of Delta with Time to Expiry :

Variation of Delta with Time to Expiry (T) for European option on a non-dividend-paying share with strike price of X. **Red**, **Blue** and **Green** lines denote out-of-the-money, at-the-money and in-the-money options respectively.



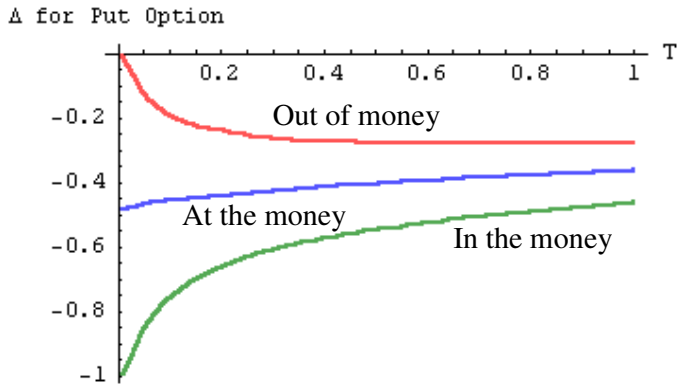


Figure 4.3 Typical pattern for variation of delta with the time to maturity for

a call and put option.

Simulations

Tables 4.1 and 4.2 provide two simulations of the operation of delta hedging for the example in Section 14.1. The hedge is assumed to be adjusted or rebalanced weekly. In both tables delta is calculated initially as 0.522. This means that as soon as the option is written, Rs. 2,557,800 must be borrowed to buy 52,200 shares at a price of Rs. 49. An interest cost of Rs. 2,500 is incurred in the first week.

In Table 4.1 the stock price falls to Rs. 48⅛ by the end of the first week. This reduces the delta to 0.458, and 6,400 shares are sold to maintain the hedge. This realizes Rs. 308,000 in cash and the cumulative borrowings at the end of week I are reduced to Rs. 2,252,300. During the second week the stock price reduces to Rs. 47⅜ and delta declines again; and so on. Toward the end of the life of the option it becomes apparent that the option will be exercised and delta

approaches 1.0. By week 20, therefore, the hedger has a fully covered position. The hedger receives Rs. 5,000,000 for the stock held, so that the total cost of writing the option and hedging it is Rs. 263,400.

Table 4.2 illustrates an alternative sequence of events which are such that the option closes out of the money. As it becomes progressively clearer that the option will not be exercised, delta approaches zero. By week 20 the hedger has a naked position and has incurred costs totaling Rs. 256,600.

In Tables 4.1 and 4.2 the costs of hedging the option, when discounted to the beginning of the period, are close to but not exactly the same as the Black-Scholes price of Rs. 240,000. If the hedging scheme worked perfectly, the cost of hedging would; after discounting, be exactly equal to the theoretical price of the option on every simulation. The reason that there is a variation in the cost of delta hedging is that the hedge is rebalanced only once a week. As rebalancing takes place more frequently, the uncertainty in the cost of hedging is reduced.

TABLE 4.1 Simulation of Delta Hedging; Option Closes in the Money; Cost of Option to Writer = Rs. 263,400

Week	Stock Price	Delta	Shares Purchased	Cost of Shares Purchased (thousands of dollars)	Cumulative Cost (inch interest, in thousands of dollars)	Interest Cost (thousands of dollars)
0	49	0.522	52,200	2,557.8	2,557.8	2.5
1	48⅛	0.458	(6,400)	(308.0)	2,252.3	2.2
2	47⅜	0.400	(5,800)	(274.8)	1,979.7	1.9
3	5¼	0.596	19,600	984.9	2,966.5	2.9
4	51¾	0.693	9,700	502.0	3,471.3	3.3
5	53 ⅛	0.774	8,100	430.3	3,904.9	3.8
6	53	0.771	(300)	(15.9)	3,892.8	3.7
7	51⅞	0.706	(6,500)	(337.2)	3,559.3	3.4
8	51⅜	0.674	(3,200)	(164.4)	3,398.4	3.3
9	53	0.787	11,300	598.9	4,000.5	3.8
10	49⅞	0.550	(23,700)	(1,182.0)	2,822.3	2.7
11	48 ½	0.413	(13,700)	(664.4)	2,160.6	2.1
12	49⅞	0.542	12,900	643.4	2,806.1	2.7
13	50⅜	0.591	4,900	246.8	3,055.6	2.9
14	52⅛	0.768	17,700	922.6	3,981.2	3.8
15	51⅞	0.759	(900)	(46.7)	3,938.3	3.8
16	52⅞	0.865	10,600	560.5	4,502.6	4.3
17	54 ⅞	0.978	11,300	620.1	5,127.0	4.9
18	54⅝	0.990	1,200	65.6	5,197.5	5.0
19	55⅞	1.000	1,000	55.9	5,258.3	5.1
20	57¼	1.000	0	0.0	5,263.4	

Table 4.3shows statistics on the performance of delta hedging from 1,000 simulations of stock price movements for our example. The performance measure is the ratio of the standard deviation of the cost of writing the option

and hedging it to the Black-Scholes price of the option. It is clear that delta hedging is a great improvement over the stop-loss strategy. Unlike the stop-loss strategy, the performance of delta hedging gets steadily better as the hedge is monitored more frequently.

Delta hedging aims to keep the total wealth of the financial institution as close to unchanged as possible. Initially, the value of the written option is Rs. 240,000. In the situation depicted in Table 14.2, the value of the option can be calculated as Rs. 414,500 in week 9. Thus the financial institution has lost Rs. 174,500 on its option position between week 0 and week 9. Its cash position, as measured by the cumulative cost, is Rs. 1,442.700 worse in week 9 than in week 0. The value of the "hares held have increased from Rs. 2.557.800 to Rs. 4.171, 100 between week 0 and week 9. The net effect of all this is that the overall wealth of the financial institution has changed by only Rs. 3,900 during the nine-week period.

TABLE 4.2 Simulation of Delta Hedging; Option Closes out of the Money; Cost of Option to Writer = Rs. 256,600

Week	Stock Price	Delta	Shares Purchased	Cost of Shares Purchased (thousands Of dollars)	Cumulative Cost (incl. interest, in thousands of dollars)	Interest Cost (thousands of dollars)
0	49	0.522	52,200	2,557.8	2,557.8	2.5
1	49¾	0.568	4,600	228.9	2,789.1	2.7
2	52	0.705	13,700	712.4	3,504,2	3.4
3	50	0.579	(12,600)	(630.0)	2,877.6	2.8
4	48⅜	0.459	(12,000)	(580.5)	2,299.8	2.2
5	48¼	0.443	(1,600)	(77.2)	2,224.8	2.1
6	48¾	0.475	3,200	156.0	2,383.0	2.3
7	49⅝	0.540	6,500	322.6	2,707.8	2.6
8	48¼	0.420	(12,000)	(579.0)	2.131.4	2.0
9	48¼	0.410	(1,000)	(48.2)	2,085.2	2.0
10	51⅛	0.658	24,800	1,267.9	3,355.1	3.2
11	51½	0.692	3,400	175.1	3,533.5	3.4
12	49⅞	0.542	(15,000)	(748.1)	2,788.7	2.7
13	49⅞	0.538	(400)	(20.0)	2,771.5	2,7
14	48¾	0.400	(13,800)	(672.7)	2,101.4	2.0
15	47½	0.236	(16,400)	(779.0)	1.324.4	1.3
16	48	0.261	2,500	120.0	1.445.7	1.4
17	46¼	0.062	(19,900)	(920.4)	526.7	0.5
18	48⅛	0.183	12,100	582.3	1,109.5	1.1
19	46⅝	0.007	(17,600)	(820.6)	290.0	0.3
20	48⅛	0.000	(700)	(33.7)	256.6	----

TABLE 4.3 Performance of Delta Hedging

Hedge performance measure = ratio to theoretical price of option of standard deviation of cost of option						
Time between Hedge Rebalancing (weeks)	5	4	2	1	0.5	0.25
Performance Measure	0.43	0.39	0.26	0.19	0.14	0.09

Where the Cost Comes From

The delta-hedging scheme in Tables 4.1 and 4.2 in effect creates a long position in the option synthetically. This neutralizes the short position arising from the option that has been written. The scheme generally involves selling stock just after the price has gone down and buying stock just after the price has gone up. It might be termed a buy high-sell low scheme! The cost of Rs. 240,000 comes from the average difference between the price paid for the stock and the price realized for it. Of course, the simulations in Tables 4.1 and 4.2 are idealized in that they assume that the volatility is constant and that there are no transactions costs.

Delta of Other European Options

For European call options on a stock index paying a dividend yield *q,*

$$\Delta = e^{-q(T-t)} N(d_1)$$

Where d_1 is defined as in European call price 'C' formula.. For European put options on the stock index,

$$\Delta = e^{-q(T-t)}[N(d_1) - 1]$$

For European call options on a currency,

$$\Delta = e^{-r_f (T-t)} N(d_1)$$

where r_f is the foreign risk-free interest rate and d_1 is defined as in European put price 'P' formula. For European put options on a currency,

$$\Delta = e^{-r_f (T-t)} [N(d_1) - 1]$$

For European futures call options,

$$\Delta = e^{-r (T-t)} N(d_1)$$

where d_1 is defined as earlier, and for European futures put options,

$$\Delta = e^{-r (T-t)} [N(d_1) - 1]$$

Example 4.1:

A bank has written a six-month European option to sell £ 1,000,000 at an exchange rate of 1.6000. Suppose that the current exchange rate is 1.6200, the risk-free interest rate in the United Kingdom is 13% per annum, the risk-free interest rate in the United States is 10% per annum, and the volatility of sterling is 15%. In this case S = 1.6200, X = 1.6000, r = 0.10, $r_f = 0.13, \sigma = 0.15$, and $T - t = 0.5$. The delta of a put option on a currency is

$$[N(d_1) - 1] e^{-r_f (T-t)}$$

where d_1 is given by equation:

$$d_1 = 0.0287$$

$$N(d_1) = 0.5115$$

The delta of the put option is therefore (0.5115 -l)e-O.13XO.5 = -0.458.This is the delta of a long position in one put option. The delta of the bank's total short position is - 1,000,000 times this or +458,000. Delta hedging therefore requires that a short sterling position of £458,000 be set up

initially. This short sterling position has a delta of -458,000 and neutralizes the delta of the option position. As time passes, the short position must be changed.

Using Futures

In practice, delta hedging is often carried out using a position in futures rather than one in the underlying asset. The contract that is used does not have to mature at the same time as the derivative. For ease of exposition we assume that a futures contract is on one unit of the underlying asset.

Define:

T^*: maturity of futures contract

H_A: required position in asset at time t for delta hedging

H_F: alternative required position in futures contracts at time t for delta hedging

If the underlying asset is a non-dividend-paying stock, the futures price, F, is from equation given by

$$F=Se^{-r\,(T^*-t)}$$

When the stock price increase by ΔS, the futures price increases by $\Delta Se^{r\,(T^*-t)}$. The delta of the futures contract is therefore $e^{r\,(T^*-t)}$. Thus $e^{-r\,(T^*-t)}$ futures contracts have the same sensitivity to stock price movements as one stock. Hence

$$H_F= e^{-r\,(T^*-t)}\,H_A$$

When the underlying asset is a stock or stock index paying a dividend yield q, a similar argument shows that

$$H_F = e^{-\,(r-q)\,(T^*-t)}\,H_A \qquad (4.1)$$

When it is a currency

$$H_F = e^{-\,(r-rf)\,(T^*-t)}\,H_A$$

Example 4.2

Consider again the option in Example 4.1. Suppose that the bank decides to hedge using nine-month currency futures contracts. In this case $T^* - t = 0.75$ and

$$e^{-(r-rf)\,(T^*-t)} = 1.0228$$

so that the short position in currency futures required for delta hedging is 1.0228 x 458,000 = Rs. 468,442. Since each futures contract is for the purchase or sale of Rs.62,500, this means that (to the nearest whole number) seven contracts should be shorted.

It is interesting to note that the delta of a futures contract is different from the delta of the corresponding forward. This is true even when interest rates are constant and the forward price equals the futures price. Consider the situation where the underlying asset is a non-dividend-paying stock. The delta of a futures contract on one unit of the asset is $e^{-r(T^*-t)}$ whereas the delta of a forward contract on one unit of the asset is, as discussed earlier, 1.0.

Delta of a Portfolio

In a portfolio of options and other derivatives where there is a single underlying asset, the delta of the portfolio is a weighted sum of the deltas of the individual derivatives in the portfolio. If a portfolio, Π, consists of an amount, *Wi,* of derivative i ($1 \leq i \leq n$), the delta of the portfolio is given by

$$\Delta = \sum_{i=1}^{n} w_i \Delta_i$$

where Δ_i is the delta of i^{th} derivative. This can be used to calculate the position in the underlying asset, or in a futures contract on the underlying asset, necessary to carry out delta hedging. When this position has been taken, the delta of the portfolio is zero and the portfolio is referred to as being delta neutral.

Example 4.3

Consider a financial institution that has the following three positions in options to buy or sell German marks:

1. A long position in 100,000 call options with strike price 0.55 and exercise date in three months. The delta of each option is 0.533.
2. A short position in 200,000 call options with strike price 0.56 and exercise date in five months. The delta of each, option is 0.468.
3. A short position in 50,000 put options with strike price 0.56 and exercise date in two months. The delta of each option is -0.508.

The delta of the whole portfolio is

$$0.533 \times 100{,}000 - 200{,}000 \times 0.468 - 50{,}000 \times (-0.508) = -14{,}900$$

This means that the portfolio can be made delta neutral with a long position of 14,900 marks.

A six-month futures contract could also be used to achieve delta neutrality in this example. Suppose that the risk-free rate of interest is 8% per annum in the United States and 4% per annum in Germany. The number of marks that must be bought in the futures market for delta neutrality is

$$14{,}900e^{-(0.08-0.04)\times 0.5} = 14{,}605$$

B. THETA

The *theta* of a portfolio of derivatives, e, is the rate of change of the value of the portfolio with respect to time with all else remaining the same [*]. It is sometimes referred to as the *time decay* of the portfolio. Theta is generally used to gain an idea of how time decay is affecting your portfolio.

$$\text{Theta} = \frac{\text{Change in an option premium}}{\text{Change in time to expiry}}$$

For a European call option on a non-dividend-paying stock,

$$\Theta = -\frac{SN'(d_1)\sigma}{2\sqrt{T-t}} - rX_e^{-r(T-t)}N(d_2)$$

where d_1 and d_2 are defined as in equation and

$$N'(x) = \frac{1}{\sqrt{2\pi}} e^{-x^2/2}$$

For a European put option on the stock,

$$\Theta = -\frac{SN'(d_1)\sigma}{2\sqrt{T-t}} + rX_e^{-r(T-t)}N(-d_2)$$

For a European call option on a stock index paying a dividend at rate *q,*

$$\Theta = -\frac{SN'(d_1)\sigma e^{-q(T-t)}}{2\sqrt{T-t}} + qSN(d_1)e^{-q(T-t)} - rX_e^{-r(T-t)}N(d_2)$$

where d_1 and d_2 are defined as in equation. The formula for *N'(x)* is given in Section. For a European put option on the stock index

$$\Theta = -\frac{SN'(d_1)\sigma e^{-q(T-t)}}{2\sqrt{T-t}} - qSN(d_1)e^{-q(T-t)} + rX_e^{-r(T-t)}N(-d_2)$$

[*] More formally, $\Theta = \partial\Pi / \partial t$ where II is the value of the portfolio.

With q equal to $r f$, these last two equations give thetas for European call and put options on currencies. With q equal to rand S equal to F, they give thetas for European futures options.

Example 4.4

Consider a four-month put option on a stock index. The current value of the index is 305, the strike price is 300, the dividend yield is 3% per annum, the risk-free interest rate is 8% per annum, and the volatility of the index is 25% per annum. In this case, S = 305, X = 300, q = 0.03, r = 0.08, σ = 0.25, and T - t = 0.3333. The option's theta is

$$\Theta = -\frac{SN'(d_1)\sigma e^{-q(T-t)}}{2\sqrt{T-t}} - qSN(d_1)e^{-q(T-t)} + rX_e{}^{-r(T-t)}N(-d_2) = -18.15$$

This means that if 0.01 year (or 2.5 trading days) passes with no changes to the value of the index or its volatility, the value of the option declines by 0.1815.

Theta is usually negative for an option ♣. This is because as the time to maturity decreases, the option tends to become less valuable. The variation of Θ with stock price for a call option on a stock is shown in Figure 4.4. When the stock price is very low, theta is close to zero. For an at-the-money call option, theta is large and negative. As the stock price becomes larger, theta tends to – rXe^{-rT} Figure 4.5 shows typical patterns for the variation of Θ with the time to maturity for in-the-money, at-the-money, and out-of-the-money call options.

Theta is not the same type of hedge paAmpeter as delta and gamma. This is because there is some uncertainty about the future stock price, but there is no

♣ An exception to this could be an in-tile-money European put option on a non-dividend-paying stock or an in-the-money European call option on a currency with a very high interest rate.

uncertainty about the passage of time. It does not make sense to hedge against the effect of the passage of time on an option portfolio. As we will see in Section Gamma, if theta is large in absolute terms, either delta or gamma must be large. If both the delta and gamma of an option position are zero, theta indicates that the value of the position will grow at the risk-free rate.

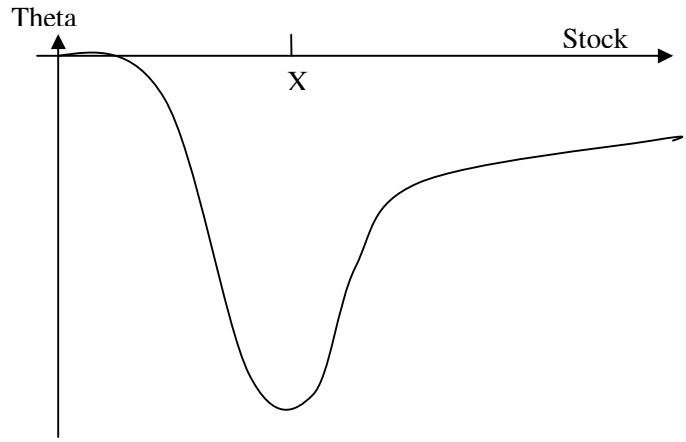


Figure 4.4 Variation of theta of a European call option with stock price.

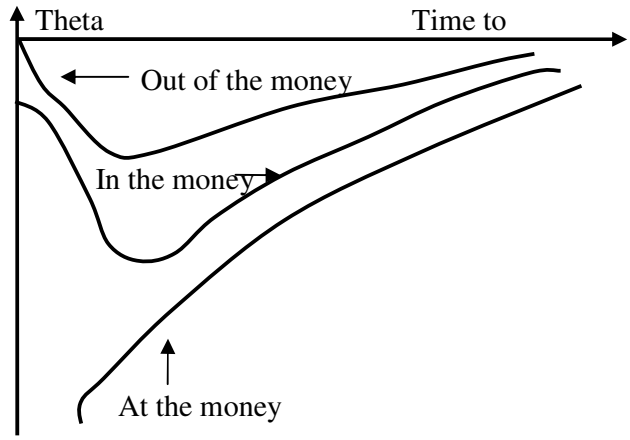


Figure 4.5 Typical patterns for variation of theta of a European call option with time to maturity.

Assume an option has a premium of 3 and a theta of 0.06. After one day it will decline to 2.94, the second day to 2.88 and so on. Naturally other factors,

such as changes in value of the underlying stock will alter the premium. Theta is only concerned with the time value. Unfortunately, we cannot predict with accuracy the change's in stock market's value, but we can measure exactly the time remaining until expiration

C. GAMMA

The *gamma,* Γ , of a portfolio of derivatives on an underlying asset is the rate of change of the portfolio's delta with respect to the price of the underlying asset ♥.

$$\text{Gamma} = \frac{\text{Change in an option delta}}{\text{Change in underlying price}}$$

If gamma is small, delta changes only slowly.The adjustments to keep a portfolio delta neutral need only be made relatively infrequently. However, if gamma is large in absolute terms, delta is highly sensitive to the price of the underlying asset. It is then quite risky to leave a delta-neutral portfolio unchanged for any length of time. Figure 4.6 illustrates this point. When the stock price moves from S to S', delta hedging assumes that the option price moves from C to c.' when in actual fact it moves from C to *C".* The difference between C' and C" leads to a hedging error. The error depends on the curvature of the relationship between the option price and the stock price. Gamma measures this curvature ♠.

Suppose that ΔS is the change in the price of an underlying asset in a small interval of time, Δt, and ΔII is the corresponding change in the price of the

♥ More formally, $\Gamma = \partial^2 \Pi / \partial S^2$, where Π is the value of the portfolio.

♠ lndeed, the gamma of an option is sometimes referred to by practitioners as its curvature.

portfolio. If terms such as Δt^2, which are of higher order than Δt, are ignored, Appendix 14A shows that for a delta-neutral portfolio,

$$\Delta\Pi = \Theta\, \Delta t + \tfrac{1}{2}\, \Gamma \Delta S^2 \qquad (4.2)$$

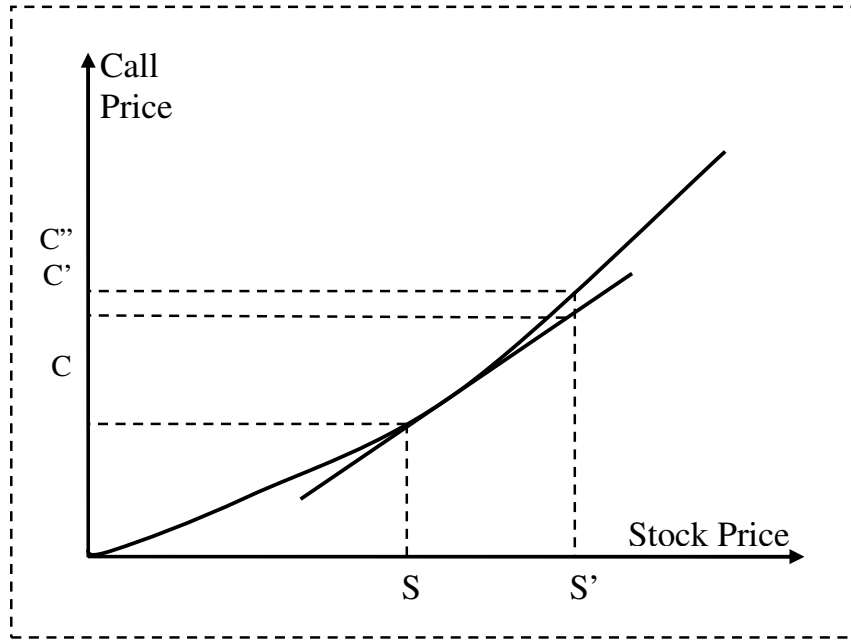


Figure 4.6 Error in delta hedging

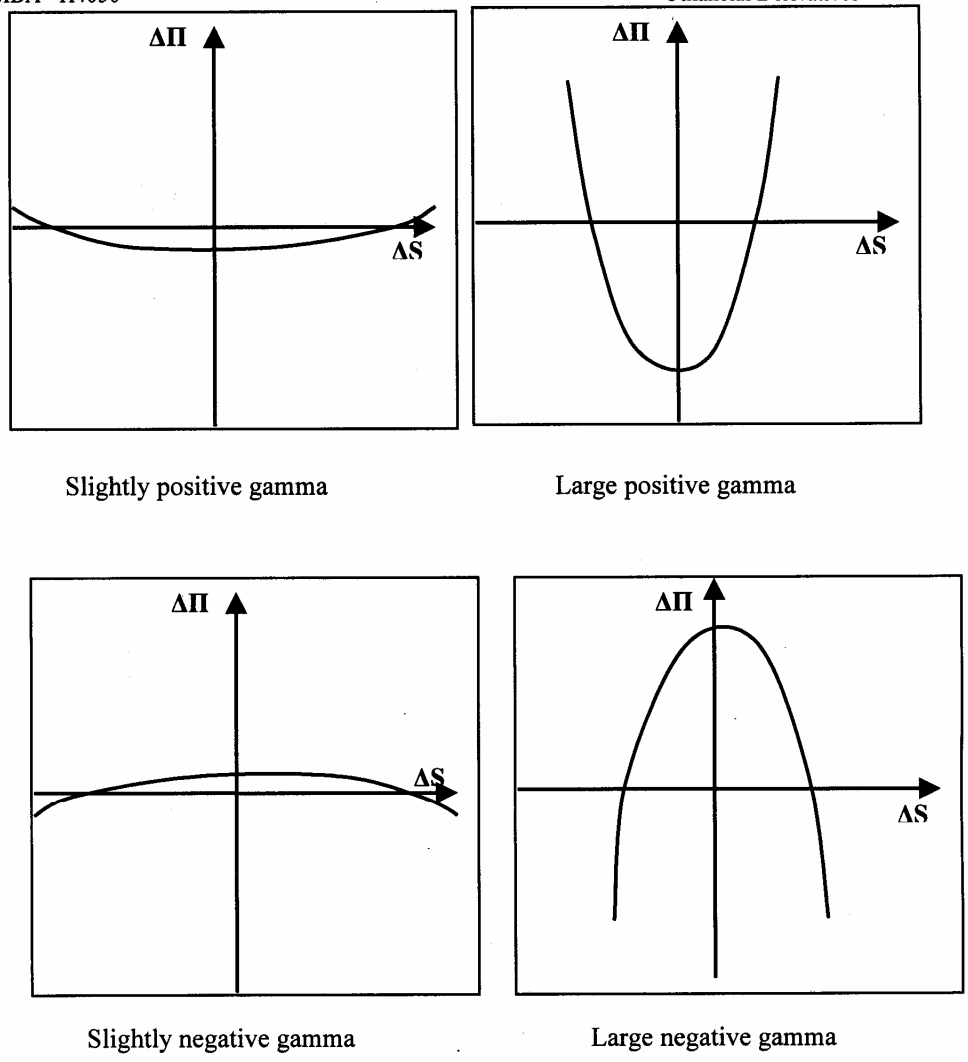


Figure 4.7 Alternative relationships between ΔΠ and ΔS for a delta-neutral portfolio.

where Θ is the theta of the portfolio. Figure 4.7 shows the nature of this relationship between ΔΠ and Δ*S*. When gamma is positive, theta tends to be negative.[10] The portfolio declines in value if there is no change in the S, but

increases in value if there is a large positive or negative change in S. When gamma is negative, theta tends to be positive and the reverse is true; the portfolio increases in value if there is no change in S but decreases in value if there is a large positive or negative change in S. As the absolute value of gamma increases, the sensitivity of the value of the portfolio to S increases.

Example 4.5

Suppose that the gamma of a delta-neutral portfolio of options on an asset is - 10,000. Equation (4.2) shows that if a change of + 2 or - 2 in the price of the asset occurs over a short period of time, there is an unexpected decrease in the value of the portfolio of approximately 0.5 x 10,000 x 2^2 = Rs. 20,000.

For example: if a Call option has a delta of 0.50 and a gamma of 0.05, then a rise of ±1 in the underlying means the delta will move to 0.55 for a price rise and 0.45 for a price fall. Gamma is rather like the rate of change in the speed of a car – its acceleration – in moving from a standstill, up to its cruising speed, and braking back to a standstill. Gamma is greatest for an ATM (at-the-money) option (cruising) and falls to zero as an option moves deeply ITM (in-the-money) and OTM (out-of-the-money) (standstill).

If you are hedging a portfolio using the delta-hedge technique described under "Delta", then you will want to keep gamma as small as possible as the smaller it is the less often you will have to adjust the hedge to maintain a delta neutral position. If gamma is too large a small change in stock price could wreck your hedge. Adjusting gamma, however, can be tricky and is generally done using options -- unlike delta, it can't be done by buying or selling the underlying

asset as the gamma of the underlying asset is, by definition, always zero so more or less of it won't affect the gamma of the total portfolio.

Making a Portfolio Gamma Neutral

A position in the underlying asset or in a futures contract on the underlying asset has zero gamma. The only way a financial institution can change the gamma of its portfolio is by taking a position in a traded option. Suppose that a delta-neutral portfolio has gamma equal to Γ and a traded option has a gamma equal to Γ_T. If the number of traded options added to the portfolio is W_T, the gamma of the portfolio is

$$W_T \Gamma_T + \Gamma$$

Hence the position in the traded option necessary to make the portfolio gamma neutral is $- \Gamma / \Gamma_T$. Of course, including the traded option is liable to change the delta of the portfolio, so the position in the underlying asset (or futures contract on the underlying asset) then has to be changed to maintain delta neutrality. Note that the portfolio is only gamma neutral instantaneously. As time passes, gamma neutrality can be maintained only if the position in the traded option is adjusted so that it is always equal to $- \Gamma / \Gamma_T$.

Example 4.6

Suppose that a portfolio is delta neutral and has a gamma of - 3,000. The delta and gamma of a particular traded call option are 0.62 and 1.50, respectively. The portfolio can be made gamma neutral by including a long position of

$$\frac{3{,}000}{1.5} = 2{,}000$$

traded call options in the portfolio. However, the delta of the portfolio will then change from zero to 2,000 X 0.62 = 1,240. A quantity, 1,240, of the underlying asset must there- fore be sold from the portfolio to keep it delta neutral.

[10]It will be shown in Section relationship among Delta, Theta, and Gamma that

$$\Theta + \tfrac{1}{2}\sigma^2 S^2 \Gamma = r\Pi$$

for a delta-neutral portfolio.

Making a portfolio gamma neutral can be regarded as a first correction for the fact that the position in the underlying asset (or futures contracts on the un. derlying asset) cannot be changed continuously when delta hedging is used.

Calculation of Gamma

For a European call or put option on a non-dividend-paying stock, the gamma is given by

$$\Gamma = \frac{N'(d_1)}{S\sigma\sqrt{T-t}}$$

Where d_1, is defined as in equation and *N′(x)* is given in Cumulative Normal Distribution function. This is always positive and varies with S in the way indicated in Figure 4.8.

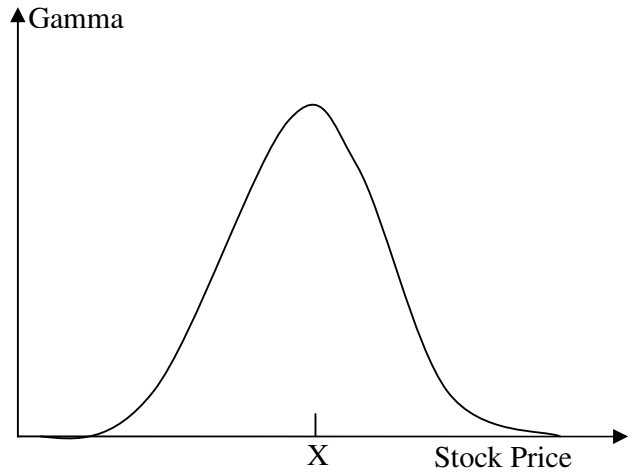


Figure 4.8 Typical patterns for variation of gamma with stock price for an option.

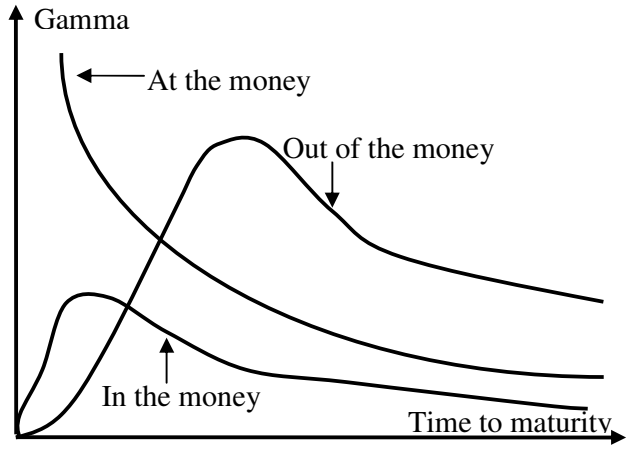


Figure 4.9 Variation of gamma with time to maturity for a stock option.

Typical patterns for the variation of gamma with time to maturity for out-of-the money, at-the-money, and in-the-money options are shown in Figure

4.9. For an at-the-money option, gamma increases as the time to maturity decreases. Short-life at-the-money options have a very high gamma, which means that the value of the option holder's position is highly sensitive to jumps in the stock price.

For a European call or put option on a stock index paying a continuous dividend at rate *q,*

$$\Gamma = \frac{N'(d_1)e^{-q(T-t)}}{S\sigma\sqrt{T-t}}$$

Where d_1 is defined as earlier. This formula gives the gamma for a European option on a currency when *q* is put equal to the foreign risk-free rate and gives the gamma for a European futures option with *q = r and S = F.*

Example 4.7

Consider a four-month put option on a stock index. Suppose that the current value of the index is 305, the strike price is 300, the dividend yield is 3% per annum, the risk-free interest rate is 8% per annum, and volatility of the index is 25% per annum. In this case, S = 305, X = 300, $q = 0.03$, $r = 0.08$, $\sigma = 0.25$, and $T - t = 0.3333$. The gamma of the index option is given by

$$\frac{N'(d_1)e^{-q(T-t)}}{S\sigma\sqrt{T-t}} = 0.00857$$

Thus an increase of 1 in the index increases the delta of the option by approximately 0.00857.

RELATIONSHIP AMONG DELTA, THETA, AND GAMMA

The Black-Scholes differential equation that must be satisfied by the price, f, of any derivative on a non-dividend-paying stock is

$$\frac{\partial f}{\partial t} + rS\frac{\partial f}{\partial S} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 f}{\partial S^2} = rf$$

Since

$$\Theta = \frac{\partial f}{\partial t} \qquad \Delta = \frac{\partial f}{\partial S} \qquad \Gamma = \frac{\partial^2 f}{\partial S^2}$$

it follows that

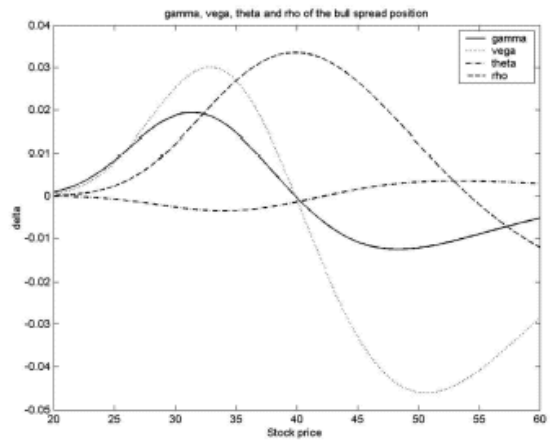
$$\Theta + rS\Delta + \frac{1}{2}\sigma^2 S^2 \Gamma = rf \tag{4.3}$$

This is true for portfolios of derivatives on a non-dividend-paying security as well as for individual derivatives.

For a delta-neutral portfolio, $\Delta. = 0$ and

$$\Theta + \frac{1}{2}\sigma^2 S^2 \Gamma = rf$$

This shows that when Θ is large and positive, gamma tends to be large and negative, and vice versa. In a delta-neutral portfolio, theta can be regarded as a proxy for gamma.



D. VEGA

Up to now we' have implicitly assumed that the volatility of the asset underlying a derivative is constant. In practice, volatilities change over time. This means that the value of a derivative is liable to change because of movements in volatility as well as because of changes in the asset price and the passage of time.

The *vega* of a portfolio of derivatives, γ, is the rate of change of the value of the portfolio with respect to the volatility of the underlying asset •.

$$\text{Vega} = \frac{\text{Change in an option premium}}{\text{Change in volatility}}$$

If for example, XYZ stock has a volatility factor of 30% and the current premium is 3, a vega of .08 would indicate that the premium would increase to 3.08 if the volatility factor increased by 1% to 31%. As the stock becomes more volatile the changes in premium will increase in the same proportion. Vega measures the sensitivity of the premium to these changes in volatility.

What practical use is the vega to a trader? If a trader maintains a delta neutral position, then it is possible to trade options purely in terms of volatility – the trader is not exposed to changes in underlying prices.

If vega is high in absolute terms, the portfolio's value is very sensitive to small changes in volatility. If vega is low in absolute terms, volatility changes have relatively little impact on the value of the portfolio.

• More formally, $\gamma = \partial\Pi/\partial\sigma$, where Π is the value of the portfolio. Vega i*s* also sometimes referred to as lambda, kappa or sigma.

A position in the underlying asset or in a futures contract has zero vega. However, the vega of a portfolio can be changed by adding a position in a traded option. If γ is the vega of the portfolio and γ_T is the vega of a traded option, a position of $-\gamma / \gamma_T$ in the traded option makes the portfolio instantaneously vega neutral. Unfortunately, a portfolio that is gamma neutral will not in general be vega neutral, and vice versa. If a hedger requires a portfolio to be both gamma and vega neutral, at least two traded derivatives dependent on the underlying asset must usually be used.

Example 4.8

Consider a portfolio that is delta neutral, with a gamma of -5,000 and a vega of -8,000. Suppose that a traded option has a gamma of 0.5, a vega of 2.0, and a delta of 0.6. The portfolio can be made vega neutral by including a long position in 4,000 traded options. This would increase delta to 2,400 and require that 2,400 units of the asset be sold to maintain delta neutrality. The gamma of the portfolio would change from - 5,000 to - 3,000.

To make the portfolio gamma and vega neutral, we suppose that there is a second traded option with a gamma of 0.8, a vega of 1.2, and a delta of 0.5. If w_1 and w_2 are the amounts of the two traded options included in the portfolio, we require that

$$-5{,}000 + 0.5w_1 + 0.8w_2 = 0$$
$$-8{,}000 + 2.0\, w_1 + 1.2\, w_2 = 0$$

The solution to these equations is $w_1 = 400$, $w_2 = 6{,}000$. The portfolio can therefore be made gamma and vega neutral by including 400 of the first traded option and 6,000 of the second traded option. The delta of the portfolio

after the addition of the positions in the two traded options is 400 X 0.6 + 6,000 X 0.5 = 3,240. Hence 3,240 units of the asset would have to be sold to maintain delta neutrality.

For a European call or put option on a non-dividend-paying stock, vega is given by

$$\gamma = S\sqrt{T-t}\ N'(d_1)$$

where d_1 is defined as in equation (11.22). The formula for *N'(x)* is given in Section 11 .8. For a European call or put option on a stock or stock index paying a continuous dividend yield at rate *q,*

$$\gamma = S\sqrt{T-t}\ N'(d_1)e^{-q(T-t)}$$

where d_1 is defined as in equation .This equation gives the vega for a European currency option with *q* replaced by r*f* It also gives the vega for a European futures option with *q* replaced by r, and S replaced by F. The vega of an option is always positive. The general way in which it varies with S is shown in Figure 4.10.

Calculating vega from the Black-Scholes pricing formula is an approximation., This is because one of the assumptions underlying Black-Scholes is that volatility is constant. Ideally, we would like to calculate vega from a model in which volatility is assumed to be stochastic. This is considerably more complicated.

Luckily, it can be shown that the vega calculated from a stochastic volatility model is very similar to the Black-Scholes vega [≈].

[≈] See J. Hull and A. White, "The Pricing of Options on Assets with Stochastic Volatilities," *Journal of Finance,* 42 (June 1987), 281-300; J. Hull and A. White, "An Analysis of the Bias in

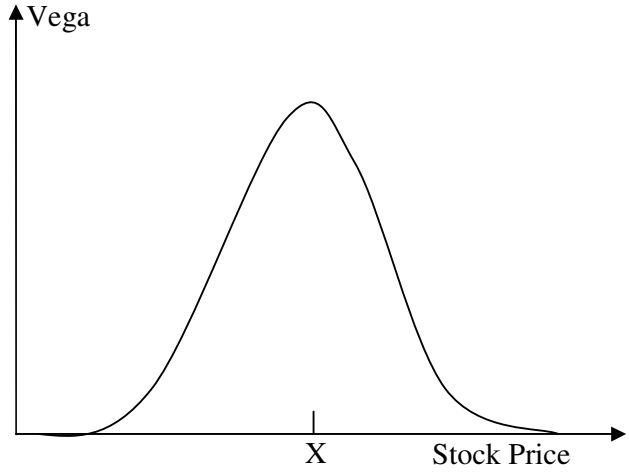


Figure.4.10 Variation of vega with stock price for an option.

Gamma neutrality corrects for the fact that time elapses between hedge rebalancing. Vega neutrality corrects for a variable σ. As might be expected, whether it is best to use an available traded option for vega or gamma hedging depends on the time between hedge rebalancing and the volatility of the volatility [∝].

Example 4.9

Consider again the put option in Example 4.7. Its vega is given by

$$S\sqrt{T-t}\ \ N'(d_1)e^{-q(T-t)} = 66.44$$

Option Pricing Caused by a Stochastic Volatility," *Advances in Futures and Options Research,* 3 (1988), 27-61.

[∝] For a discussion of this issue; seeJ.Hull and A. White, "Hedging the Risks from Writing Foreign Currency Options," *Journal of International Money and Finance.* 6 (June 1987), 131-52

Thus a 1 % or 0.01 increase in volatility (from 25% to 26%) increases the value of the option by approximately 0.6644.

E. RHO

The *rho* of a portfolio of derivatives is the rate of change of the value of the portfolio with respect to the interest rate [∅]. It measures the sensitivity of the value of a portfolio to interest rates.

$$\text{Rho} = \frac{\text{Change in an option premium}}{\text{Change in cost of funding underlying}}$$

Example:

Assume the value of Rho is 14.10. If the risk free interest rates go up by 1% the price of the option will move by Rs 0.14109. To put this in another way: if the risk-free interest rate changes by a small amount, then the option value should change by 14.10 times that amount. For example, if the risk-free interest rate increased by 0.01 (from 10% to 11%), the option value would change by 14.10*0.01 = 0.14. For a put option the relationship is inverse. If the interest rate goes up the option value decreases and therefore, Rho for a put option is negative. In general Rho tends to be small except for long-dated options.

For a European call option on a non-dividend-paying stock,

$$\text{rho} = X(T - t)\, e^{-r\,(T-t)}\, N(d_2)$$

and for a European put option on the stock,

$$\text{rho} = -\, X(T - t)\, e^{-r\,(T-t)}\, N(-\, d_2)$$

[∅] More formally, rho equals $\partial \Pi / \partial r$, where Π is the value of the portfolio.

Where d_2 is defined as in equation earlier. These same formulas apply to European call and put options on stocks and stock indices paying a dividend yield at rate *q,* and to European call and put options on futures contracts, when appropriate changes are made to the definition of d_2.

Example 4.10

Consider again the four: month put option on a stock index. The current value of the index is 305, the strike price is 300, the dividend yield is 3% per annum, the risk-free interest rate is 8% per annum, and the volatility of the index is 25% per annum. In this case, S = 305, X = 300, q = 0.03, r = 0.08, σ = 0.25, $T - t$ = 0.333. The option's rho is

$$- X(T - t)\, e^{-r\,(T-t)}\, N(- d_2) = -42.57$$

This means that for a one-percentage-point or 0.01 increase in the risk-free interest rate (from 8% to 9%), the value of the option decreases by 0.4257.

In the case of currency options, there are two rhos corresponding to the two interest rates. The rho corresponding to the domestic interest rate is given by previous formulas. The rho corresponding to the foreign interest rate for a European call on a currency is given by

$$\text{rho} = - (T-t)e^{-r_f\,(T-t)}\, SN(d_1)$$

while for a European put it is

$$\text{rho} = (T-t)e^{-r_f\,(T-t)}\, SN(-d_1)$$

III. PORTFOLIO INSURANCE

Portfolio managers holding a well-diversified stock portfolio are sometimes interested in insuring themselves against the value of the portfolio dropping below a certain level. One way of doing this is by holding, in conjunction with the stock portfolio, put options on a stock index. This strategy was discussed in earlier units.

Consider, for example, a fund manager with a Rs. 30 million portfolio whose value mirrors the value of the S&P 500. Suppose that the S&P 500 is standing at 300 and the manager wishes to insure against the value of the portfolio dropping below Rs. 29 million in the next six months. One approach is to buy 1,000 six-month put option contracts on the S&P 500 with a strike price of 290 and a maturity in six months. If the index drops below 290, the put options will become in the money and provide the manager with compensation for the decline in the value of the portfolio. Suppose, for example, that the index drops to 270 at the end of 6 months. The value of the manager's stock portfolio is likely to be about Rs. 27 million. Since each option contract is on 100 times the index, the total value of the put options is Rs. 2 million. This brings the' value of the entire holding back up to Rs. 29 million. Of course, insurance is not free. In this example the put options could cost the portfolio manager as much as Rs. 1 million

Creating Options Synthetically

An alternative approach open to the portfolio manager involves creating the put options synthetically. This involves taking a position in the underlying asset (or futures on the underlying asset) so that the delta of the position is

maintained equal to the delta of the required option. If more accuracy is required, the next step is to use traded options to match the gamma and vega of the required option. The position necessary to create an option synthetically is the reverse of that necessary to hedge it. This is a reflection of the fact that a procedure for hedging an option involves the creation of an equal and opposite option synthetically.

There are two reasons why it may be more attractive for the portfolio manager to create the required put option synthetically than to buy it in the market. The first is that options markets do not always have the liquidity to absorb the trades that managers of large funds would like to carry out. The second is that fund managers often require strike prices and exercise dates that are different from those available in traded options markets.

The synthetic option can be created from trades in stocks themselves or from trades in index futures contracts. We first examine the creation of a put option by trades in the stocks themselves. Consider again the fund manager with a well-diversified portfolio worth Rs. 30 million who wishes to buy a European put on the portfolio with a' strike price of Rs. 29 million and an exercise date in six months. Recall that the delta of a European put on an index is given by

$$\Delta = e^{-q(T-t)}[N(d_1) - 1]$$

where, with the usual notation,

$$d_1 = \frac{\text{In}(S/X) + (r-q + \sigma^2/2)\,(T-t)}{\sigma\sqrt{T-t}}$$

Since, in this case, the fund manager's portfolio mirrors the index, this is also the delta of a put on the portfolio when it is regarded as a single security.

The delta is negative. Accordingly, to create the put option synthetically, the fund manager should ensure that at any given time a proportion

$$e^{-q(T-t)}[1- N(d_1)]$$

of the stocks in the original Rs. 30 million portfolio have been sold and the proceeds invested in riskless assets. As the value of the original portfolio declines, the delta of the put becomes more negative and the proportion of the portfolio sold must be increased. As the value of the original portfolio increases, the delta of the put becomes less negative and the proportion of the portfolio sold must be decreased (i.e., some of the original portfolio must be repurchased).

Using this strategy to create portfolio insurance means that at any given time funds are divided between the stock portfolio on which insurance is required and riskless assets. As the value of the stock portfolio increases, riskless assets are sold and the position in the stock portfolio is increased. As the value of the stock portfolio declines, the position in the stock portfolio is decreased and riskless assets are purchased. The cost of the insurance arises from the fact that the portfolio manager is always selling after a decline in the market and buying after a rise in the market.

Use of Index Futures

Using index futures to create portfolio insurance can be preferable to using the underlying stocks, provided that the index futures market is sufficiently liquid to handle the required trades. This is because the transactions costs associated with trades in index futures are generally less than those associated with the corresponding trades in the underlying stocks. The portfolio manager considered earlier would keep the Rs. 30 million stock portfolios intact and short index futures contracts. From equations (4.1) and (4.4), the amount of futures contracts shorted as a proportion of the value of the portfolio should be

$e^{-q(T-t)}\, e^{-(r-q)(T^*-t)}[1- N(d_1)] = e^{-q(T^*-T)}\, e^{-r(T^*-t)}[1- N(d_1)]$

Where T^* is the maturity date of the futures contract. If the portfolio is worth. K_1 times the index and each index futures contract is on K_2 times the index, this means that the number of futures contracts shorted at any given time should be

$$e^{-q(T^*-T)}\, e^{-r(T^*-t)}[1- N(d_1)]\ \frac{k_1}{k_2}$$

Example 4.11

In the example given at the beginning of this section, suppose that the volatility of the market is 25% per annum, the risk-free interest rate is 9% per annum, and the dividend yield on the market is 3% per annum. In this case, S = 300, X = 290, r = 0.09, q = 0,03, σ = 0.25, and T - t = 0.5. The delta of the option that is required is

$$e^{-q(T-t)}[\, N(d_1) - 1\,] = -\,0.322$$

Hence, if trades in the portfolio are used to create the option, 32.2% of the portfolio should be sold initially. If nine-month futures contracts on the S&P 500 are used, T* - T = 0.25, T' - t = 0.75, K_1 = 100,000, K2 = 500, so that the number of futures contracts shorted should be

$$e^{-q(T^*-T)}\, e^{-r(T^*-t)}[1- N(d_1)]\ \frac{k_1}{k_2} = 61.6$$

An important issue when put options are created synthetically for portfolio insurance is the frequency with which the portfolio manager's position should be adjusted or rebalanced. With no transaction costs, continuous rebalancing is

,optimal. However, as transactions costs increase, the optimal frequency of rebalancing declines. This issue is discussed by Leland ˜ .

Up to now we have assumed that the portfolio mirrors the index. As discussed in Chapter 12, the hedging scheme can be adjusted to deal with other situations. Tile strike price for the options used should be the expected level of the market index when the portfolio's value reaches its insured value. The number of index options used should be β times the number of options that would be required if the portfolio had a beta of 1.0.

Example 4.12

Suppose that the risk-free rate of interest is 5% per annum, the S&P 500 stands at 500, and the value of a portfolio with a beta of 2.0 is Rs. 10 million. Suppose that the dividend yield on the S&P 500 is 3%, the dividend yield on the portfolio is 2%, and that the portfolio manager wishes to insure against a decline in the value of the portfolio to below Rs. 9.3 million in the next year. If the value of the portfolio declines to Rs. 9.3 million at the end of the year, the total return (after taking account of the 2% dividend yield) is approximately -5% per annum. This is 10% per annum less than the risk-free rate. We expect the market to perform 5% worse than the risk-free rate (i.e., .to provide zero return) in these circumstances. Hence, we expect a 3% decline in the S&P 500 since this index does not take any account of dividends. The correct strike price for the put options that are created is therefore 485. The number of put options required is beta times the value of the portfolio I divided by the value of the index, or 40,000 (i.e., 400 contracts).

˜ [15]See H. E. Leland, "Option Pricing and Replication with Transactions Costs," *Journal of Finance,* 40 (December 1985), 1283-1301.

To illustrate that this answer is at least approximately correct, suppose that the portfolio's value drops to Rs. 8.3 million. With dividends it provides a return of approximately -15% per annum. This is approximately 20% per annum less than the risk-free rate.

The S&P 500 plus dividends on the S&P 500 can be expected to provide a return that is 10% per annum less than the risk-free rate. This means that the index will reduce by 8%, to 460. The 40,000 put options with a strike price of 485 will payoff Rs. 1 million, as required.

When β is not equal to 1.0 and the fund manager wishes to use trades in the portfolio to create the option, the portfolio can be regarded as a single security. As an approximation, the volatility of the portfolio can be assumed to be equal to β times the volatility of the market index ♦.

October 19, 1987 and Stock Market Volatility

Creating put options on the index synthetically does not work well if the volatility of the index changes rapidly or if the index exhibits large jumps. On Monday, October 19, 1987, the Dow Jones Industrial Average dropped by over 500 points. Portfolio managers who had insured themselves by buying traded put options survived this crash well. Those who had chosen to create put options synthetically found that they were unable to sell either stocks or index futures fast enough to protect their position.

♦ *This is exactly true only if beta is calculated on the basis of the returns in very small time intervals. By contrast, the argument in Example 4.12 is exactly true only if beta is calculated on the basis of returns in time intervals of length equal to the life of the option being created.*

We have already raised the issue of whether volatility is caused solely by the arrival of new information or whether trading itself generates volatility. Portfolio insurance schemes such as those just described have the potential to increase volatility. When the market declines, they cause portfolio managers either to sell stock or to sell index futures contracts. This may accentuate the decline. The sale of stock is liable to drive down the market index further in a direct way. The sale of index futures contracts is liable to drive down futures prices. This creates selling pressure on stocks via the mechanism of index arbitrage so that the market index is liable to be driven down in this case as well. Similarly, when the market rises, the portfolio insurance schemes cause portfolio managers either to buy stock or to buy futures contracts. This may accentuate the rise.

In addition to formal portfolio insurance schemes, we can speculate that many investors consciously or subconsciously follow portfolio insurance schemes of their own. For example, an investor may be inclined to enter the market when it is rising, but will sell when it is falling, to limit his or her downside risk.

Whether portfolio insurance schemes (formal or informal) affect volatility depends on how easily the market can absorb the trades that are generated by portfolio insurance. If portfolio insurance trades are a very small fraction of all trades, there is likely to be no effect. But as portfolio insurance becomes more widespread, it is liable to have a destabilizing effect on the market.

IV. Conclusion

- ***Historical`Volatility***

  Historical Volatility reflects how far an instruments price has deviated from it's average price (mean) in the past. On a yearly basis, this number represents the one standard deviation % price change expected in the year ahead. In other words if a stock is trading at 100 and has a volatility of 0.20(20%) then there is a 68% probability(1 standard dev = 68% probability) that the price will be in the range 80 to 120 a year from now. Similarly there is a 95% probability that the price will be between 60 and 140 a year from now (2 standard deviations). The higher the volatility number the higher the volatility.

Within Investor/RT, there are two methods to choose from when computing volatility: The Close-to-Close Method and the Extreme Value Method. The Close-to-Close Method compares the closing price with the closing price of the previous period, while the Extreme Value Method compare the highs and lows of each period. The method used, along with the number of periods used in the calculation, and the periodicity (duration of each period) may be set by the user in the Options Analysis Preferences. (Volatility Computation Details)

- ***Theoretical`Value***

  The Theoretical Value of an option is expressed without the influences of the market, such as supply/demand, current volume traded, or expectations. It is calculated using a formula involving strike price, exercise price, time until expiration, and historical volatility. Currently, Investor/RT uses the Black-Scholes model to calculate the theoretical value of the option, although other model options may be added in the future. (Black-Scholes Computation Details)

- ***Implied`Volatility***

  Implied Volatility is calculated by inspecting the current option premium, and determining what the volatility should be in order to justify that premium. It is determined by plugging the actual option price into our Theoreticl Value model and solving for volatility. This implied volatility can be compared to the historical volatility of the underlying in search of underpriced and overpriced options.

1. ***Deltas***

Delta is the rate of change of the theoretical value of an option with respect to its underlying. It is also defined as the probablility that an option will finish in the money. Higher deltas(approaching 1.0) represent deep in-the-money options, and lower deltas(approaching 0.0) represent further out-of-the-money options. At-the-money options generally have deltas around 0.50, representing a 50% chance the contract will be in the money. This also represents the fact that if the underlying moves 1.0 point, the options should move 0.50.

The **delta** measures sensitivity to price. The **Δ**, of an instrument is the derivative of the value function with respect to the underlying price, $\frac{\partial V}{\partial S}$.

2) ***Gamma***

Gamma represents the rate of change of an options Delta. If an options has a delta of 0.35 and a gamma of 0.05, then the option can be expected to have a delta of 0.40 if the underlying goes up one point, and a delta of 0.30 if the underlying goes down one point.

The **gamma** measures second order sensitivity to price. The **Γ** is the second derivative of the value function with respect to the underlying price, $\frac{\partial^2 V}{\partial S^2}$.

3) Theta

Theta is also commonly referred to as time decay. It represents the options loss in theoretical value for each day the underlying price remains unchanged. An option with a theta of 0.10 would lose 10 cents each day provided the underlying does not move.

The **theta** measures sensitivity to the passage of time (see Option time value). **Θ** is minus the derivative of the option value with respect to the amount of time to expiry of the option, $\Theta = -\frac{\partial V}{\partial T}$.

4) Vega

Vega is the sensitivity of an options price to a change in volatility. An option with a vega of 0.25 would gain 25 cents for each percentage point increase in volatility.

The **vega**, measures sensitivity to volatility. Vega is not a Greek letter, but sounds like one and starts with **v**; it is a humorous reference to Scholes's Chevrolet Vega. The vega is the derivative of the option value with respect to the volatility of the underlying, $\frac{\partial V}{\partial \sigma}$. The term **kappa**, κ, is sometimes used instead of **vega**, and some trading firms have also used the term **tau**, τ.

5) Lambda

Lambda measures the percentage change in an option for a one percent change in the price of the underlying. A Lambda of 5 means a 1 percent change in the underlying will result in a 5 percent change in the option.

a. The **lambda**, **λ** is the percentage change in option value per change in the underlying price, or $\frac{\partial V}{\partial S} \times \frac{1}{V}$.
b. The **vega gamma** or **volga** measures second order sensitivity to implied volatility. This is the second derivative of the

option value with respect to the volatility of the underlying, $\frac{\partial^2 V}{\partial \sigma^2}$.

6) Rho

Rho measures the sensitivity of an option's theoretical value to a change in interest rates.

The **rho** measures sensitivity to the applicable interest rate. The **ρ** is the derivative of the option value with respect to the risk free rate, $\frac{\partial V}{\partial r}$.

Questions :

1. What do you mean by Hedging?
2. What are the Hedging Schemes?
3. What do you mean by Delta Hedging?
4. What do you mean by Theta in Hedging?
5. What do you mean by Gamma in Hedging?
6. What do you mean by Vega in Hedging?
7. What do you mean by Rho Hedging?
8. Explain hedging with an example
9. Explain the relationship among Delta, Theta, and Gamma.
10. Explain the Error in Delta Hedging.
11. What do you mean by long hedge and hedge funds?
12. Explain the concept Time to Maturity.
13. Explain the concept Price of Underlying
14. Explain the terms In the money, At the money and out of the money.

UNIT - V

I. Development of Derivatives Market in India

The first step towards introduction of derivatives trading in India was the promulgation of the Securities Laws(Amendment) Ordinance, 1995, which withdrew the prohibition on options in securities. The market for derivatives, however, did not take off, as there was no regulatory framework to govern trading of derivatives. SEBI set up a 24–member committee under the Chairmanship of **Dr.L.C.Gupta** on November 18, 1996 to develop appropriate regulatory framework for derivatives trading in India. The committee submitted its report on March 17, 1998 prescribing necessary pre–conditions for introduction of derivatives trading in India. The committee recommended that derivatives should be declared as 'securities' so that regulatory framework applicable to trading of 'securities' could also govern trading of securities. SEBI also set up a group in June 1998 under the Chairmanship of **Prof.J.R.Varma**, to recommend measures for risk containment in derivatives market in India. The report, which was submitted in October 1998, worked out the operational details of margining system, methodology for charging initial margins, broker net worth, deposit requirement and real–time monitoring requirements.

The Securities Contract Regulation Act (**SCRA**) was amended in December 1999 to include derivatives within the ambit of 'securities' and the regulatory framework was developed for governing derivatives trading. The act also made it clear that derivatives shall be legal and valid only if such contracts are traded on a recognized stock exchange, thus precluding OTC derivatives. The government also rescinded in March 2000, the three– decade old notification, which prohibited forward trading in securities.

Derivatives trading commenced in India in June 2000 after SEBI granted the final approval to this effect in May 2001. SEBI permitted the derivative segments of two stock exchanges, NSE and BSE, and their clearing house/corporation to commence trading and settlement in approved derivatives contracts. To begin with, SEBI approved trading in index futures contracts based on S&P CNX Nifty and BSE–30(Sensex) index. This was followed by approval for trading in options based on these two indexes and options on individual securities.

The trading in BSE Sensex options commenced on June 4, 2001 and the trading in options on individual securities commenced in July 2001. Futures contracts on individual stocks were launched in November 2001. The derivatives trading on NSE commenced with S&P CNX Nifty Index futures on June 12, 2000. The trading in index options commenced on June 4, 2001 and trading in options on individual securities commenced on July 2, 2001.

Single stock futures were launched on November 9, 2001. The index futures and options contract on NSE are based on S&P CNX Trading and settlement in derivative contracts is done in accordance with the rules, byelaws, and regulations of the respective exchanges and their clearing house/corporation duly approved by SEBI and notified in the official gazette. Foreign Institutional Investors (FIIs) are permitted to trade in all Exchange traded derivative products.

The following are some observations based on the trading statistics provided in the NSE report on the futures and options (F&O):

• Single-stock futures continue to account for a sizable proportion of the F&O segment. It constituted 70 per cent of the total turnover during June 2002. A primary reason attributed to this phenomenon is that traders are comfortable

with single-stock futures than equity options, as the former closely resembles the erstwhile badla system.

• On relative terms, volumes in the index options segment continues to remain poor. This may be due to the low volatility of the spot index. Typically, options are considered more valuable when the volatility of the underlying (in this case, the index) is high. A related issue is that brokers do not earn high commissions by recommending index options to their clients, because low volatility leads to higher waiting time for round-trips.

• Put volumes in the index options and equity options segment have increased since January 2002. The call-put volumes in index options have decreased from 2.86 in January 2002 to 1.32 in June. The fall in call-put volumes ratio suggests that the traders are increasingly becoming pessimistic on the market.

• Farther month futures contracts are still not actively traded. Trading in equity options on most stocks for even the next month was non-existent.

• Daily option price variations suggest that traders use the F&O segment as a less risky alternative (read substitute) to generate profits from the stock price movements. The fact that the option premiums tail intra-day stock prices is evidence to this. Calls on Satyam fall, while puts rise when Satyam falls intra-day.

If calls and puts are not looked as just substitutes for spot trading, the intra-day stock price variations should not have a one-to-one impact on the option premiums.

Month	Index futures	Stock futures	Index options	Stock options	Total
Jun-00	35	-	-	-	35
Jul-00	108	-	-	-	108
Aug-00	90	-	-	-	90
Sep-00	119	-	-	-	119
Oct-00	153	-	-	-	153
Nov-00	247	-	-	-	247
Dec-00	237	-	-	-	237
01-Jan	471	-	-	-	471
01-Feb	524	-	-	-	524
01-Mar	381	-	-	-	381
01-Apr	292	-	-	-	292
01-May	230	-	-	-	230
01-Jun	590	-	196	-	785
01-Jul	1309	-	326	396	2031
01-Aug	1305	-	284	1107	2696
01-Sep	2857	-	559	2012	5281
01-Oct	2485	-	559	2433	5477
01-Nov	2484	2811	455	3010	8760
01-Dec	2339	7515	405	2660	12919
02-Jan	2660	13261	338	5089	21348
02-Feb	2747	13939	430	4499	21616
02-Mar	2185	13989	360	3957	20490
2001-02	21482	51516	3766	25163	101925

Table-1: Business growth of futures and options market: NSE Turnover (Rs.cr)

Table: Business growth of futures and options market: NSE Turnover (Rs.cr)

Commodity Derivatives

Futures contracts in pepper, turmeric, guar (jaggery), hessian (jute fabric), jute sacking, castor seed, potato, coffee, cotton, and soybean and its derivatives are traded in 18 commodity exchanges located in various parts of the country. Futures trading in other edible oils, oilseeds and oil cakes have been permitted. Trading in futures in the new commodities, especially in edible oils, is expected to commence in the near future. The sugar industry is exploring the merits of trading sugar futures contracts.

The policy initiatives and the modernisation programme include extensive training, structuring a reliable clearinghouse, establishment of a system of warehouse receipts, and the thrust towards the establishment of a national commodity exchange. The Government of India has constituted a committee to explore and evaluate issues pertinent to the establishment and funding of the proposed national commodity exchange for the nationwide trading of commodity futures contracts, and the other institutions and institutional processes such as warehousing and clearinghouses.

With commodity futures, delivery is best effected using warehouse receipts (which are like dematerialised securities). Warehousing functions have enabled viable exchanges to augment their strengths in contract design and trading. The viability of the national commodity exchange is predicated on the reliability of the warehousing functions. The programme for establishing a system of warehouse receipts is in progress. The Coffee Futures Exchange India (COFEI) has operated a system of warehouse receipts since 1998.

There are two exchanges for commodity in India:

1) National Commodity & Derivatives Exchange Limited

-(Herein referred to as 'NCDEX' or 'Exchange'),

2) Multi Commodity Exchange (MCX)

Table-3: Turnover in Commodity Derivatives Exchanges:

. *Commodity*	*Turnover in 2005-06 (Rs. Crore)*	*Turnover in 2004-05 (Rs. Crore)*
Total*	21,34,472	13,87,780
NCDEX	10,67,696	7,46,775
Top 10 commodities on NCDEX:		
Guar Seed	306,900	--------
Chana	219,000	--------
Urad	178,800	--------
Silver	85,600	33,200
Gold	47,600	660
Tur	36,600	--------
Guar gum	35,900	--------
Refined Soya Oil	25,900	--------
Sugar	25,600	--------
% of volumes:		
Pulse	40%	--------
Guar	30%	--------
Bullion	12%	--------

Foreign Exchange Derivatives

The Indian foreign exchange derivatives market owes its origin to the important step that the RBI took in 1978 to allow banks to undertake intra-day trading in foreign exchange; as a consequence, the stipulation of maintaining square or near square position was to be complied with only at the close of each business day. This was followed by use of products like cross-currency options, interest rate and currency swaps, caps/collars and forward rate agreements in the international foreign exchange market; development of a rupee-foreign currency swap market; and introduction of additional hedging instruments such as foreign currency-rupee options. Cross-currency derivatives with the rupee as one leg were introduced with some restrictions in the April 1997 Credit Policy by the RBI. In the April 1999 Credit Policy, Rupee OTC interest rate derivatives were permitted using pure rupee benchmarks, while in April 2000, Rupee interest rate derivatives were permitted using implied rupee benchmarks. In 2001, a few select banks introduced Indian National Rupee (INR) Interest Rate Derivatives (IRDs) using Government of India security yields as floating benchmarks. Interest rate futures (long bond and t-bill) were introduced in June 2003 and Rupee-foreign exchange options were allowed in July 2003.

Fixed income derivatives

Scheduled Commercial Banks, Primary Dealers (PDs) and FIs have been allowed by RBI since July 1993 to write Interest Rate Swaps (IRS) and Forward Rate Agreements (FRAs) as products for their own asset liability management (ALM) or for market making (risk trading) purposes. Since October 2000, IRS can be written on benchmarks in domestic money or debt market (e.g. NSE

MIBOR, Reuter Mibor, GoI Treasury Bills) or on implied foreign currency interest rates [e.g. Mumbai Interbank Forward Offer Rate (MIFOR), Mumbai Interbank Tom Offer Rate (MITOR)]. IRS based on MIFOR/MITOR could well be written on a stand-alone basis, and need not be a part of a Cross Currency Interest Rate Swap (CC-IRS). This enables corporates to benchmark the servicing cost on their rupee liabilities to the foreign currency forward yield curve.

There is now an active Over-The-Counter (OTC) IRS and FRA market in India. Yet, the bulk of the activity is concentrated around foreign banks and some private sector banks (new generation) that run active derivatives trading books in their treasuries. The presence of Public Sector Bank (PSB) majors (such as SBI, BoB, BoI, PNB, amongst others) in the rupee IRS market is marginal, at best. Most PSBs are either unable or unwilling to run a derivatives trading book enfolding IRS or FRAs. Further, most PSBs are not yet actively offering IRSs or FRAs to their corporate customers on a "covered" basis with back-to-back deals in the inter-institutional market.

The consequence is a paradox. On the one side you have foreign banks and new generation private sector banks that run a derivatives trading book but do not have the ability to set significant counter party (credit) limits on a large segment of corporate customers of PSBs. And, on the other side are PSBs who have the ability and willingness to set significant counter party (credit) limits on corporate customers, but are unable or unwilling to write IRS or FRAs with them. Thereby, the end user corporates are denied access through this route to appropriate hedging and yield enhancing products, to better manage the asset-liability portfolio. This inability or unwilling of PSB majors seemingly stems from the following key impediments they are yet to overcome:

1. Inadequate technological and business process readiness of their treasuries to run a derivatives trading book, and manage related risks.
2. Inadequate readiness of human resources/talent in their treasuries to run a derivatives trading book, and manage related risks.
3. Inadequate willingness of bank managements to the "risk" being held accountable for bona-fide trading losses in the derivatives book, and be exposed to subsequent onerous investigative reviews, in a milieu where there is no penal consequence for lost opportunity profit.
4. Inadequate readiness of their Board of Directors to permit the bank to run a derivatives trading book, partly for reasons cited above, and partly due to their own "discomfort of the unfamiliar."

Interest rate options and futures:

The RBI is yet to permit banks to write rupee (INR) interest rate options. Indeed, for banks to be able to write interest rate options, a rupee interest rate futures market would need to first exist, so that the option writer can *delta* hedge the risk in the interest rate options positions. And, according to one school of thought, perhaps the policy dilemma before RBI is: how to permit an interest rate futures market when the current framework does not permit short selling of sovereign securities. Further, even if short selling of sovereign securities were to be permitted, it may be of little consequence unless lending and borrowing of sovereign securities is first permitted.

II. REGULATORY FRAMEWORK FOR DERIVATIVES

THE GUIDING PRINCIPLES

Regulatory objectives

1. The Committee believes that regulation should be designed to achieve specific, well-defined goals. It is inclined towards positive regulation designed to encourage healthy activity and behaviour. It has been guided by the following objectives :

a. **Investor Protection:** Attention needs to be given to the following four aspects:

   i. **Fairness and Transparency:** The trading rules should ensure that trading is conducted in a fair and transparent manner. Experience in other countries shows that in many cases, derivative brokers/dealers failed to disclose potential risk to the clients. In this context, sales practices adopted by dealers for derivatives would require specific regulation. In some of the most widely reported mishaps in the derivatives market elsewhere, the underlying reason was inadequate internal control system at the user-firm itself so that overall exposure was not controlled and the use of derivatives was for speculation rather than for risk hedging. These experiences provide useful lessons for us for designing regulations.

   ii. **Safeguard for clients' moneys:** Moneys and securities deposited by clients with the trading members should not only be kept in a separate clients' account but should also not be attachable for meeting the broker's own debts. It should be ensured that trading by dealers on own account is totally segregated from that for clients.

iii. **Competent and honest service:** The eligibility criteria for trading members should be designed to encourage competent and qualified personnel so that investors/clients are served well. This makes it necessary to prescribe qualification for derivatives brokers/dealers and the sales persons appointed by them in terms of a knowledge base.

iv. **Market integrity:** The trading system should ensure that the market's integrity is safeguarded by minimising the possibility of defaults. This requires framing appropriate rules about capital adequacy, margins, clearing corporation, etc.

a. **Quality of markets:** The concept of "Quality of Markets" goes well beyond market integrity and aims at enhancing important market qualities, such as cost-efficiency, price-continuity, and price-discovery. This is a much broader objective than market integrity.

b. **Innovation:** While curbing any undesirable tendencies, the regulatory framework should not stifle innovation which is the source of all economic progress, more so because financial derivatives represent a new rapidly developing area, aided by advancements in information technology.

1. Of course, the ultimate objective of regulation of financial markets has to be to promote more efficient functioning of markets on the "real" side of the economy, i.e. economic efficiency.

2. Leaving aside those who use derivatives for hedging of risk to which they are exposed, the other participants in derivatives trading are attracted by the speculative opportunities which such trading offers due to inherently high

leverage. For this reason, the risk involved for derivative traders and speculators is high. This is indicated by some of the widely publicised mishaps in other countries. Hence, the regulatory frame for derivative trading, in all its aspects, has to be much stricter than what exists for cash trading. The **scope of regulation** should cover derivative exchanges, derivative traders, brokers and sales-persons, derivative contracts or products, derivative trading rules and derivative clearing mechanism.

3. In the Committee's view, the regulatory responsibility for derivatives trading will have to be shared between the exchange conducting derivatives trading on the one hand and SEBI on the other. The committee envisages that this sharing of regulatory responsibility is so designed as to maximize regulatory effectiveness and to minimize regulatory costs.

Major issues concerning regulatory framework

4. The Committee's attention had been drawn to several important issues in connection with derivatives trading. The Committee has considered such issues, some of which have a direct bearing on the design of the regulatory framework. *They are listed below :*

a. Should a derivatives exchange be organised as independent and separate from an existing stock exchange?
b. What exactly should be the division of regulatory responsibility, including both framing and enforcing the regulations, between SEBI and the derivatives exchange?
c. How should we ensure that the derivatives exchange will effectively fulfill its regulatory responsibility?
d. What criteria should SEBI adopt for granting permission for derivatives trading to an exchange?

e. What conditions should the clearing mechanism for derivatives trading satisfy in view of high leverage involved?

f. What new regulations or changes in existing regulations will have to be introduced by SEBI for derivatives trading?

Should derivatives trading be conducted in a separate exchange?

1. A major issue raised before the Committee for its decision was whether regulations should mandate the creation of a separate exchange for derivatives trading, or allow an existing stock exchange to conduct such trading. The Committee has examined various aspects of the problem. It has also reviewed the position prevailing in other countries. Exchange-traded financial derivatives originated in USA and were subsequently introduced in many other countries. Organisational and regulatory arrangements are not the same in all countries. Interestingly, in U.S.A., for reasons of history and regulatory structure, a future trading in financial instruments, including currency, bonds and equities, was started in early 1970s, under the auspices of commodity futures markets rather than under securities exchanges where the underlying bonds and equities were being traded. This may have happened partly because currency futures, which had nothing to do with securities markets, were the first to emerge among financial derivatives in U.S.A. and partly because derivatives were not "securities" under U.S. laws. Cash trading in securities and options on securities were under the Securities and Exchange Commission (SEC) while futures trading were under the Commodities Futures Trading Commission (CFTC). In other countries, the arrangements have varied.

2. The Committee examined the relative merits of allowing derivatives trading to be conducted by an existing stock exchange vis-a-vis a separate exchange for derivatives. The arguments for each are summarised below.

Arguments for allowing existing stock exchanges to start futures trading:

a. The weightiest argument in this regard is the advantage of synergies arising from the pooling of costs of expensive information technology networks and the sharing of expertise required for running a modern exchange. Setting-up a separate derivatives exchange will involve high costs and require more time.

b. The recent trend in other countries seems to be towards bringing futures and cash trading under coordinated supervision. The lack of coordination was recognised as an important problem in U.S.A. in the aftermath of the October 1987 market crash. Exchange-level supervisory coordination between futures and cash markets is greatly facilitated if both are parts of the same exchange.

Arguments for setting-up separate futures exchange:

a. The trading rules and entry requirements for futures trading would have to be different from those for cash trading.

b. The possibility of collusion among traders for market manipulation seems to be greater if cash and futures trading are conducted in the same exchange.

c. A separate exchange will start with a clean slate and would not have to restrict the entry to the existing members only but the entry will be thrown open to all potential eligible players.

Recommendation

From the purely regulatory angle, a separate exchange for futures trading seems to be a neater arrangement. However, considering the constraints in infrastructure facilities, the existing stock exchanges having cash trading may also be permitted to trade derivatives provided they meet the minimum eligibility conditions as indicated below:

1. The trading should take place through an online screen-based trading system, which also has a disaster recovery site. The per-half-hour capacity of the computers and the network should be at least 4 to 5 times of the **anticipated** peak load in any half hour, or of the actual peak load seen in any half-hour during the **preceding** six months. This shall be reviewed from time to time on the basis of experience.
2. The clearing of the derivatives market should be done by an independent clearing corporation, which satisfies the conditions listed in a later chapter of this report.
3. The exchange must have an online surveillance capability which monitors positions, prices and volumes in realtime so as to deter market manipulation. Price and position limits should be used for improving market quality.
4. Information about trades, quantities, and quotes should be disseminated by the exchange in realtime over at least two information vending networks which are accessible to investors in the country.
5. The Exchange should have at least 50 members to start derivatives trading.
6. If derivatives trading are to take place at an existing cash market, it should be done in a separate segment with a separate membership; i.e., all members of the existing cash market would not automatically become members of the derivatives market.

7. The derivatives market should have a separate governing council which shall not have representation of trading/clearing members of the derivatives Exchange beyond whatever percentage SEBI may prescribe after reviewing the working of the present governance system of exchanges.
8. The Chairman of the Governing Council of the Derivative Division/Exchange shall be a member of the Governing Council. If the Chairman is a Broker/Dealer, then, he shall not carry on any Broking or Dealing Business on any Exchange during his tenure as Chairman.
9. The exchange should have arbitration and investor grievances redressal mechanism operative from all the four areas/regions of the country.
10. The exchange should have an adequate inspection capability.
11. No trading/clearing member should be allowed simultaneously to be on the governing council of both the derivatives market and the cash market.
12. If already existing, the Exchange should have a satisfactory record of monitoring its members, handling investor complaints and preventing irregularities in trading.

II.A. Derivatives Market Trading Turnover

The number of instruments available in derivatives has been expanded. To begin with, SEBI only approved trading in index futures contracts based on S&P CNX Nifty Index and BSE-30 (Sensex) Index. This was followed by approval for trading in options based on these two indices and options on individual securities and also futures on interest rates derivative instruments (*91-day Notional T-Bills and 10-year Notional 6% coupon bearing as well as zero coupon bonds).* Now, there are futures and options based on benchmark index S&P CNX Nifty and CNX IT Index as well as options and futures on single stocks (51 stocks).

The total exchange traded derivatives witnessed a value of Rs. 21,422,690 million during 2003-04 as against Rs. 4,423,333 million during the preceding year. While NSE accounted for about 99.5% of total turnover, BSE accounted for less than 1% in 2003-04. NSE has created a niche for itself in terms of derivatives trading in the global market.

A. Derivatives

Single stock futures continue to dominate derivatives market with a percentage share of about 55- 65 per cent during 2003-04. One important development is that index futures started picking up during the year. Percentage of number of contracts traded to the total number of derivatives contracts traded in the market has increased steadily from about 14 per cent to 34 per cent (a growth of 150 per cent). Both index options and stock options recorded decline in terms of number of contracts as well as percentage share. Single stock futures share slid in 2003-04 compared to the previous year. Futures contract appear to be predominant when compared to option contracts. Single stock futures recorded continuous growth month after month except for three months i.e. November 2003, February and March 2004. The growth rate also has been very high. Though the BSE has a very small share of the total volume of derivatives segment, one important feature is that index futures not only dominate but also account for almost over 60 per cent of the volume traded. Yet, another specialty is that BSE recorded zero volume turnovers in the index option segment. In many months even stock options remained dormant.

This is in sharp contrast with NSE trading in derivatives where single stock futures are the most dominant segment.

(Rs. Crore)

2002-03	Index Futures		Index Options		Stock Options		Single Stock Futures		Total	
	Turnover	*Percentage Change*	Turnover	*Percentage Change*	Turnover	*Percentage Change*	Turnover	*Percentage Change*	Turnover	*Percentage Change*
Apr	1,656		382		4,571		15,065		21,674	
May	2,022	*22.10*	463	*21.20*	5,133	*12.29*	15,981	*6.08*	23,600	*8.89*
Jun	2,123	*5.00*	389	*-15.98*	4,642	*-9.57*	16,178	*1.23*	23,332	*-1.14*
Jul	2,513	*18.37*	511	*31.36*	6,178	*33.09*	21,205	*31.07*	30,407	*30.32*
Aug	2,978	*18.50*	518	*1.37*	5,562	*-9.97*	17,881	*-15.68*	26,938	*-11.41*
Sep	2,836	*-4.77*	583	*12.55*	6,221	*11.85*	17,501	*-2.13*	27,140	*0.75*
Oct	3,145	*10.90*	727	*24.70*	8,357	*34.34*	21,213	*21.21*	33,441	*23.22*
Nov	3,500	*11.29*	846	*16.37*	10,029	*20.01*	25,463	*20.03*	39,837	*19.13*
Dec	5,958	*70.23*	1,087	*28.49*	13,043	*30.05*	35,532	*39.54*	55,620	*39.62*
Jan	5,557	*-6.73*	940	*-13.52*	14,353	*10.04*	38,299	*7.79*	59,149	*6.34*
Feb	5,040	*-9.30*	946	*0.64*	10,964	*-23.61*	32,445	*-15.28*	49,395	*-16.49*
Mar	6,624	*31.43*	1,856	*96.19*	11,082	*1.08*	29,770	*-8.24*	49,332	*-0.13*
2003-04										
Apr	6,994	*5.59*	1,707	*-8.03*	11,569	*4.39*	29,749	*-0.07*	50,019	*1.39*
May	6,283	*-10.17*	1,617	*-5.27*	12,772	*10.40*	32,752	*10.09*	53,424	*6.81*
Jun	9,348	*48.78*	1,942	*20.10*	15,042	*17.77*	46,505	*41.99*	72,837	*36.34*
Jul	14,743	*57.71*	3,203	*64.93*	21,370	*42.07*	70,515	*51.63*	1,09,831	*50.79*
Aug	24,989	*69.50*	3,838	*19.83*	20,247	*-5.26*	91,288	*29.46*	1,40,362	*27.80*
Sep	45,861	*83.52*	5,013	*30.61*	20,404	*0.78*	1,13,874	*24.74*	1,85,152	*31.91*
Oct	56,435	*23.06*	4,574	*-8.76*	22,978	*12.62*	1,46,377	*28.54*	2,30,365	*24.42*
Nov	49,486	*-12.31*	3,848	*-15.87*	16,375	*-28.74*	1,22,463	*-16.34*	1,92,171	*-16.58*
Dec	65,378	*32.11*	5,455	*41.76*	17,141	*4.68*	1,50,933	*23.25*	2,38,907	*24.32*
Jan	99,878	*52.77*	6,913	*26.73*	2,1484	*25.34*	1,95,788	*29.72*	3,24,063	*35.64*
Feb	86,359	*-13.54*	6,545	*-5.32*	18,472	*-14.02*	1,61,464	*-17.53*	2,72,840	*-15.81*
Mar	88,710	*2.72*	8,168	*24.80*	19,360	*4.81*	1,44,243	*-10.67*	2,60,481	*-4.53*

Source : NSE

Table-4: Derivatives Trading Turnover – NSE

Table-5: Derivatives Trading Turnover – BSE

(Rs. Crore)

2002-03	Index Futures		Index Options		Stock Options		Single Stock Futures		Total	
	Turnover	*Percentage Change*	Turnover	*Percentage Change*	Turnover	*Percentage Change*	Turnover	*Percentage Change*	Turnover	*Percentage Change*
Apr	1		1	*Na*	1	*Na*	21		24	
May	10	*900.00*	0	*Na*	0	*Na*	105	*400.00*	115	*379.17*
Jun	12	*20.00*	—	*Na*	0	*Na*	90	*-14.29*	103	*-10.43*
Jul	1	*-91.67*	—	*Na*	0	*Na*	77	*-14.44*	79	*-23.30*
Aug	0	*-100.00*	—	*Na*	0	*Na*	44	*-42.86*	44	*-44.30*
Sep	0	*Na*	—	*Na*	2	*Na*	18	*-59.09*	20	*-54.55*
Oct	—	*Na*	—	*Na*	0	*-100.00*	14	*-22.22*	14	*-30.00*
Nov	—	*Na*	—	*Na*	0	*Na*	13	*-7.14*	13	*-7.14*
Dec	—	*Na*	—	*Na*	0	*Na*	16	*23.08*	16	*23.08*
Jan	547	*Na*	—	*Na*	0	*Na*	100	*525.00*	647	*3943.75*
Feb	589	*7.68*	0	*Na*	6	*Na*	90	*-10.00*	685	*5.87*
Mar	651	*10.53*	1	*Na*	10	*66.67*	56	*-37.78*	718	*4.82*
2003-04										
Apr	65	*-90.02*	—	*Na*	2	*-80.00*	21	*-62.50*	87	*-87.88*
May	8	*-87.69*	0	*Na*	4	*100.00*	10	*-52.38*	23	*-73.56*
Jun	1	*-87.50*	—	*Na*	3	*-25.00*	6	*-40.00*	9	*-60.87*
Jul	51	*5000.00*	—	*Na*	3	*0.00*	49	*716.67*	103	*1044.44*
Aug	303	*494.12*	—	*Na*	0	*-100.00*	206	*320.41*	509	*394.17*
Sep	408	*34.65*	—	*Na*	2	*Na*	441	*114.08*	851	*67.19*
Oct	420	*2.94*	—	*Na*	3	*50.00*	435	*-1.36*	857	*0.71*
Nov	450	*7.14*	—	*Na*	1	*-66.67*	478	*9.89*	929	*8.40*
Dec	1,785	*296.67*	—	*Na*	55	*5400.00*	1,844	*285.77*	3684	*296.56*
Jan	2,213	*23.98*	—	*Na*	75	*36.36*	1,498	*-18.76*	3787	*2.80*
Feb	555	*-74.92*	—	*Na*	96	*28.00*	79	*-94.73*	730	*-80.72*
Mar	314	*-43.42*	—	*Na*	87	*-9.38*	103	*30.38*	505	*-30.82*

Source : BSE

B. Volatility of Stock Markets

Trend of movements in stock prices/indices represent historical movements. An analysis of such trend indicates the economic fundamentals of the scrip/index. Augments are made based upon conclusions drawn from a set of variables derived from the trend in the scrip/index. Such technical indicators afford a quick view on the next likely move by markets. Charts provide detailed

information on the daily volatility behaviour of various stock indices from different countries in different regions, representing mature as well as emerging markets. Additionally, annualized volatility has also been provided for each country. From the table and the charts, it is evident that volatility, by and large, is lower in mature markets compared to that in emerging markets. Amongst the developed markets, Germany has highest volatility and he United States has the lowest volatility. Amongst the emerging markets, Brazil has the highest volatility while Malaysia has the lowest volatility. India has an annualized volatility of 22.7 per cent (NSE) and 21.4 per cent (BSE).

Table-6: Investment of FIIs:

Year	Gross Purchases (Rs. Crore)	Gross Sales Rs. Crore)	Net Investment (Rs. Crore)	Net Investment in US$ Million)	Cumulative Net Investment US $ mn at monthly Exchange Rate
1992-93	17	4	13	4	4
1993-94	5,593	466	5,126	1,634	1,638
1994-95	7,631	2,835	4,796	1,528	3,167
1995-96	9,694	2,752	6,942	2,036	5,202
1996-97	15,554	6,979	8,574	2,432	7,634
1997-98	18,695	12,737	5,957	1,650	9,284
1998-99	16,115	17,699	-1,584	-386	8,898
1999-00	56,856	46,734	10,122	2,339	11,237
2000-01	74,051	64,116	9,934	2,159	13,396
2001-02	49,920	41,165	8,755	1,846	15,242
2002-03	47,061	44,373	2,689	562	15,805
2003-04	1,44,858	99,094	45,767	9,950	25,755
Total	**4,46,045**	**3,38,954**	**1,07,089**	**25,755**	**25,755**

III. Derivatives Markets Working and Trading in India

- ***What are Derivatives?***

  The term "**Derivative**" indicates that it has no independent value, i.e. its value is entirely "derived" from the value of the underlying asset. The underlying asset can be securities, commodities, bullion, currency, live stock or anything else. In other words, Derivative means a forward, future, option or any other hybrid contract of pre determined fixed

duration, linked for the purpose of contract fulfillment to the value of a specified real or financial asset or to an index of securities.

With Securities Laws (Second Amendment) Act,1999, Derivatives has been included in the definition of Securities. The term Derivative has been defined in Securities Contracts (Regulations) Act, as:-

A Derivative includes: -

a. *a security derived from a debt instrument, share, loan, whether secured or unsecured, risk instrument or contract for differences or any other form of security;*
b. *a contract which derives its value from the prices, or index of prices, of underlying securities;*

- ***What is a Futures Contract?***

  Futures Contract means a legally binding agreement to buy or sell the underlying security on a future date. Future contracts are the organized/standardized contracts in terms of quantity, quality (in case of commodities), delivery time and place for settlement on any date in future.

Presently, the following future products are available:

- Sensex Future: It is a future contract with Sensex as the underlying.
- Stock Future: It is a future contract on the stock with respective stock as the underlying.

What is an Option contract?

Options Contract is a type of Derivatives Contract which gives the buyer/holder of the contract the right (but not the obligation) to buy/sell the underlying asset at a predetermined price within or at end of a

specified period. Under Securities Contracts (Regulations) Act,1956 options on securities has been defined as "option in securities" means a contract for the purchase or sale of a right to buy or sell, or a right to buy and sell, securities in future, and includes *a teji, a mandi, a teji mandi, a galli*, a put, a call or a put and call in securities;

An Option to buy is called *Call option* and option to sell is called *Put option.* Further, if an option that is exercisable on or before the expiry date is called *American option* and one that is exercisable only on expiry date, is called *European option*. The price at which the option is to be exercised is called *Strike price or Exercise price*.

Therefore, in the case of American options the buyer has the right to exercise the option at anytime on or before the expiry date. This request for exercise is submitted to the Exchange, which randomly assigns the exercise request to the sellers of the options, who are obligated to settle the terms of the contract within a specified time frame.

Presently, the following Option products are available:

- Sensex Option: It is an Option contract with Sensex as the underlying.
- Stock Option : It is an Option contract on the stock with respective stock as the underlying.

In- the- money options (ITM) - An in-the-money option is an option that would lead to positive cash flow to the holder if it were exercised immediately. A Call option is said to be in-the-money when the current price stands at a level higher than the strike price. If the Spot price is much higher than the strike price, a Call is said to be deep in-the-money option. In the case of a Put, the put is in-the-money if the Spot price is below the strike price.

At-the-money-option (ATM) - An at-the money option is an option that would lead to zero cash flow if it were exercised immediately. An option on the index is said to be "at-the-money" when the current price equals the strike price.

Out-of-the-money-option (OTM) - An out-of- the-money Option is an option that would lead to negative cash flow if it were exercised immediately. A Call option is out-of-the-money when the current price stands at a level which is less than the strike price. If the current price is much lower than the strike price the call is said to be deep out-of-the money. In case of a Put, the Put is said to be out-of-money if current price is above the strike price.

The factors that affect the price of an option:

There are five fundamental factors that affect the price of an option. These are:

1. Price of the underlying stock or index
2. Strike price/exercise price of the option
3. Time to expiration of the option
4. Risk-free rate of interest
5. Volatility of the price of underlying stock or index

Adjust the price for dividend expected during the term of the option to arrive at fine prices.

Benefits of trading in Futures and Options.

1) Able to transfer the risk to the person who is willing to accept them
2) Incentive to make profits with minimal amount of risk capital
3) Lower transaction costs
4) Provides liquidity, enables price discovery in underlying market
5) Derivatives market is lead economic indicators.

6) Arbitrage between underlying and derivative market.

7) Eliminate security specific risk.

- ***Index Futures and Index Option Contracts***

Futures contract based on an index i.e. the underlying asset is the index, are known as Index Futures Contracts. For example, futures contract on NIFTY Index and BSE-30 Index. These contracts derive their value from the value of the underlying index.

Similarly, the options contracts, which are based on some index, are known as Index options contract. However, unlike Index Futures, the buyer of Index Option Contracts has only the right but not the obligation to buy / sell the underlying index on expiry. Index Option Contracts are generally European Style options i.e. they can be exercised / assigned only on the expiry date.

An index, in turn derives its value from the prices of securities that constitute the index and is created to represent the sentiments of the market as a whole or of a particular sector of the economy. Indices that represent the whole market are broad based indices and those that represent a particular sector are sectoral indices.

In the beginning futures and options were permitted only on S&P Nifty and BSE Sensex. Subsequently, sectoral indices were also permitted for derivatives trading subject to fulfilling the eligibility criteria. Derivative contracts may be permitted on an index if 80% of the index constituents are individually eligible for derivatives trading. However, no single ineligible stock in the index shall have a weightage of more than 5% in the index. The

index is required to fulfill the eligibility criteria even after derivatives trading on the index have begun. If the index does not fulfill the criteria for 3 consecutive months, then derivative contracts on such index would be discontinued.

By its very nature, index cannot be delivered on maturity of the Index futures or Index option contracts therefore, these contracts are essentially cash settled on Expiry.

Benefits of trading in Index Futures compared to any other security :

An investor can trade the 'entire stock market' by buying index futures instead of buying individual securities with the efficiency of a mutual fund.

The advantages of trading in Index Futures are:

- The contracts are highly liquid
- Index Futures provide higher leverage than any other stocks
- It requires low initial capital requirement
- It has lower risk than buying and holding stocks
- It is just as easy to trade the short side as the long side
- Only have to study one index instead of 100's of stocks
- Settled in cash and therefore all problems related to bad delivery, forged, fake certificates, etc can be avoided.

Structure of Derivative Markets in India

Derivative trading in India takes can place either on a separate and independent Derivative Exchange or on a separate segment of an existing Stock Exchange. Derivative Exchange/Segment function as a Self-Regulatory

Organisation (SRO) and SEBI acts as the oversight regulator. The clearing & settlement of all trades on the Derivative Exchange/Segment would have to be through a Clearing Corporation/House, which is independent in governance and membership from the Derivative Exchange/Segment.

Working of Derivatives markets in India

Dr. L.C Gupta Committee constituted by SEBI had laid down the regulatory framework for derivative trading in India. SEBI has also framed suggestive bye-law for Derivative Exchanges/Segments and their Clearing Corporation/House which lay's down the provisions for trading and settlement of derivative contracts. The Rules, Bye-laws & Regulations of the Derivative Segment of the Exchanges and their Clearing Corporation/House have to be framed in line with the suggestive Bye-laws. SEBI has also laid the eligibility conditions for Derivative Exchange/Segment and its Clearing Corporation/House. The eligibility conditions have been framed to ensure that Derivative Exchange/Segment & Clearing Corporation/House provide a transparent trading environment, safety & integrity and provide facilities for redressal of investor grievances. Some of the important eligibility conditions are-

- Derivative trading to take place through an on-line screen based Trading System.
- The Derivatives Exchange/Segment shall have on-line surveillance capability to monitor positions, prices, and volumes on a real time basis so as to deter market manipulation.
- The Derivatives Exchange/ Segment should have arrangements for dissemination of information about trades, quantities and quotes on a real time basis through atleast two information vending networks, which are easily accessible to investors across the country.

- The Derivatives Exchange/Segment should have arbitration and investor grievances redressal mechanism operative from all the four areas / regions of the country.
- The Derivatives Exchange/Segment should have satisfactory system of monitoring investor complaints and preventing irregularities in trading.
- The Derivative Segment of the Exchange would have a separate Investor Protection Fund.
- The Clearing Corporation/House shall perform full notation, i.e., the Clearing Corporation/House shall interpose itself between both legs of every trade, becoming the legal counterparty to both or alternatively should provide an unconditional guarantee for settlement of all trades.
- The Clearing Corporation/House shall have the capacity to monitor the overall position of Members across both derivatives market and the underlying securities market for those Members who are participating in both.
- The level of initial margin on Index Futures Contracts shall be related to the risk of loss on the position. The concept of value-at-risk shall be used in calculating required level of initial margins. The initial margins should be large enough to cover the one-day loss that can be encountered on the position on 99% of the days.
- The Clearing Corporation/House shall establish facilities for electronic funds transfer (EFT) for swift movement of margin payments.
- In the event of a Member defaulting in meeting its liabilities, the Clearing Corporation/House shall transfer client positions and assets to another solvent Member or close-out all open positions.

- The Clearing Corporation/House should have capabilities to segregate initial margins deposited by Clearing Members for trades on their own account and on account of his client. The Clearing Corporation/House shall hold the clients' margin money in trust for the client purposes only and should not allow its diversion for any other purpose.
- The Clearing Corporation/House shall have a separate Trade Guarantee Fund for the trades executed on Derivative Exchange / Segment.

Presently, SEBI has permitted Derivative Trading on the Derivative Segment of BSE and the F&O Segment of NSE.

Membership categories in the Derivatives Market

The various types of membership in the derivatives market are as follows:

1. **Professional Clearing Member (PCM):**

PCM means a Clearing Member, who is permitted to clear and settle trades on his own account, on account of his clients and/or on account of trading members and their clients.

2. **Custodian Clearing Member (CCM):**

CCM means Custodian registered as Clearing Member, who may clear and settle trades on his own account, on account of his clients and/or on account of trading members and their clients.

3. **Trading Cum Clearing Member (TCM):**

A TCM means a Trading Member who is also a Clearing Member and can clear and settle trades on his own account, on account of his clients and on account of associated Trading Members and their clients.

4. **Self Clearing Member (SCM):**

   A SCM means a Trading Member who is also Clearing Member and can clear and settle trades on his own account and on account of his clients.

5. **Trading Member (TM):**

   A TM is a member of the Exchange who has only trading rights and whose trades are cleared and settled by the Clearing Member with whom he is associated.

6. **Limited Trading Member (LTM):**

   A LTM is a member, who is not the members of the Cash Segment of the Exchange, and would like to be a Trading Member in the Derivatives Segment at BSE. An LTM has only the trading rights and his trades are cleared and settled by the Clearing Member with whom he is associated.

As on January 31, 2002, there are 1 Professional Clearing Member, 3 Custodian Clearing Members, 75 trading cum Clearing Members, 93 Trading Members and 17 Limited Trading Members in the Derivative Segment of the Exchange.

Financial Requirement for Derivatives Membership:

The most basic means of controlling counterparty credit and liquidity risks is to deal only with creditworthy counterparties. The Exchange seeks to ensure that their members are creditworthy by laying down a set of financial requirements for membership. The members are required to meet, both initially and on an ongoing basis, minimum networth requirement. Unlike Cash Segment membership where all the trading members are also the clearing members, in the Derivatives Segment the trading and clearing rights are segregated. In other words, a member may opt to have both clearing and trading rights or he may opt for trading rights only in which case his trades are

cleared and settled by the Clearing Member with whom he is associated. Accordingly, the networth requirement is based on the type of membership and is as under:

Table-7: Networth requirement is based on the type of membership:

Type of Membership	Networth Requirement
Professional Clearing Member, Custodian Clearing Member and Trading cum Clearing Member	300 lakhs
Self Clearing Member	100 lakhs
Trading Member	25 lakhs
Limited Trading Member	25 lakhs
Limited Trading Member (for members of other stock exchange whose Clearing Member is a subsidiary company of a Regional Stock Exchange)	10 lakhs

Requirements to be a member of the derivatives exchange/ clearing corporation

- Balance Sheet Networth Requirements: SEBI has prescribed a networth requirement of Rs. 3 crores for clearing members. The clearing members are required to furnish an auditor's certificate for the networth every 6 months to the exchange. The networth requirement is Rs. 1 crore for a self-clearing member. SEBI has not specified any networth requirement for a trading member.
- Liquid Networth Requirements: Every clearing member (both clearing members and self-clearing members) has to maintain atleast Rs. 50 lakhs as Liquid Networth with the exchange / clearing corporation.

- Certification requirements: The Members are required to pass the certification programme approved by SEBI. Further, every trading member is required to appoint atleast two approved users who have passed the certification programme. Only the approved users are permitted to operate the derivatives trading terminal.

Requirements for a Member with regard to the conduct of his business

The derivatives member is required to adhere to the code of conduct specified under the SEBI Broker Sub-Broker regulations. The following conditions stipulations have been laid by SEBI on the regulation of sales practices:

- Sales Personnel: The derivatives exchange recognizes the persons recommended by the Trading Member and only such persons are authorized to act as sales personnel of the TM. These persons who represent the TM are known as Authorised Persons.
- Know-your-client: The member is required to get the Know-your-client form filled by every one of client.
- Risk disclosure document: The derivatives member must educate his client on the risks of derivatives by providing a copy of the Risk disclosure document to the client.
- Member-client agreement: The Member is also required to enter into the Member-client agreement with all his clients.

Derivative contracts that are permitted by SEBI

Derivative products have been introduced in a phased manner starting with Index Futures Contracts in June 2000. Index Options and Stock Options

were introduced in June 2001 and July 2001 followed by Stock Futures in November 2001. Sectoral indices were permitted for derivatives trading in December 2002. Interest Rate Futures on a notional bond and T-bill priced off ZCYC have been introduced in June 2003 and exchange traded interest rate futures on a notional bond priced off a basket of Government Securities were permitted for trading in January 2004.

Eligibility criteria for stocks on which derivatives trading may be permitted

A stock on which stock option and single stock future contracts are proposed to be introduced is required to fulfill the following broad eligibility criteria:-

- The stock shall be chosen from amongst the top 500 stock in terms of average daily market capitalisation and average daily traded value in the previous six month on a rolling basis.
- The stock's median quarter-sigma order size over the last six months shall be not less than Rs.1 Lakh. A stock's quarter-sigma order size is the mean order size (in value terms) required to cause a change in the stock price equal to one-quarter of a standard deviation.
- The market wide position limit in the stock shall not be less than Rs.50 crores.

A stock can be included for derivatives trading as soon as it becomes eligible. However, if the stock does not fulfill the eligibility criteria for 3 consecutive months after being admitted to derivatives trading, then derivative contracts on such a stock would be discontinued.

Minimum contract size

The Standing Committee on Finance, a Parliamentary Committee, at the time of recommending amendment to Securities Contract (Regulation) Act, 1956 had recommended that the minimum contract size of derivative contracts traded in the Indian Markets should be pegged not below Rs. 2 Lakhs. Based on this recommendation SEBI has specified that the value of a derivative contract should not be less than Rs. 2 Lakh at the time of introducing the contract in the market. In February 2004, the Exchanges were advised to re-align the contracts sizes of existing derivative contracts to Rs. 2 Lakhs. Subsequently, the Exchanges were authorized to align the contracts sizes as and when required in line with the methodology prescribed by SEBI.

Lot size of a contract

Lot size refers to number of underlying securities in one contract. The lot size is determined keeping in mind the minimum contract size requirement at the time of introduction of derivative contracts on a particular underlying.
For example, if shares of XYZ Ltd are quoted at Rs.1000 each and the minimum contract size is Rs.2 lacs, then the lot size for that particular scrips stands to be 200000/1000 = 200 shares i.e. one contract in XYZ Ltd. covers 200 shares.

- ***What is corporate adjustment?***

The basis for any adjustment for corporate action is such that the value of the position of the market participant on cum and ex-date for corporate action continues to remain the same as far as possible. This will facilitate in retaining the relative status of positions viz. in-the-money, at-the-money and out-of-the-money. Any adjustment for corporate actions is carried out on the last day on which a security is traded on a cum basis in the underlying cash market.

Adjustments mean modifications to positions and/or contract specifications as listed below:

a. Strike price
b. Position
c. Market/Lot/ Multiplier

The adjustments are carried out on any or all of the above based on the nature of the corporate action. The adjustments for corporate action are carried out on all open, exercised as well as assigned positions.

The corporate actions are broadly classified under stock benefits and cash benefits. The various stock benefits declared by the issuer of capital are:

- Bonus
- Rights
- Merger/ demerger
- Amalgamation
- Splits
- Consolidations
- Hive-off
- Warrants, and
- Secured Premium Notes (SPNs) among others

The cash benefit declared by the issuer of capital is cash dividend.

Margining system in the derivative markets:

Two type of margins have been specified -

- **Initial Margin** - Based on 99% VaR (Value at Risk) and worst case loss over a specified horizon, which depends on the time in which Mark to Market margin is collected.

- **Mark to Market Margin** (MTM) - collected in cash for all Futures contracts and adjusted against the available Liquid Networth for option positions. In the case of Futures Contracts MTM may be considered as Mark to Market Settlement.

  Dr. L.C Gupta Committee had recommended that the level of initial margin required on a position should be related to the risk of loss on the position. C

  The concept of value-at-risk should be used in calculating required level of initial margins. The initial margins should be large enough to cover the one day loss that can be encountered on the position on 99% of the days. The recommendations of the Dr. L.C Gupta Committee have been a guiding principle for SEBI in prescribing the margin computation & collection methodology to the Exchanges. With the introduction of various derivative products in the Indian securities Markets, the margin computation methodology, especially for initial margin, has been modified to address the specific risk characteristics of the product. The margining methodology specified is consistent with the margining system used in developed financial & commodity derivative markets worldwide. The exchanges were given the freedom to either develop their own margin computation system or adapt the systems available internationally to the requirements of SEBI.

  A portfolio based margining approach which takes an integrated view of the risk involved in the portfolio of each individual client comprising of his positions in all Derivative Contracts i.e. Index Futures, Index Option, Stock Options and Single Stock Futures, has been prescribed. The initial margin requirements are required to be based on the worst case loss of a portfolio of an individual client to cover 99% VaR over a specified time horizon.

The Initial Margin is Higher of

(Worst Scenario Loss +Calendar Spread Charges)

Or

Short Option Minimum Charge

The *worst scenario loss* are required to be computed for a portfolio of a client and is calculated by valuing the portfolio under 16 scenarios of probable changes in the value and the volatility of the Index/ Individual Stocks. The options and futures positions in a client's portfolio are required to be valued by predicting the price and the volatility of the underlying over a specified horizon so that 99% of times the price and volatility so predicted does not exceed the maximum and minimum price or volatility scenario. In this manner initial margin of 99% VaR is achieved. The specified horizon is dependent on the time of collection of mark to market margin by the exchange.

The probable change in the price of the underlying over the specified horizon i.e. 'price scan range', in the case of Index futures and Index option contracts are based on three standard deviation (3σ) where 'σ ' is the volatility estimate of the Index. The volatility estimate 'σ ', is computed as per the Exponentially Weighted Moving Average methodology. This methodology has been prescribed by SEBI. In case of option and futures on individual stocks the price scan range is based on three and a half standard deviation (3.5 σ) where 'σ' is the daily volatility estimate of individual stock.

If the mean value (taking order book snapshots for past six months) of the impact cost, for an order size of Rs. 0.5 million, exceeds 1%, the price scan range would be scaled up by square root three times to cover the close out risk. This means that stocks with impact cost greater than 1% would now have a

price scan range of - Sqrt (3) * 3.5σ or approx. 6.06σ. For stocks with impact cost of 1% or less, the price scan range would remain at 3.5σ.

For Index Futures and Stock futures it is specified that a minimum margin of 5% and 7.5% would be charged. This means if for stock futures the 3.5 σ value falls below 7.5% then a minimum of 7.5% should be charged. This could be achieved by adjusting the price scan range.

The probable change in the volatility of the underlying i.e. 'volatility scan range' is fixed at 4% for Index options and is fixed at 10% for options on Individual stocks. The volatility scan range is applicable only for option products.

Calendar spreads are offsetting positions in two contracts in the same underlying across different expiry. In a portfolio based margining approach all calendar-spread positions automatically get a margin offset. However, risk arising due to difference in cost of carry or the 'basis risk' needs to be addressed. It is therefore specified that a calendar spread charge would be added to the worst scenario loss for arriving at the initial margin. For computing calendar spread charge, the system first identifies spread positions and then the spread charge which is 0.5% per month on the far leg of the spread with a minimum of 1% and maximum of 3%. Further, in the last three days of the expiry of the near leg of spread, both the legs of the calendar spread would be treated as separate individual positions.

In a portfolio of futures and options, the non-linear nature of options make short option positions most risky. Especially, short deep out of the money options, which are highly susceptible to, changes in prices of the underlying. Therefore a short option minimum charge has been specified. The short option minimum charge is 3% and 7.5 % of the notional value of all short

Index option and stock option contracts respectively. The short option minimum charge is the initial margin if the sum of the worst –scenario loss and calendar spread charge is lower than the short option minimum charge.

To calculate volatility estimates the exchange are required to uses the methodology specified in the Prof J.R Varma Committee Report on Risk Containment Measures for Index Futures. Further, to calculate the option value the exchanges can use standard option pricing models - Black-Scholes, Binomial, Merton, Adesi-Whaley.

The initial margin is required to be computed on a real time basis and has two components:-

- The first is creation of risk arrays taking prices at discreet times taking latest prices and volatility estimates at the discreet times, which have been specified.

- The second is the application of the risk arrays on the actual portfolio positions to compute the portfolio values and the initial margin on a real time basis.

The initial margin so computed is deducted from the available Liquid Networth on a real time basis.

CONDITIONS FOR LIQUID NETWORTH

Liquid net worth means the total liquid assets deposited with the clearing house towards initial margin and capital adequacy; LESS initial margin applicable to the total gross open position at any given point of time of all trades cleared through the clearing member.

The following conditions are specified for liquid net worth:

- Liquid net worth of the clearing member should not be less than Rs 50 lacs at any point of time.

- Mark to market value of gross open positions at any point of time of all trades cleared through the clearing member should not exceed the specified exposure limit for each product.

Liquid Assets

At least 50% of the liquid assets should be in the form of cash equivalents viz. cash, fixed deposits, bank guarantees, T bills, units of money market mutual funds, units of gilt funds and dated government securities. Liquid assets will include cash, fixed deposits, bank guarantees, T bills, units of mutual funds, dated government securities or Group I equity securities which are to be pledged in favor of the exchange.

Collateral Management

Collateral Management consists of managing, maintaining and valuing the collateral in the form of cash, cash equivalents and securities deposited with the exchange. The following stipulations have been laid down to the clearing corporation on the valuation and management of collateral:

- At least weekly marking to market is required to be carried out on all securities.
- Debt securities of only investment grade can be accepted.10% haircut with weekly mark to market will be applied on debt securities.

- Total exposure of clearing corporation to the debt or equity of any company not to exceed 75% of the Trade Guarantee Fund or 15% of its total liquid assets whichever is lower.
- Units of money market mutual funds and gilt funds shall be valued on the basis of its Net Asset Value after applying a hair cut of 10% on the NAV and any exit load charged by the mutual fund.
- Units of all other mutual funds shall be valued on the basis of its NAV after applying a hair cut equivalent to the VAR of the units NAV and any exit load charged by the mutual fund.
- Equity securities to be in demat form. Only Group I securities would be accepted. The securities are required to be valued / marked to market on a daily basis after applying a haircut equivalent to the respective VAR of the equity security.

Mark to Market Margin

Options – The value of the option are calculated as the theoretical value of the option times the number of option contracts (positive for long options and negative for short options). This Net Option Value is added to the Liquid Networth of the Clearing member. Thus MTM gains and losses on options are adjusted against the available liquid networth. The net option value is computed using the closing price of the option and are applied the next day.

Futures – The system computes the closing price of each series, which is used for computing mark to market settlement for cumulative net position. If this margin is collected on T+1 in cash, then the exchange charges a higher initial margin by multiplying the price scan range of 3 σ & 3.5 σ with square root of 2, so that the initial margin is adequate to cover 99% VaR over a two days horizon. Otherwise if the Member arranges to pay the Mark to Market margins by the end of T day itself, then the initial margins would not be scaled up. Therefore, the

Member has the option to pay the MTM margins either at the end of T day or on T+1 day.

Table-8: Summary of parameters specified for Initial Margin Computation

Index Options	**Index Futures**	**Stock Options**	**Stock Futures**	**Interest Rate Futures**	**Price Scan Range**
3 sigma	3 sigma	3.5 sigma	For order size of Rs.5 Lakh, if mean value of impact cost > 1%, the Price Scan Range be scaled up by √3(in addition to look ahead days)	3.5 sigma For order size of Rs.5 Lakh, if mean value of impact cost > 1%, the Price Scan Range be scaled up by √3(in addition to look ahead days) For long bond futures, 3.5 sigma and for notional T-Bill futures, 3.5 sigma.	
Volatility Scan Range	4%		10%		
Minim		5%		7.5%	For long

um margin require ment					bond futures, mini mum margin is 2%. For notional T-Bill futures minimum margin is 0.2%.
Short option minim um charge	3%		7.5%		
Calend ar Spread	0.5% per month on the far month contract (min of 1% and max 3%)				
Mark to Marke t	Net Option Value (positive for long positions and negative for short positions) to be adjusted from the liquid networth on a real time basis. The daily closing price of Futures Contract for Mark to Market settlement would be calculated on the basis of the last half an hour weighted average price of the contract.				

MARGIN COLLECTION

Initial Margin - is adjusted from the available Liquid Networth of the Clearing Member on an online real time basis.

Marked to Market Margins-

Futures contracts: The open positions (gross against clients and net of proprietary / self trading) in the futures contracts for each member are marked to market to the daily settlement price of the Futures contracts at the end of each trading day. The daily settlement price at the end of each day is the weighted average price of the last half an hour of the futures contract. The profits / losses arising from the difference between the trading price and the settlement price are collected / given to all the clearing members.

Option Contracts: The marked to market for Option contracts is computed and collected as part of the SPAN Margin in the form of Net Option Value. The SPAN Margin is collected on an online real time basis based on the data feeds given to the system at discrete time intervals.

Client Margins

Clearing Members and Trading Members are required to collect initial margins from all their clients. The collection of margins at client level in the derivative markets is essential as derivatives are leveraged products and non-collection of margins at the client level would provide zero cost leverage. In the derivative markets all money paid by the client towards margins is kept in trust with the Clearing House / Clearing Corporation and in the event of default of the Trading or Clearing Member the amounts paid by the client towards margins are segregated and not utilised towards the dues of the defaulting member.

Therefore, Clearing members are required to report on a daily basis details in respect of such margin amounts due and collected from their Trading members / clients clearing and settling through them. Trading members are also required to report on a daily basis details of the amount due and collected from their clients. The reporting of the collection of the margins by the clients is done electronically through the system at the end of each trading day. The reporting of collection of client level margins plays a crucial role not only in ensuring that members collect margin from clients but it also provides the clearing corporation with a record of the quantum of funds it has to keep in trust for the clients.

Exposure limits in Derivative Products

It has been prescribed that the notional value of gross open positions at any point in time in the case of Index Futures and all Short Index Option Contracts shall not exceed 33 1/3 (thirty three one by three) times the available liquid networth of a member, and in the case of Stock Option and Stock Futures Contracts, the exposure limit shall be higher of 5% or 1.5 sigma of the notional value of gross open position.

In the case of interest rate futures, the following exposure limit is specified:

- The notional value of gross open positions at any point in time in futures contracts on the notional 10 year bond should not exceed 100 times the available liquid networth of a member.
- The notional value of gross open positions at any point in time in futures contracts on the notional T-Bill should not exceed 1000 times the available liquid networth of a member.

Position limits in Derivative Products

The position limits specified are as under-

1) Client / Customer level position limits:

For index based products there is a disclosure requirement for clients whose position exceeds 15% of the open interest of the market in index products. For stock specific products the gross open position across all derivative contracts on a particular underlying of a customer/client should not exceed the higher of –

- 1% of the free float market capitalisation (in terms of number of shares).

Or

- 5% of the open interest in the derivative contracts on a particular underlying stock (in terms of number of contracts).

This position limits are applicable on the combine position in all derivative contracts on an underlying stock at an exchange. The exchanges are required to achieve client level position monitoring in stages.

The client level position limit for interest rate futures contracts is specified at Rs.100 crore or 15% of the open interest, whichever is higher.

2) Trading Member Level Position Limits:

For Index options the Trading Member position limits are Rs. 250 cr or 15% of the total open interest in Index Options whichever is higher and for Index futures the Trading Member position limits are Rs. 250 cr or 15% of the total open interest in Index Futures whichever is higher.

For stocks specific products, the trading member position limit is 20% of the market wide limit subject to a ceiling of Rs. 50 crore. In Interest rate futures the Trading member position limit is Rs. 500 Cr or 15% of open interest whichever is higher.

It is also specified that once a member reaches the position limit in a particular underlying then the member shall be permitted to take only offsetting positions (which result in lowering the open position of the member) in derivative contracts on that underlying. In the event that the position limit is breached due to the reduction in the overall open interest in the market, the member are required to take only offsetting positions (which result in lowering the open position of the member) in derivative contract in that underlying and fresh positions shall not be permitted. The position limit at trading member level is required to be computed on a gross basis across all clients of the Trading member.

3) Market wide limits:

There are no market wide limits for index products. For stock specific products the market wide limit of open positions (in terms of the number of underlying stock) on an option and futures contract on a particular underlying stock would be lower of –

- 30 times the average number of shares traded daily, during the previous calendar month, in the cash segment of the Exchange,

Or

- 20% of the number of shares held by non-promoters i.e. 20% of the free float, in terms of number of shares of a company.

Table-9: Summary of Position Limits

	Index Options	**Index Futures**	**Stock Options**	**Stock Futures**	**Interest Rate Futures**
Client level	Disclosure requirement for any person or persons acting in concert holding 15% or more of the open interest of all derivative contracts on a particular underlying index	Disclosure requirement for any person or persons acting in concert holding 15% or more of the open interest of all derivative contracts on a particular underlying index	1% of free float or 5% of open interest whichever is higher	1% of free float or 5% of open interest whichever is higher	Rs.100 crore or 15% of the open interest, whichever is higher.

Trading Member level	15% of the total Open Interest of the market or Rs. 250 crores, whichever is higher	15% of the total Open Interest of the market or Rs. 250 crores, whichever is higher	20% of Market Wide Limit subject to a ceiling of Rs.50 cr.	20% of Market Wide Limit subject to a ceiling of Rs.50 cr.	Rs. 500 Cr or 15% of open interest whichever is higher.
Market wide			30 times the average number of shares traded daily, during the previous calendar month, in the relevant underlying security in the underlying segment or, - 20% of the number of shares held by non-promoters in the relevant underlying security, whichever is lower	30 times the average number of shares traded daily, during the previous calendar month, in the relevant underlying security in the underlying segment or, - 20% of the number of shares held by non-promoters in the relevant underlying security, whichever is lower	

Requirements for a FII and its sub-account to invest in derivatives

A SEBI registered FIIs and its sub-account are required to pay initial margins, exposure margins and mark to market settlements in the derivatives market as required by any other investor. Further, the FII and its sub-account are also subject to position limits for trading in derivative contracts. The FII and sub-account position limits for the various derivative products are as under:

Table- 10: Requirement for FII

	Index Options	**Index Futures**	**Stock Options**	**Single stock Futures**	**Interest rate futures**
FII Level	Rs. 250 crores or 15% of the OI in Index options, whichever is higher. In addition, hedge positions are permitted.	Rs. 250 crores or 15% of the OI in Index futures, whichever is higher. In addition, hedge positions are permitted.	20% of Market Wide Limit subject to a ceiling of Rs. 50 crores.	20% of Market Wide Limit subject to a ceiling of Rs. 50 crores.	Rs. USD 100 million. In addition to the above, the FII may take exposure in exchange traded in interest rate derivative contracts to the extent of the book

					value of their cash market exposure in Governmen t Securities.
Sub-accoun t level	Disclosure requirement for any person or persons acting in concert holding 15% or more of the open interest of all derivative contracts on a particular underlying index	Disclosure requirement for any person or persons acting in concert holding 15% or more of the open interest of all derivative contracts on a particular underlying index	1% of free float market capitaliz ation or 5% of open interest on a particula r underlyi ng whichev er is higher	1% of free float market capitalizati on or 5% of open interest on a particular underlying whichever is higher	Rs. 100 Cr or 15% of total open interest in the market in exchange traded interest rate derivative contracts, whichever is higher.

Requirements for a NRI to invest in derivatives

NRIs are permitted in invest in exchange traded derivative contracts subject to the margin and other requirements which are in place for other investors. In addition, a NRI is subject to the following position limits:

Table-11: NRI position limits:

	Index Options	**Index Futures**	**Stock Options**	**Single stock Futures**	**Interest rate futures**
NRI level	Disclosure requirement for any person or persons acting in concert holding 15% or more of the open interest of all derivative contracts on a particular underlying index	Disclosure requirement for any person or persons acting in concert holding 15% or more of the open interest of all derivative contracts on a particular underlying index	1% of free float market capitalization or 5% of open interest on a particular underlying whichever is higher	1% of free float market capitalization or 5% of open interest on a particular underlying whichever is higher	Rs. 100 Cr or 15% of total open interest in the market in exchange traded interest rate derivative contracts, whichever is higher.

Measures that have been specified by SEBI to protect the rights of investor in Derivatives Market

The measures specified by SEBI include:

- Investor's money has to be kept separate at all levels and is permitted to be used only against the liability of the Investor and is not available to the trading member or clearing member or even any other investor.
- The Trading Member is required to provide every investor with a risk disclosure document which will disclose the risks associated with the derivatives trading so that investors can take a conscious decision to trade in derivatives.
- Investor would get the contract note duly time stamped for receipt of the order and execution of the order. The order will be executed with the identity of the client and without client ID order will not be accepted by the system. The investor could also demand the trade confirmation slip with his ID in support of the contract note. This will protect him from the risk of price favour, if any, extended by the Member.
- In the derivative markets all money paid by the Investor towards margins on all open positions is kept in trust with the Clearing House/Clearing Corporation and in the event of default of the Trading or Clearing Member the amounts paid by the client towards margins are segregated and not utilised towards the default of the member. However, in the event of a default of a member, losses suffered by the Investor, if any, on settled / closed out position are compensated from the Investor Protection Fund, as per the rules, bye-laws and regulations of the derivative segment of the exchanges.

- The Exchanges are required to set up arbitration and investor grievances redressal mechanism operative from all the four areas / regions of the country.

Table – 12:Types of F&O contracts at NSE :

	Index Futures	Stock Futures	Index Options	Stock Options
Underlying Instrument	S&P CNX NIFTY#	Futures contracts are available on 118 securities which are traded in the Capital Market segment of the Exchange.	S&P CNX NIFTY (European) CE - Call, PE - Put	Options contracts are available on the same 118 securities on which Futures contracts are available. (American) CA - Call , PA - Put.
Trading cycle	maximum of 3-month trading cycle: the near month (one), the next month (two) and the far month (three).			
Expiry day	last Thursday of the expiry month or on the previous trading day if the last Thursday is a trading holiday.			

Strike Price Intervals	NA	NA	a minimum of five strike prices for every option type (i.e. call & put) during the trading month.At any ime, there are two contracts in-the-money (ITM), two contracts out- fthe-money (OTM) and one contract at-the money (ATM).The strike price interval is 10.	

Contract size	lot size of Nifty futures contracts is 200 and multiples thereof	multiples of 100 and fractions if any, shall be rounded off to the next higher multiple of 100. The permitted lot size for the futures contracts on individual ecurities shall be the same for options or as specified by the Exchange	lot size of Nifty options contracts is 200 and multiples thereof	multiples of 100 and fractions if any, shall be rounded off to the next higher multiple of 100. The value of the option contracts on individual securities may not be less than Rs. 2 lakhs at the time of introduction.

Quantity freeze	20,000 units or greater, after which the Exchange may at its discretion approve further orders, on confirmation by the member that the order is genuine.	quantity freeze shall be the lesser of the follow-ing:1% of the marketwide position limit stipulated for open positions on the futures and options on individual securities or Notional value of the contract of around Rs.5 crores	20,000 units or greater	the lesser of the following:1 % of the marketwide position limit stipulated for open positions on options on individual securities or Notional value of the contract of around Rs.5 crores
Price bands	No day minimum/maxi mum price ranges applicable, however, operating ranges are kept at +	operating ranges are kept at + 20%	operating ranges and day minimum/maximum ranges for options contract are kept at 99% of the base price	

	10%,after which price freeze would be removed on confirmation by the member that the order is genuine.			
Price steps	The price step in respect of S&P CNX Nifty futures contracts is Re.0.05.	The price step for futures contracts is Re.0.05.	The price step in respect of S&P CNX Nifty options contracts is Re.0.05.	The price step for options contracts is Re.0.05.
Base Prices	Base price of S&P CNX Nifty futures contracts on the first day of trading would be theoretical futures price. The base	the theoretical futures price on introduction and the daily settlement price of the futures contracts on subse-	Base price of the new options contracts would be the theoretical value of the options contract arrived at based on Black-Scholes model of calculation of options premiums.The base price of the contracts on subsequent trading days, will be the	

	price of the contracts on subsequent trading days would be the daily settlement price of the futures contracts.	quent trading days.	daily close price of the options contracts, which is the last half an hour's weighted average price if the contract is traded in the last half an hour, or the last traded price (LTP) of the contract. If a contract is not traded during a day on the next day the base price is calculated as for a new contract.
Order type	Regular lot order; Stop loss order; Immediate or cancel; Good till day/cancelled*/date; Spread order		

***BSE also has the above derivatives as in NSE**

Settlement basis

1. Index Futures / Futures Mark to Market and final settlement on individual securities be settled in cash on T+1 basis.
2. Index Options Premium settlement on T+1 Basis and Final Exercise settlement on T+1 basis.

3. Options on individual Premium settlement on T+1 basis and securities option Exercise settlement on T+2 basis.

Settlement price

1. S&P CNX Nifty Futures / Daily settlement price will be the closing Futures price on individual securities of the futures contracts for the trading day and the final settlement price shall be the closing value of the underlying index/ security on the last trading day Index Options /options The settlement price shall be closing on individual security price of underlying security What are the contract specifications of the Interest rate Derivatives traded in National Stock Exchange.

Trading cycle

The interest rate future contract shall be for a period of maturity of one year with three months continuous contracts for the first three months and fixed quarterly contracts for the entire year. New contracts will be introduced on the trading day following the expiry of the near month contract.

Table-13: Derivatives Segment at BSE and NSE

			BSE					NSE				
			Jun00-Mar 01	*2001-2002*	*2002-2003*	*2003-2004*	*2004-2005*	*Jun00-Mar 01*	*2001-2002*	*2002-2003*	*2003-2004*	*2004-2005*
Index Futures		No. of contracts	77743	79552	111324	246443	449630	90580	1025588	2126763	17192274	21635449
		Turnover (Rs. cr.)	1673.0	1276.0	1811.0	6572.0	13600.0	2365.0	21428.0	43951.0	554462.0	772174.0
Stock Futures		No. of contracts	–	17951	25842	128193	6725	–	1957856	10675786	32485160	47043066
		Turnover (Rs. cr.)	–	452.0	644.0	1571.0	213.0	–	51516.0	286532.0	1305949.0	1484067.0
Index Options	Call	No. of contracts	–	1139	41	1	48065	–	113974	269721	1043894	1870647
		Notional Turnover (Rs. cr.)	–	39.0	1.0	0.0	1471.0	–	2466.0	5671.0	31801.0	69373.0
	Put	No. of contracts	–	1276	2	0	27210	–	61926	172520	688520	1422911
		Notional Turnover (Rs. cr.)	–	45.0	0.0	0.0	827.0	–	1300.0	3577.0	21022.0	52581.0
Stock Options	Call	No. of contracts	–	3605	783	4391	72	–	768159	2456501	4258595	3946979
		Notional Turnover (Rs. cr.)	–	79.0	21.0	174.0	2.1	–	18780.0	69644.0	168174.0	132066.0
	Put	No. of contracts	–	1500	19	3230	17	–	269370	1066561	1338654	1098133
		Notional Turnover (Rs. cr.)	–	35.0	0.0	157.0	0.5	–	6383.0	30490.0	49038.0	36792.0
Interest Rate Futures		No. of contracts	–	–	–	–	–	–	–	–	1013	–
		Turnover (Rs. cr.)	–	–	–	–	–	–	–	–	20	–
Total		No. of contracts	77743	105527	138037	382258	531719	90580	4196873	16767852	56886776	77017185
		Turnover (Rs. cr.)	1673.0	1922.0	2478.0	12452.0	16112.0	2365.0	101925.0	439865.0	2130649.0	2547063.0

Source: *Handbook of Securities Markets, 2005*, SEBI.

RISKS INVOLVED IN TRADING IN DERIVATIVES CONTRACTS

Effect of "Leverage" or "Gearing"

The amount of margin is small relative to the value of the derivatives contract so the transactions are 'leveraged' or 'geared'.

Derivatives trading, which is conducted with a relatively small amount of margin, provides the possibility of great profit or loss in comparison with the principal investment amount. But transactions in derivatives carry a high degree of risk.

You should therefore completely understand the following statements before actually trading in derivatives trading and also trade with caution while taking into account one's circumstances, financial resources, etc. If the prices

move against you, you may lose a part of or whole margin equivalent to the principal investment amount in a relatively short period of time. Moreover, the loss may exceed the original margin amount.

A. Futures trading involve daily settlement of all positions. Every day the open positions are marked to market based on the closing level of the index. If the index has moved against you, you will be required to deposit the amount of loss (notional) resulting from such movement. This margin will have to be paid within a stipulated time frame, generally before commencement of trading next day.

B. If you fail to deposit the additional margin by the deadline or if an outstanding debt occurs in your account, the broker/member may liquidate a part of or the whole position or substitute securities. In this case, you will be liable for any losses incurred due to such close-outs.

C. Under certain market conditions, an investor may find it difficult or impossible to execute transactions. For example, this situation can occur due to factors such as illiquidity i.e. when there are insufficient bids or offers or suspension of trading due to price limit or circuit breakers etc.

D. In order to maintain market stability, the following steps may be adopted: changes in the margin rate, increases in the cash margin rate or others. These new measures may be applied to the existing open interests. In such conditions, you will be required to put up additional margins or reduce your positions.

E. You must ask your broker to provide the full details of the derivatives contracts you plan to trade i.e. the contract specifications and the associated obligations.

1) Risk-reducing orders or strategies

The placing of certain orders (e.g., "stop-loss" orders, or "stop-limit" orders) which are intended to limit losses to certain amounts may not be effective because market conditions may make it impossible to execute such orders. Strategies using combinations of positions, such as "spread" positions, may be as risky as taking simple "long" or "short" positions.

2) Suspension or restriction of trading and pricing relationships

Market conditions (e.g., illiquidity) and/or the operation of the rules of certain markets (e.g., the suspension of trading in any contract or contact month because of price limits or "circuit breakers") may increase the risk of loss due to inability to liquidate/offset positions.

3) Deposited cash and property

You should familiarise yourself with the protections accorded to the money or other property you deposit particularly in the event of a firm insolvency or bankruptcy. The extent to which you may recover your money or property may be governed by specific legislation or local rules. In some jurisdictions, property which has been specifically identifiable as your own will be pro-rated in the same manner as cash for purposes of distribution in the event of a shortfall. In case of any dispute with the member, the same shall be subject to arbitration as per the byelaws/regulations of the Exchange.

4) Risk of Option holders

1. An option holder runs the risk of losing the entire amount paid for the option in a relatively short period of time. This risk reflects the nature of an

option as a wasting asset which becomes worthless when it expires. An option holder who neither sells his option in the secondary market nor exercises it prior to its expiration will necessarily lose his entire investment in the option. If the price of the underlying does not change in the anticipated direction before the option expires to the extent sufficient to cover the cost of the option, the investor may lose all or a significant part of his investment in the option.

2. The Exchange may impose exercise restrictions and have authority to restrict the exercise of options at certain times in specified circumstances.

5) Risks of Option Writers

1. If the price movement of the underlying is not in the anticipated direction the option writer runs the risks of losing substantial amount.
2. The risk of being an option writer may be reduced by the purchase of other options on the same underlying interest-and thereby assuming a spread position-or by acquiring other types of hedging positions in the options markets or other markets. However, even where the writer has assumed a spread or other hedging position, the risks may still be significant. A spread position is not necessarily less risky than a simple 'long' or 'short' position.
3. Transactions that involve buying and writing multiple options in combination, or buying or writing options in combination with buying or selling short the underlying interests, present additional risks to investors. Combination transactions, such as option spreads, are more complex than buying or writing a single option. And it should be further noted that, as in any area of investing, a complexity not well understood is, in itself, a risk factor. While this is not to suggest that combination strategies should not be

considered, it is advisable, as is the case with all investments in options, to consult with someone who is experienced and knowledgeable with respect to the risks and potential rewards of combination transactions under various market circumstances.

6) Commission and other charges

Before you begin to trade, you should obtain a clear explanation of all commission, fees and other charges for which you will be liable. These charges will affect your net profit (if any) or increase your loss.

7) Trading facilities

The Exchange offers electronic trading facilities which are computer-based systems for order-routing, execution, matching, registration or clearing of trades. As with all facilities and systems, they are vulnerable to temporary disruption or failure. Your ability to recover certain losses may be subject to limits on liability imposed by the system provider, the market, the clearing house and/or member firms. Such limits may vary; you should ask the firm with which you deal for details in this respect.

This document does not disclose all of the risks and other significant aspects involved in trading on a derivatives market. The constituent should therefore study derivatives trading carefully before becoming involved in it.

Trading Mechanism

The derivatives trading system, called NEAT-F&O trading system, provides a fully automated screen based trading for derivatives on a nationwide basis. It supports an anonymous order driven market which operates on a strict

price/time priority. It provides tremendous flexibility to users in terms of kinds of orders that can be placed on the system. Various time/price related conditions like, Goodtill- Day, Good-till-Cancelled, Good-till-Date, Immediate or Cancel, Limit/Market Price, Stop Loss, etc. can be built into an order. It is similar to that of trading of securities in the CM segment.

The NEAT-F&O trading system is accessed by two types of users. The trading user has access to functions such as, order entry, order matching, order and trade management. The clearing user uses the trader workstation for the purpose of monitoring the trading member(s) for whom he clears the trades. Additionally, he can enter and set limits to positions, which a trading member can take.

A FEW BASIC STRATEGIES

A. Assumption: Bullish on the market over the short term Possible Action by you: Buy Nifty calls

Example:

Current Nifty is 1880. You buy one contract of Nifty near month calls for Rs.20 each. The strike price is 1900, i.e. 1.06% out of the money. The premium paid by you will be (Rs.20 * 200) Rs.4000.Given these, your break-even level Nifty is 1920 (1900+20). If at expiration Nifty advances by 5%, i.e. 1974, then Nifty expiration level 1974.00 Less Strike Price 1900.00 Option value 74.00 (1974-1900)

Less Purchase price 20.00

Profit per Nifty 54.00

Profit on the contract Rs.10800 (Rs. 54* 200)

Note :

1) If Nifty is at or below 1900 at expiration, the call holder would not find it profitable to exercise the option and would loose the entire premium, i.e. Rs.4000 in this example. If at expiration, Nifty is between 1900 (the strike price) and 1920 (breakeven), the holder could exercise the calls and receive the amount by which the index level exceeds the strike price. This would offset some of the cost.

2) The holder, depending on the market condition and his perception, may sell the call even before expiry.

B. Assumption: Bearish on the market over the short term Possible Action by you: Buy Nifty puts

Example:

Nifty in the cash market is 1880. You buy one contract of Nifty near month puts for Rs.17 each. The strike price is 1840, i.e. 2.12% out of the money. The premium paid by you will be Rs.3400 (17*200). Given these, your break-even level Nifty is 1823 (i.e. strike price less the premium). If at expiration Nifty declines by 5%, i.e.1786, then

Put Strike Price 1840

Nifty expiration level 1786

Option value 54 (1840-1786)

Less Purchase price 17

Profit per Nifty 37

Profit on the contract Rs.7400 (Rs.37* 200)

Note :

1) If Nifty is at or above the strike price 1840 at expiration, the put holder would not find it profitable to exercise the option and would loose the entire premium, i.e. Rs.3400 in this example. If at expiration, Nifty is between 1840 (the strike price) and 1823 (breakeven), the holder could exercise the puts and receive the amount by which the strike price exceeds the index level. This would offset some of the cost.

2) The holder, depending on the market condition and his perception, may sell the put even before expiry.

Use Put as a portfolio Hedge:

Assumption: You are concerned about a downturn in the short term market and its effect on your portfolio.

The portfolio has performed well and you expect to continue appreciate over the long term but like to protect existing profits or prevent further losses.

Possible Action: Buy Nifty puts.

Example:

You held a portfolio with say, a single stock, HLL valued at Rs.10 Lakhs (@ Rs.200 each share). Beta of HLL is 1.13. Current Nifty is at 1880. Nifty near month puts of strike price 1870 is trading at Rs.15. To hedge, you bought 3 puts 600{Nifties, equivalent to Rs.10 lakhs*1.13 (Beta of HLL) or Rs.1130000}. The premium paid by you is Rs.9000, (i.e.600 15). If at expiration Nifty declines to 1800, and Hindustan Lever falls to Rs.195, then

Put Strike Price 1870

Nifty expiration level 1800

Option value 70 (1870-1800)

Less Purchase price 15

Profit per Nifty 55

Profit on the contract Rs.33000 (Rs.55* 600)

Loss on Hindustan Lever Rs.25000

Net profit Rs. 8000

***A list of some abbreviations used above*:**

AD: Authorised Dealer

ADR: American Depository Receipt

BIS: Bank for International Settlements

BSE: Bombay Stock Exchange Ltd.

CCIL: Clearing Corporation of India Ltd.

CM: Clearing Member

EUR: Euro

F&O: Futures and Options

FII: Foreign Institutional (portfolio) Investor

FMC: Forward Markets Commission (set up under the Ministry of Consumer Affairs, Food and Public Distribution, Government of India)

FRA: Forward Rate Agreement

GBP: Pound

GDR: Global Depository Receipt

INR: Indian National Rupee

IRS: Interest rate swap

JPY: Yen

MF: Mutual Fund

MTM: Mark to Market Margin

NRI: Non-Resident Indian

NSCCL: National Securities Clearing Corporation

(a wholly owned subsidiary of NSE)

NSE: National Stock Exchange of India Ltd.

OIS: Overnight Index Swap

OTC: Over-the-counter

RBI: Reserve Bank of India

SEBI: Securities and Exchange Board of India

TM: Trading Member

USD: US Dollar

VaR: Value at Risk

Questions- Derivatives Market in India::

1. Explain the L.C.Gupta Committee recommendations
2. What are the LC Gupta Committee recommendations for investor protection
3. Discuss the Business growth of futures and options market.
4. Explain about the derivatives trading available in India.
5. What do you mean by Volatility of Stock Markets?
6. Discuss about the investment of FIIs in Derivatives in India.
7. Explain the types of option and its Trading.
8. Explain the types of Futures and its Trading.
9. What are the factors that affect the price of an option?
10. What are the Benefits of trading in Futures and Options?
11. Explain about Index Futures and Index Option Contracts.
12. What are the advantages of trading in Index Futures?
13. Explain about the Membership categories in the Derivatives Market?
14. Explain the Financial Requirement for Derivatives Membership.
15. Explain the Networth requirement for various type of membership.
16. Explain the Eligibility criteria for stocks on which derivatives trading may be permitted.
17. Explain the Margining system in the derivative markets.
18. Explain in detail about the position limits.
19. What are the risks involved in trading in derivatives market?