

# **THE USE OF DERIVATIVES IN GENERAL INSURANCE**

## **WORKING PARTY**

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# 1. Objective of the paper

- 1.1 A General Insurance Company both accepts risks and manages them. It does this in ways generally not available to an insured and attempts to produce a profit for providing this service. The difference between profit and loss is small, and an insurance operation could readily be running extensive unplanned risks which could lead to its downfall.
- 1.2 Actuaries are playing increasingly active roles in the sound and prudent management of non-life companies. They are well placed to understand enough of other disciplines and broader business issues and hence ensure that the proper measures are taken.  
  
This paper is therefore intended to provide actuaries with an overview of the relatively new tools of modern risk management, the derivative instrument, and how it might be used to manage risk in the context of a general insurance company.
- 1.3 Recent events in Singapore and elsewhere have made people more cautious of these instruments. Most of the problems have arisen from inadequate and inefficient management controls. While these issues need careful consideration, we believe they should not obscure the significant opportunities that derivatives offer companies to manage risk more effectively. The actuary clearly needs to be aware of all the available tools, and as more and more information becomes readily available to the user, then efficient management processes will emerge and the use of derivatives become more widespread.

## 2. An Overview of Derivatives

- 2.1 The derivative industry has a history going back thousands of years. To some it just means options, with the associated view of a high risk/high reward profile. To practitioners they give a way of managing a risk by the use of a third party transaction. A derivative is an instrument (usually a financial instrument) whose value is linked to and dependent on the price of a defined object. The object may be corn, the dollar/pound exchange rate, the price of the share index, the price of a specific share, the Treasury Bond Yield, or even the cost of catastrophes. The main feature is that the assets themselves are not what is being traded. Indeed the volume of derivatives can exceed the number of shares issued.
- 2.2 The market has evolved over a period. In the 1970's and prior dealings were mainly done in Commodities. This moved in the 1980's to Futures, and in 1990's the range of instruments has expanded dramatically being generically termed derivatives.

### Definition 1

#### Futures Contract

A futures contract is a legally binding contract which is an **obligation** to deliver or take a fixed quality and quantity of an underlying asset or commodity at a fixed price **on a specified date** in the future.

### Definition 2

#### Options Contract

An option is a legally binding contract which is the **right, and not the obligation** to deliver or take delivery of a fixed quality and quantity of an underlying asset or commodity at a fixed price **on or before a specified date** in the future.

There are variations on options. The above is an American Option. A European Option is exercisable only at the final date. Asian options uses an average price (primarily used in Oil options). There are potential "Russian" options (highest price in any period) , though we don't believe these are yet traded, and so on.

- 2.3 There are other types of derivative instruments, but rather than confuse the issue, they will not be dealt with in this paper, and any interested reader should refer to the bibliography. They are Spot, Forwards, CFD's (Contract for Difference), Swaps, Swaptions (Options on Swaps). A short glossary (reproduced with the permission of PRAG) and bibliography appear at the end of the paper for newcomers to this field.

## 2.4 Valuation of Options

There are a variety of methods that one can use to value options, each one depending on assumptions as to the risk and the potential "pay off" pattern. It is not the purpose of this paper to repeat these works, and the reader should refer to the bibliography.

*The key equation is the Black and Scholes formula used to value options on share prices. This is based on the assumption that the distribution of price changes is random and lognormal .*

There are five key elements to this equation,

The current price

The strike (or option) price

The period to the final option date

The risk free rate of interest

The volatility.

- 2.5 If a share currently valued at 100 rises 10% simple every month, then in 3 months time it will be at 130. Thus an option to buy at 100 in 3 months time is worth the discounted value of 30.
- 2.6 If a small amount of volatility is introduced, then there is the possibility that the share price might be above or below 130, and an additional premium for this risk is required. If a high volatility is recognised then the risk price increases. A substantial movement in the option price therefore normally reflects the markets view of the change in volatility. Given a volatility, a price can be calculated, but more importantly given a price, then the implied volatility can be calculated.
- 2.7 The Market tends to use the Black -Scholes equation as a check on the price. but concentrates pricing on complex binomial decision trees, and using complex algorithms to calculate the expected cost.

## 2.8 The Valuation of Futures

This is fairly simple . Consider two possible transactions .

An investor wants a 151 day T-Bill. He can do this, for example, in two ways.

1. Directly buy a 151 day T-Bill at a cost of P
2. Buy a forward to deliver in 60 days a 91 day T-Bill at a price F.

If R is the rate on 60 day T-Bills then  $F/(1+R) = P$

An investor has the choice between these two routes, and naturally will choose the cheapest. There are an considerable number of possible variations, and by searching for inequalities in the market profit can be made.

## 2.9 Hedging and Artificial Options

Hedging is an important concept. At any one time, there is a factor  $H$ , known as the hedge factor such that

$$A \text{ Stock} - B \times \text{Option} = C \times \text{Risk Free Bond}$$

$H = A / B$  = the number of shares in stock that need to be held for each call option written to form a risk-free bond.

The value of  $H$  is dynamic, and changes with market perception.

Switching the formula about we can create "artificial" or synthetic options

$$B \times \text{Option} = A \times \text{Stock} - C \times \text{Risk Free Bond}.$$

This is the same as borrowing or leveraging the portfolio. In theory the concept can be expanded to simulate complex scenarios.

## 3 The Development and Trading of Contracts

- 3.1 There are two principle trading places, namely the Exchange, and Over the Counter (OTC). The differences (and similarities) are highlighted on the following table

	<b>Comparison</b>	
	<b>Exchange Traded</b>	<b>OTC</b>
1. Products	Futures Options	Options Forwards Swaps CFD Swaptions
2. Place	Investment Exchange	Dealing Rooms
3. Method	Open Outcry Electronic Trading on Screen	Telephone Meetings
4. Features of Market	Liquid. High Turnover Price is transparent	Less Liquid Low Turnover Price negotiated and opaque to outside third party
5 Credit & Risk	Clearing House with Margins Daily marked to margin	Counterparty credit risk Reliance on internal controls
6. Contract	Standardised	Flexible
7. Cost	Low Commission Infrastructure expensive.	High Commission
8. Regulations	High	Low (at present)
9. Access	Open to all (subject to basic Criteria).	Acceptance of counterparty.

- 3.2 Note the similarity between the volume risks in insurance being similar to the "Exchange" route, whereas reinsurance is traded OTC. There is a marked similarity between a reinsurance contract and an options contract both in graph profit profile, and method of trading. Markets tend to develop in the OTC format, and many products are devised but few reach the standard of a Mature Market. The process is evolutionary with a high product failure rate. Innovative products tend to be too clever and often fail to create the necessary volume of market to survive.
- 3.3 Derivatives enable asset management decisions to be made cheaply and quickly. The correlation between the returns from a traditional asset and a derivative of it may vary from 0% to 100% depending on how the underlying asset moves. Derivatives can cut the cost of dealing as compared with the underlying stocks as the actual money changing hands on which commission is charged is lower. Also administrative costs can be lower where one derivative instrument is traded rather than many underlying stocks. Similarly it can be quicker to deal in one stock than many.
- 3.4 The main question is the necessary ingredients for a successful derivative product.
- These may be summarised as follows:-
- i). The value of the underlying asset needs to be capable of being readily available and the integrity of that value needs to be beyond doubt. Thus the price of a particular equity needs to be readily seen and not capable of being manipulated by one or two traders. Where this may not be possible, say in the Oil industry, since the influence of some of the buyers is large, then some control (or averaging) is needed (hence Asian options).



- ii) The system for delivery of the underlying asset needs to be sound and beyond repute.
- iii) There needs to be an open awareness of the product, and how and where it is traded.
- iv) There needs to be awareness of the volatility. Black Scholes pricing formula for Options depends on volatility as a fundamental ingredient.
- v) Variety of needs. There needs to be a number of players, and also buyers and sellers.
- vi) Competition in the underlying market to determine price. A product that doesn't sell has no value.
- vii) Acceptance of procedures.
- viii) It needs to be attractive to the players.

3.5 It is obvious that option activity can be driven by concern over assets, but for actuaries in particular option activity may well be driven by concerns over liabilities. If the actuary fears the effect of some particular combination of exchange rates, interest rates and market levels would disproportionately affect the valuation of liabilities, then an option on such a combination of events could be a cheap way of improving solvency. Such an option is obviously an "asset" and has all the features of an insurance policy. That "need" is purchased OTC from someone willing to satisfy it. That individual/organisation is not, however, regulated like an insurance company and if they default there may be problems collecting on the deal.

3.6 Specific examples of how an insurance company could benefit from the use of derivatives are discussed in the next section.

## **4. Why an Insurer Might Want to Use a Derivative?**

- 4.1 There are a number of reasons why an Insurance Company might wish to use a derivative instrument. In all cases it tends to be used to either managed the risk by transfer to a third party. The insurer therefore needs to identify the risks it is carrying. It can then either diversify them by reinsurance or by derivatives, or retain them because of the smallness of the risk, or the lack of any market to effect the transfer. There is also the need to review the business from time to time as many insurers are often unaware of the risks they may actually be running

The main reasons ones are

- i) Asset and Liability Management
- ii) Product design
- iii) Taxation Planning.

- 4.2 These three reasons are not restricted to the General Insurance Industry; the equally apply to Life Business, and indeed any commercial body. KPMG Peat Marwick have undertaken a survey of the use of Derivatives in the Life Insurance Industry. This was a survey of 60 Life Companies, of which 47 responded. Of the respondents 26 were traditional companies, 14 unit-linked and 7 "others". No details of volumes of transactions are given. The findings are summarised below.

i) **Percentage of Companies Using Derivatives**

Options	47 %
Futures	45 %
Swaps	13 %
Stocklending	30 %
Structured Transactions	20 %

ii) **Use of Exchange versus OTC**

Exclusive Exchange	38 %
Less than 10% OTC	30 %
10% - 50% OTC	20 %
More than 50% OTC	12 %

iii) **Percentage Writing Options**

Actually writing	33 %
Considered but not written	29 %
Not considered	38 %

iv) <i>Types Used</i>	<i>Now</i>	<i>Future</i>
Equity Options	40 %	60 %
Equity Futures	38 %	58 %
Equity Swaps	2 %	4 %
Interest rate options	13 %	28 %
Interest rate futures	25 %	43 %
Interest rate swaps	8 %	14 %
Foreign Currency options	11 %	18 %
Forward Rate agreements	10 %	18 %
Currency Swaps	4 %	10 %
Stocklending	30 %	40 %
Structured transactions	20 %	25 %

v)	Uses	Now	Future
	Hedging	52 %	70 %
	Asset allocation	38 %	54 %
	Achieving investment ideas	40 %	60 %
	Matching to specific product	25 %	55 %
	Tax	13 %	23 %
	Solvency	8 %	22 %

4.3 All of this is a useful indication of the growth and potential uses for Derivative Instruments. Against this background it is worth while to put down a number of key risks and sensitivities that a General Insurance Company is running, and see if there are any instruments which may be used to transfer the risk. Some of these will be speculative instruments; all will be feasible.

4.4 An property insurers worst nightmare is a catastrophe. This can be solved in part by reinsurance. In general, a catastrophe could absorb 10 % to 20 % of the capital of the insurance industry. If on the following day the stock market dropped and interest rates rose, then the asset value would decline. The combination of events could absorb 25 % off the solvency margin (depending on equity/fixed interest rate leverage). Could this happen? It has! The storm of October 1987 preceded Black Monday. The Kobe earthquake certainly increased the volatility of the Japanese Markets, as Barings discovered to their cost. There appears to be a need for such insurers to have a proactive defence against such a "double-whammy". At least one reinsurer is actively promoting a product to meet this need.

- 4.5 An reinsurance company runs a clear currency risk. He may wish to weigh the attraction of being mismatched by currency, and obtain a good investment return, and buy a currency option against the need to specifically cover the investment risk.
- 4.6 A liability insurer is concerned that its reserves may be threatened by average claims costs exceeding the anticipated claims inflation rate assumed in the reserves or in the pricing. There are indexed linked gilts, but these are sometimes difficult to purchase because the market is not as liquid as thought. Furthermore claims cost inflation behaves differently than consumer inflation. It is possible to establish an "average claims settlement index". Provided there are a substantial number of such claims, and reporting is good (e.g. asbestos), then, in theory, an appropriate derivative could be constructed. The main problem is who would write such a contract? It would hedge the "average cost" risk, but not the "number of claims" risk.
- 4.7 Alternatively, an insurer with long term liability business might see equities as a useful long term hedge. Part of the trade off between investing directly in equities and investing in an index option, relates to the different return profile of the two approaches. The option route can put a limit on downside exposure, namely the option premium, and this may be more or less attractive to different companies depending on their capital and risk management philosophy.
- 4.8 An alternative mechanism to hedge the asbestos liabilities would be to take a position on assets whose value is correlated with the value of future settlements. One particular asset that could be envisaged is an equity holding in a firm of lawyers that specialised in asbestos litigation. Their income would be closely tied with the number and amount (through the contingent fee system) of future settlements. This is a less perfect hedge than a position in an appropriate index, with factors other

than the claims cost affecting the stock value. However, this could be useful strategy before an index is constructed and should certainly be more efficient than holding a broad spread of equities.

4. 9 Certain reinsurers are offering finite reinsurance. Such reinsurance is based on an established (conservative) claims settlement pattern. The reinsurer runs a timing risk that the claims may be reported and settle faster than anticipated. This risk may result in enforced liquidation of assets at an inopportune time. This risk may be covered by appropriate hedging devices, which need to be included in the pricing of the reinsurance product. Therefore for underwriters to assess the premium, not only do they need to know the cost based on anticipated cash flow, but need to allow in that pricing for the cost of the derivative instrument to protect against early realisation. Management itself then has the option whether to buy the required instrument.
- 4.10 Insurance company shareholders instruct the insurance operation that its results are too volatile. For example, the company is restricted to motor business and the volume of business it writes is not large, because it has small capital. It needs to emulate more closely its bigger brother. It needs to somehow invest the premiums to achieve the average loss ratio of its competitors. An index of loss ratios can be constructed, and a future, and an option on the future be traded (see the CBOT product). The insurance company has two options. It can accept pro rata a book of business similar to the index (this impacts on solvency), or correspondingly it can transact (providing it has enough margin) part of the capital to emulate the loss ratio. These different approaches appear on different sides of the balance sheet, have different solvency implications, and will give regulators concerns. This issue is addressed later.

4.11 Is the reinsurance product a derivative? There are clear similarities in the structure of profit in a call option and payments in a reinsurance contract. Reinsurance is traded OTC. The clear difference is the lack of speculators, although to some extent the spiral market was clearly the result of speculative arbitrage, and many times the volume of base insurance was being traded on some risks. Writing options may be considered a form of betting, but the reinsurance market was doing precisely this years ago when "Tonners" or bets on the number and size of ship losses were made.

In these incidents where the reinsurance market has been tempted into "speculative" underwriting it has been either hurt or restrained. Whilst there is a need to ensure that imprudent strategies are minimised it is questionable whether all speculative writings by reinsurers should be viewed with suspicion. Provided the risks are appropriately managed, they can provide extremely valuable products to cedants.

## 5. Control of Derivatives

- 5.1 As indicated in the example on uses of derivatives, and by the experience of other financial institutions, there is a need for both management and the authorities to consider control over the use and exposure of derivatives. The parties interested in control are

- i) The Directors
- ii) The Shareholders
- iii) The Regulatory Authorities
- iv) The public, as purchasers of services
- v) The Market and counterparties.

In addition, there are clearly differences between Traded and OTC Derivatives. The former has an known price and counterparty guarantees, whereas the latter has neither.

- 5.2 In theory Traded Derivatives should be easier to regulate, because of their visibility. Most problems have, however, risen in this area. Examples include Barings, Metallgesellschaft, Orange County, Proctor & Gamble and so on.

Perhaps it is because of this visibility that the problem has been detected?

Barings is well documented and a rouge trader speculated on the volatility of the Japanese market decreasing, and when it increased and he lost money, he speculated further on the same bet in a hope to eventually recover. The Kobe earthquake was a trigger for a further, substantial increase in volatility which gave rise to substantial losses. Metallgesellschaft speculated on future metal prices. A substantial loss was made when the exposure was discovered and the positions closed. It is rumoured that had the contracts been held to expiry, then the company would have seen a profit as opposed to the rumoured \$ 1 billion loss.



Orange County involved a \$2 billion loss when the Treasury Dept speculated in the income received from local taxes earmarked for future projects. Everyone involved is currently being sued.

Insurance brokers have been known to get their fingers burnt in financial speculation of premiums held by them.

- 5.3 Most of the problems are as a result of internal controls. The market is moving so fast that a bank's capital is turned over many times a day, so the traditional accounting controls are much too slow to pick up any problems. Alternative controls are absolutely necessary.

- 5.4 A summary of a single bank's exposure to derivatives is as follows. This bank (Bankers Trust) had an equity base of \$3.1 billion at the end of 1994.

All amounts \$ billions

Year	Interest Contracts		FX Contracts		Total	
	Notional	Credit	Notional	Credit	Notional	Credit
1986	50.0	1.6	101.3	0.0	151.3	1.6
1987	80.0	1.6	211.8	0.0	291.8	1.6
1988	113.0	1.5	214.8	3.9	327.0	5.4
1989	156.0	3.0	285.4	3.5	441.4	6.5
1990	354.3	11.6	381.9	10.4	777.6	24.1
1991	420.3	11.4	384.0	12.4	862.2	25.6
1992	964.3	7.5	440.8	11.7	1,166.3	21.7
1993	1,290.5	13.1	571.3	10.1	1,907.2	24.7
1994	1,244.8	n/a	668.2	n/a	1,976.7	26.7

Credit risk assumes 100% default of all counterparties.

The exposure is not small, and has been increasingly given rise to speculation that derivatives are overtraded, and one default could domino and destroy the financial system. Compare the above with Barings "exposure".

- 5.5 In December 1994 the Department of Trade and Industry issued a Prudential Guidance note "Guidance on Systems of Control over the Investments (and Counterparty exposure) of Insurance Companies with Particular Reference to the Use of Derivatives".

The Insurance Companies Act sets out criteria of Sound and Prudent Management.

*"The insurance company shall not be regarded as conducting its business in a sound and prudent manner unless it maintains adequate systems of control of its business and records"*

This responsibility falls on the Directors.

Furthermore assets backing insurance liabilities are required to satisfy the conditions

*"...are of appropriate safety, yield and marketability having regard to the classes of business carried on"; and*

*"...investments are appropriately diversified and adequately spread and that excessive reliance is not placed on investments any particular category or description".*

- 5.6 Schedule 12 of 1994 Regulations set out admissibility limits. In addition to this an insurance company is obliged to have in place procedures for establishing the credit worthiness of counterparties, and apply lower limits, if appropriate. Furthermore, in setting the companies aggregate exposure to any category, due regard must be made as to the nature of the liabilities, and the level of free assets.
- 5.7 The 1994 limited aggregate exposure to 10 % of the General Business Amount with any one counterparty or connected company from whatever the source. Reinsurance recoveries are not included, but the DTI document draws attention to assessing an "acceptable" level of exposure, which may take into account collateral arrangements.

- 5.8 In respect of Derivatives, the message is clear. The Board of Directors should take all reasonable steps to satisfy themselves that management
- i) Fully understand the nature of derivatives traded,
  - ii) Management is suitably qualified and competent to undertake and understand the nature of the exposure.
  - iii) That objectives and policies for the use of derivatives are clearly documented
  - iv) That controls are in place to ensure their use is in line with these objectives.
  - v) That, having regard to uncovered transactions that in no circumstances is the minimum solvency margin endangered.
  - vi) That those who control the derivatives are independent of the day-to-day operators
  - vii) That those in control are capable of analysing and monitoring of all transactions both individually and in aggregate (including interest rate risk, foreign currency risk, fraud, error, unauthorised access and operational risks)
  - viii) That the systems can cope with the volume of transactions.
  - ix) That the control is provided regularly with statistics and information of traded volumes by type, including all off-balance sheet transactions.
  - x) That sufficient control procedures are in place, including independent agreement and reconciliation of positions, independent checking of prices, agreement of managers profits, appropriate authorisation where dealing limits have been exceeded.
  - ix) That all valuation models which are used to value open positions and derivative instruments are adequately tested and approved, and that any amendments to such programmes are controlled. Tests should include test of robustness to stress in changing investment conditions.

# GLOSSARY

## PENSIONS RESEARCH ACCOUNTANTS GROUP

### PENSION FUND INVESTMENT - FUTURES & OPTIONS

#### GLOSSARY OF TERMS

<b>ABANDON</b>	allow an option to expire unexercised.
<b>AMERICAN (STYLE) OPTION</b>	options which may be exercised at any time within specified time period.
<b>ARBITRAGE</b>	the purchase/sale of an asset and the simultaneous taking of an equal and opposite position in a related asset to benefit from an expected change in relative prices.
<b>ASSOCIATED ECONOMIC EXPOSURE</b>	the full exposure to asset classes that is incurred by buying or selling a futures contract.
<b>ASSIGNMENT</b>	the sale of a swap contract by one party to another (swap market) usually for a lump sum payment. These require the approval of the remaining original party.
<b>AT-THE-MONEY</b>	a call/put option where the exercise price is approximately the same as the current market price of the underlying asset.
<b>BASIS</b>	the difference between the cash price of a futures contract and the futures equivalent price of the underlying asset.
<b>BASIS POINT</b>	the smallest increment of price measurement (tick)
<b>BEAR</b>	one who believes prices will fall.
<b>BID PRICE</b>	the price a buyer will pay for an options or futures contract.
<b>BLACK-SCHOLES</b>	an equation used to price over-the-counter options, value option portfolios, or evaluate option trading on exchanges.

<b>BREAK-EVEN POINT</b>	the price of the underlying asset at which an option buyer just recovers the initial outlay or premium.
<b>BULL</b>	one who believes prices will rise.
<b>BUY IN</b>	an option writer will 'buy-in' assets in the market where he does not hold enough to deliver to the option buyer at exercise.
<b>CALENDAR SPREAD</b>	a spread involving the simultaneous sale of an option with a nearby expiry date and the purchase of an option with a more deferred expiry date. Both options have the same exercise price.
<b>CALL OPTION</b>	confers the right (but not the obligation) to buy the underlying asset at a prescribed price (strike rate) on, or prior to, a fixed future date.
<b>CASH BACKING</b>	an amount of cash equal to the economic exposure created by a derivative position.
<b>CASH MARKET</b>	the market in the underlying asset on which a futures or options contract is based.
<b>CASH SETTLEMENT</b>	on maturity, the amount due to or owed by the purchaser or seller of the futures contract i.e. the difference between the purchase or sale and settlement prices.
<b>CERTIFICATE OF DEPOSIT (CD)</b>	a negotiable certificate issued by a bank as evidence of an interest bearing time deposit
<b>CLEARING</b>	the process of matching, registering and guaranteeing exchange-traded transactions.
<b>CLEARING HOUSE</b>	the organisation which guarantees performance and settlement of exchange traded contracts.
<b>CLOSE OUT</b>	a transaction which leaves the trade with a zero net commitment to the market, i.e. a purchase if the initial transaction was a sale and vice versa.
<b>CLOSING PURCHASE</b>	a transaction in which a writer purchases an option having the same terms as an option which he has previously sold, thus terminating his liability as a writer.

<b>CLOSING SALE</b>	a transaction in which the holder of an option sells in the market an option identical to one which he holds thus extinguishing his rights as a holder.
<b>COMMERCIAL PAPER</b>	a short-term unsecured promise to repay a fixed amount on a certain future date and at a specific place.
<b>CONTRACT</b>	the standard unit of trading for futures and options i.e. the size of the contract on the underlying asset (lot).
<b>CONTRACT MONTH</b>	the month in which a particular futures or options contract expires. On LIFFE these are March, June, September and December.
<b>CONTRACTS FOR DIFFERENCES</b>	financial instruments where two parties agree to make payments between themselves based on the differences between an agreed price and a subsequent market price
<b>CONVENTIONAL OPTION</b>	the contract is between two individuals and cannot be transferred.
<b>CONVERGENCE</b>	the process by which cash and futures prices converge to one price as delivery approaches.
<b>CONVERTIBLE SECURITY</b>	a fixed interest security which may be exchanged for a specified number of the issuers shares at the owners option.
<b>COVERED OPTION</b>	a written option is covered if it is matched by an opposing cash or futures position in the underlying asset, or by an opposing option position of specific characteristics. Professionals would apply this definition on a 'delta adjusted' basis. A bought option is covered, if the call is covered by cash and the put is covered by the underlying asset.
<b>CROSS HEDGE</b>	an option bought to hedge an existing position where the underlying asset is not the same.
<b>CRUDE BASIS</b>	the difference between the price of an asset in the cash market quoted in futures equivalent terms and the prevailing futures market price.

<b>CURRENCY SWAP</b>	a transaction in which two counterparties exchange specific amounts of two different currencies at the outset and repay over time according to a predetermined rule which reflects interest payments and possibly amortisation of principal. The payment flows in currency swaps (in which payments are based on fixed interest rates in each currency) are generally like those of spot and forward currency transactions.
<b>CURRENCY COUPON SWAP</b>	an agreement to exchange interest payments in two different currencies on different bases and exchange of principal at maturity.
<b>DELIVERY</b>	settlement of a futures contract, during delivery month or at expiry, by receipt or tender of the underlying asset or by cash settlement.
<b>DELTA</b>	see option delta.
<b>DELTA HEDGING</b>	a method that option writers use to hedge risk exposure of written options by purchase or sale of the underlying asset in proportion to the delta.
<b>DISCOUNT</b>	the amount by which a future or option is priced below its theoretical or fair value or below the price of the underlying asset.
<b>EDSP</b>	Exchange Delivery Settlement Price. On expiry of a contract, the EDSP determines the price for delivery or cash settlement.
<b>EUROPEAN (STYLE) OPTION</b>	options which may only be exercised on a specific date
<b>EXERCISE</b>	the process whereby the holder of a call/put takes up his right to buy/sell the underlying asset at the exercise price.
<b>EXERCISE DAY</b>	a day on which the holder of an option may exercise the right to buy or sell the underlying asset.
<b>EXERCISE NOTICE</b>	a formal notification that the holder of a call/put option wishes to buy/sell the underlying asset at the exercise price.
<b>EXERCISE PERIOD</b>	the period of time during which an option may be exercised.

<b>EXERCISE PRICE (STRIKE RATE)</b>	the price at which the option holder of a call/put option may buy/sell the underlying asset as defined in the option contract.
<b>EXPECTED VOLATILITY</b>	the degree of volatility that option pricing formulae assume will prevail over the remaining life of an option.
<b>EXPIRY DATE (EXPIRATION)</b>	the last day on which an option may be exercised or traded.
<b>FAIR VALUE</b>	the level at which a futures contract should trade to make it economically equivalent to holding the underlying asset, taking into account the financing costs associated with holding the asset to the contract settlement date.
<b>FORWARD CONTRACT</b>	a contract between two principal parties to either buy or sell an asset at a specified price on a fixed future date.
<b>FORWARD FOREIGN EXCHANGE CONTRACT</b>	contract for the exchange of specified amounts of two currencies at a specified future date.
<b>FORWARD-RATE AGREEMENT (FRA)</b>	an agreement between two parties whereby one will pay the other the difference between the contracted rate of interest and the current market rate on a notional deposit.
<b>FORWARD SWAP</b>	a contractual obligation to exchange one type of cashflow, or asset, for another at current rates for commencement at some future date.
<b>FUTURES CONTRACT</b>	an agreement to buy or sell an asset at a pre-determined future date and at a price agreed between the parties through open outcry on the floor of an organised exchange i.e. a future is an exchange -traded variant of a forward contract.
<b>FUTURES EQUIVALENT PRICE</b>	the pricing of the cash asset being put on the same basis as the futures contracts pricing to enable direct comparison.
<b>GAMMA</b>	the rate at which an options delta changes over time.
<b>GEARING</b>	see leverage.



<b>HEDGING TRANSACTIONS</b>	transactions entered into with the intention of reducing the risk of loss or reduction in profits arising from movements in interest rates, exchange rates and/or in the market price inherent in existing assets, liabilities, positions, or future cash flows.
<b>HEDGE</b>	the reduction of risk.
<b>HEDGE RATIO</b>	the delta of an option derived from an option valuation model showing the proportion of options and underlying assets that will create a theoretically riskless hedge.
<b>IMPLIED VOLATILITY</b>	the value of asset price volatility that will equate the market price of an option with the fair value of an option.
<b>IMRO</b>	Investment Management Regulatory Organisation Limited.
<b>INITIAL MARGIN</b>	the returnable collateral required to initiate a new futures or options position. This is required by the clearing house from clearing members as protection against default of a futures or options contract.
<b>INTEREST RATE CAP</b>	an arrangement whereby an institution, for a fee, guarantees an upper limit for the interest rate on a loan.
<b>IN-THE-MONEY</b>	a call/put option where the exercise price is below/above the current market price of the underlying security.
<b>INTRINSIC VALUE</b>	the amount the option is in-the-money i.e. the difference between the exercise price and the price of the underlying asset. It may be zero.
<b>LAPSING</b>	allowing an option to expire without it being exercised.
<b>LAST TRADING DAY</b>	the final day for dealing in a futures or options contract for a particular delivery or expiry month.
<b>LCH</b>	The London Clearing House.
<b>LEVERAGE</b>	The use of borrowing or derivatives to increase the economic exposure to the underlying asset class. Leverage is measured by the ratio of economic exposure to the cash value of the fund.

<b>LIBID</b>	London Interbank Bid Rate.
<b>LIBOR</b>	London Interbank Offered Rate.
<b>LIFFE</b>	The London International Financial Futures and Options Exchange.
<b>LONG</b>	the position that is established by the buying of a futures or options contract if there is no off-setting position.
<b>MARGIN</b>	the sum of money or securities which must be deposited as collateral by the writer with the clearing house on establishing a futures or options contract.
<b>MARGIN CALLS</b>	the additional funds which a person with a futures position, or who has written an option, may be called upon to deposit if there is an adverse price change or if margin requirements alter.
<b>MARK TO MARKET</b>	the practice under which transactions are revalued daily to their current market price i.e. to reflect accrued profits and losses and for the calculation of the variation margin.
<b>MATURITY</b>	last trading day.
<b>MID-MARKET PRICE</b>	the average of 'bid' and 'offer' prices, based on readily available quotations and assumes transactions of normal market size.
<b>NAPF</b>	The National Association of Pension Funds.
<b>NAKED WRITING</b>	writing a call/put option on an underlying asset which is not currently owned by the Writer.
<b>OFFER PRICE</b>	the price at which a seller is willing to sell a contract.
<b>OPEN INTEREST</b>	the number of outstanding "longs" and "shorts" (open positions) for a given option or futures contract.
<b>OPEN POSITION</b>	a long or short position that has not been offset by an equal and opposite position.
<b>OPEN OUTCRY</b>	the method of trading where bids and offers for a contract are made audibly to all other members in a pit.

<b>OPENING PURCHASE</b>	a transaction in which the buyer becomes the holder of an option ('long position').
<b>OPENING SALE</b>	a transaction in which the seller of an option becomes the writer ('short position')
<b>OPTION</b>	the right, but not the obligation, to assume a long or short position in the underlying asset at a pre-determined exercise price (strike rate) at a fixed future date.
<b>OPTION DELTA</b>	sensitivity of the option price to a unit change in the share price.
<b>OPTION PREMIUM</b>	the total amount received from the sale of the option.
<b>OPTION WARRANT</b>	a warrant which may be exercised into either shares or bonds, at the choice of the holder.
<b>OUT-OF-THE-MONEY</b>	a call/put option in which the exercise price is above/below the current price of the underlying asset.
<b>OVER-THE-COUNTER (OTC)</b>	an instrument between two individual counterparties rather than on an exchange i.e. there is a direct link between buyer and seller and there is no standardisation of contract specifications.
<b>PHYSICAL SETTLEMENT/ DELIVERY</b>	when the contract purchaser takes delivery of, or delivers, the underlying asset.
<b>PIT</b>	trading floor of the exchange.
<b>PREMIUM</b>	the cost of buying an option - the sum of money which the option buyer will pay and the writer receive for the rights granted by the option.
<b>PUT/OPTION</b>	confers the right (but not the obligation) to sell the underlying asset at a prescribed price (strike rate) on, or prior to, a fixed future day.
<b>RECOGNISED INVESTMENT EXCHANGE (RIE)</b>	an exchange authorised by the SIB and which conforms to Schedule 4 of the Financial Services Act 1986.

<b>REPURCHASE AGREEMENT (REPO)</b>	a holder of securities sells these securities to an investor with an agreement to repurchase them at a fixed price on a fixed date.
<b>RISK FACTORS</b>	the factors (deltas) which are published daily by the exchange and which indicate the risk of an option position relative to that of the related futures contract.
<b>ROLLING OVER</b>	substituting an option with a different expiration date and for a different striking price for a previously established position.
<b>ROUND TRIP</b>	the opening purchase/sale of a futures or options contract and the subsequent opposite and closing transaction in the same contract.
<b>SELLING</b>	the sale or granting of an option (writing).
<b>SERIES</b>	all options of the same class having the same exercise price and expiry date.
<b>SETTLEMENT PRICE</b>	the closing price of a future or option at the end of each day, as published by the exchange.
<b>SFA</b>	The Securities and Futures Authority Limited.
<b>SHORT</b>	selling a futures or options contract where there is no off-setting position.
<b>SIB</b>	Securities and Investments Board.
<b>SPOT MONTH</b>	the contract month close to delivery or expiry.
<b>SPREAD</b>	the difference between the price of two related futures contracts.
<b>SRO</b>	Self-Regulating Organisation.
<b>STRADDLE</b>	a spread between different delivery months in the same contract.
<b>STRIKE RATE</b>	the price at which an option entitles its holder to buy or sell the underlying asset (exercise price).
<b>SWAP</b>	a contractual obligation to exchange one type of cashflow, or asset, for another according to terms which are agreed at the outset of the swap.

<b>SPREADS/COMBINATIONS</b>	options involving two or more option series on the same underlying asset.
<b>SYNTHETIC ASSET</b>	a security created through the combination of cash and futures contract.
<b>SYNTHETIC FUTURE</b>	a position equivalent to a position in a futures contract created by buying a put/call and writing a call/put at the same exercise price with the same expiry date.
<b>SYNTHETIC POSITION</b>	an option or futures position which has the same risk/reward characteristics as another kind of position.
<b>TICK</b>	the standardised minimum price fluctuation of a futures or options contract and represents a specific value for each contract type.
<b>TIME VALUE</b>	the difference between the premium and the intrinsic value. The time value reflects the remaining life of an option.
<b>TRADED OPTION</b>	the contract is traded on an exchange and thus is readily transferable.
<b>UNCOVERED/NAKED POSITION</b>	an option where the writer has no cover against a market move in the buyer's favour.
<b>UNDERLYING ASSET</b>	the instrument or security upon which traded options are listed e.g. UK equities, stock indices, money market instruments.
<b>VARIATION MARGIN</b>	profits or losses on open positions in futures and options contracts which are paid or collected daily.
<b>VOLATILITY</b>	a measure of the amount by which an asset price is expected to fluctuate over a given period of time. Normally measured by the annualised standard deviation of daily price changes.
<b>WARRANT</b>	an instrument conferring on the holder the option to purchase from, or sell to, the warrant issuer a fixed income security or equity stock under specified conditions for some period of time.
<b>WRITER</b>	a person who executes an opening sale of an option contract ('short position').
<b>WRITTEN OPTIONS</b>	options sold to a purchaser.

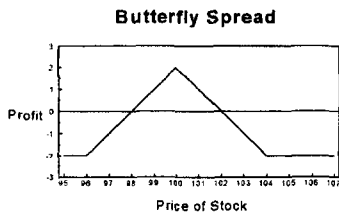
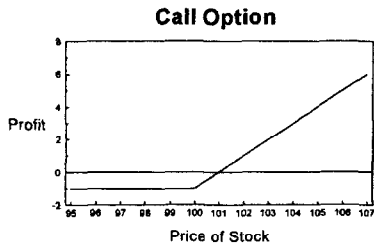
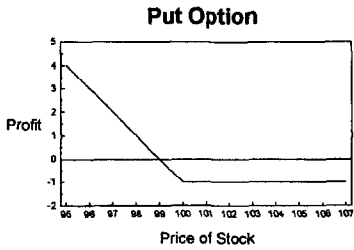
## Appendix B

### Background Bibliography

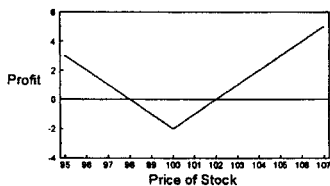
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# Appendix C

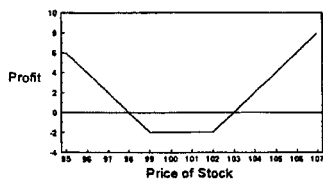
## Some Option Strategies and Profit Curves



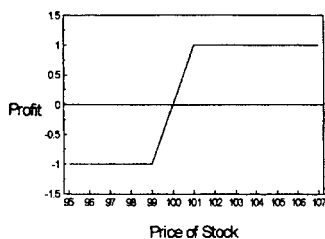
### Straddle Buyer at Expiration



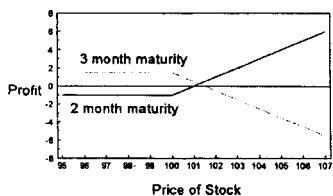
### Strangle Buyer at Expiration



### Call Spread



### Calendar Spread



### Cylinder or Range Forward

