ISMA CENTRE - THE BUSINESS SCHOOL
OF THE FINANCIAL MARKETS

UNIVERSITY OF READING
ENGLAND

IFID Certificate Programme

Rates Trading and Hedging

Options Strategies

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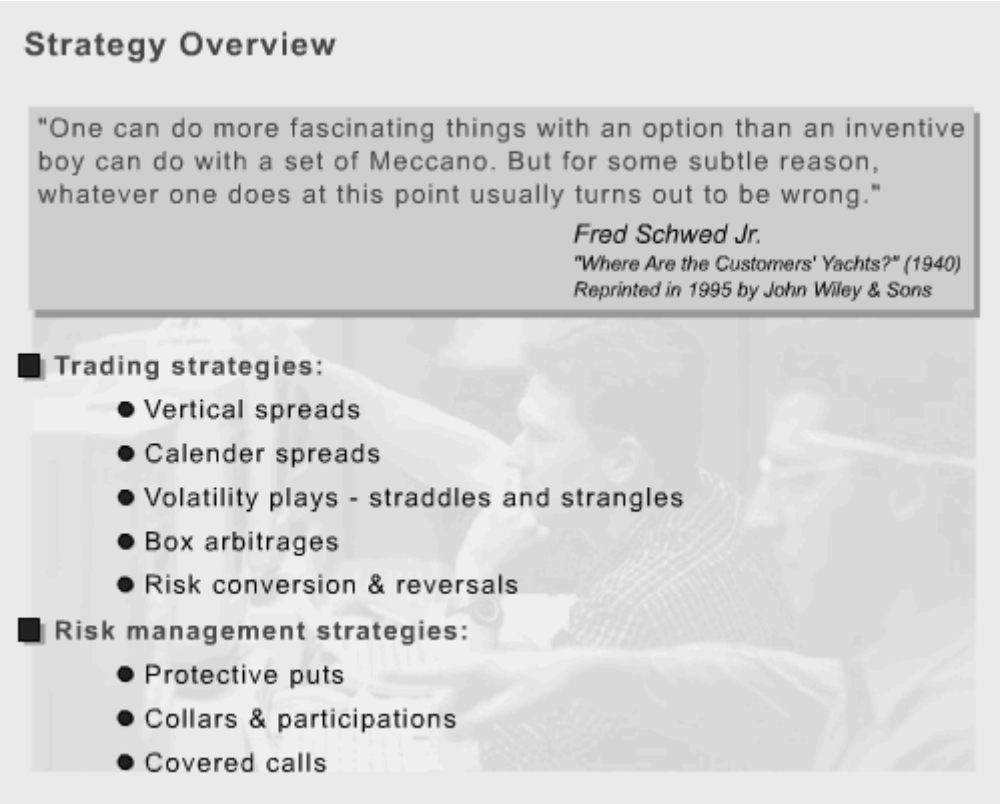
1. Overview



Options are used to manage risks on existing exposures or as speculative trading vehicles, and in this module we explore some of the main strategies that are relevant in both contexts. The list of strategies covered here is by no means exhaustive, but it should be enough to illustrate the many different ways in which options can be combined to achieve desired - sometimes quite complex - exposure profiles. As a general rule it pays to keep it simple!

The applications discussed are quite generic and are illustrated without reference to a specific market sector, although the exercises do refer to specific option products.

Learning Objectives

By the end of this module, you will be able to:

1. - Formulate strategies for trading volatility in the options market
2. - Compare the return and the risk tradeoffs between the following derivatives-based risk management strategies:
   - Protective puts
   - Collars / risk reversals
   - Participations
   - Covered calls

2. Spread Trading

Spread trading involves the simultaneous buying and selling of calls (or puts) with:

- Same expiries but different strikes (**vertical spreads)**
- Same strikes but different expiries (**horizontal** or **calendar spreads**)

Benefits of spread trades over single-option trades:

- They allow the trader to fine-tune his risk-return profile
- Spreads are cheaper in net premium cost

Example 1: Simple Spread

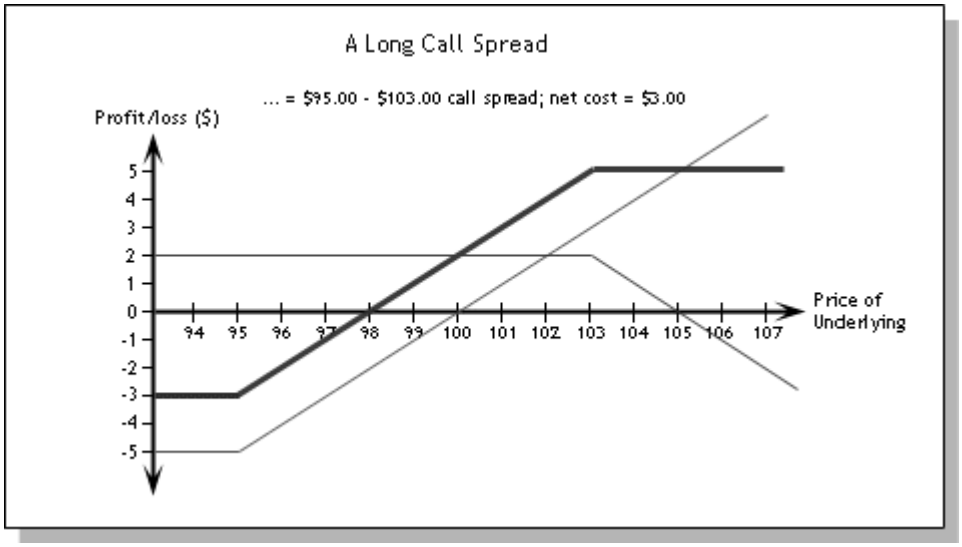
Underlying: $95.00

Scenario: Trader believes the market should tick up but fail to break through resistance at around $103.00.

Strategy: Buy a $95-103 **bull call spread**:

- Buy $95.00 call; premium cost = $5.00
- Sell $103.00 call; premium income = $2.00

The figure below shows the payoff profile of this bull call spread. (For an example of a **bear put spread**, which is the corresponding bear strategy involving put options, see *Exercises*.)



Detailed analysis

The table below shows the profit/loss on the trade at expiry, for different underlying price scenarios.

Underlying Price	Profit/loss		
	Long 95 Call	Short 103 Call	Net
95.00[1]	-5.00	+2.00	**- 3.00**[2]
98.00	-2.00	+2.00	**0.0**[3]
100.00	0.0	+2.00	**+2.00**
103.00	+3.00	+2.00	**+5.00**[4]
105.00	+5.00	0.0	**+5.00**
107.00	+7.00	-2.00	**+5.00**
109.00	+9.00	-4.00	**+5.00**

Strategy Features

- Net premium cost is only $3.00, compared with $5.00 for the naked long call
- Maximum downside is $3.00, which will be suffered if at expiry the market is $95 or below (the floor)
- The trade breaks even at $98 (=95 + 3), instead of $100 for the naked long call, so it has a higher gearing
- Maximum upside is now capped at $5 (from $103 or higher); with a naked call it is unlimited

2.1. Ratio Spreads

In a ratio spread, the number of calls bought and sold (or puts bought and sold) is not the same.

Example

Underlying: $95.00

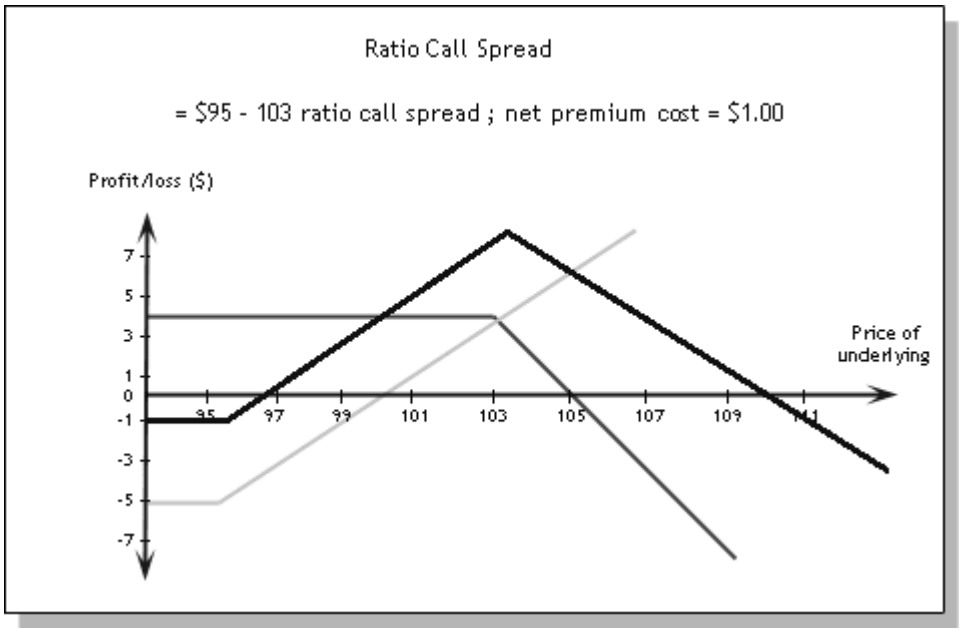
Scenario: Trader believes the market should tick up to around $110.00, but not much more.

Strategy: Buy a 1-for-2 $95 - 103 **ratio call spread**:

- Buy 1 $95.00 call; premium cost = $5.00
- Sell 2 $103.00 calls; premium income = 2 x $2.00 = $4.00

The figure on the next page shows the payoff profile of this strategy. (For an example of the **ratio put spread**, which is the corresponding bear strategy using put options, see the *Exercises*.)

[1] Or below
[2] The floor
[3] The breakeven
[4] The cap



Detailed analysis

The table below shows the profit/loss on the trade at expiry, for different underlying price scenarios.

Underlying Price	Profit/loss		
	Long 95 Call	Short 103 Calls	Net
95.00[5]	-5.00	+4.00	**-1.00**[6]
96.00	-4.00	+4.00	**0.0**[7]
98.00	-2.00	+4.00	**+2.00**
100.00	0.0	+4.00	**+4.00**
103.00	+3.00	+4.00	**+7.00**
105.00	+5.00	0.0	**+5.00**
107.00	+7.00	-4.00	**+3.00**
109.00	+9.00	-8.00	**+1.00**
110.00	+10.00	-10.00	**0.0**[8]
112.00	+12.00	-14.00	**-2.00**
114.00	+14.00	-18.00	**-4.00**

Strategy Features

- Net premium cost is only $1.00, compared with $3.00 for the simple call spread
- Downside limited to $1.00 if at expiry the market is $95 or below (the floor)
- The trade breaks even at $96 (=95 + 1), instead of $98 for the simple call spread, so the strategy has higher gearing
- Maximum upside is capped at $7.00 but the position is net short a call so there are potentially unlimited losses above $110

[5] Or below
[6] The floor
[7] Breakeven
[8] Breakeven

2.2. Calendar Spreads

In a calendar spread, the trader simultaneously buys and sells calls with the same strike but different expiries.

Example

Underlying: $95.00

Scenario: Trader believes the market should trade within a narrow range in the near future.

Strategy: Buy a $95 **calendar call spread**:

- Buy $95.00 call with 1 month expiry; premium cost = $5.00
- Sell $95.00 call with 2 weeks expiry; premium income = $1.85

The idea is to profit from the faster rate of time value decay of the short-dated option - i.e. the 2-week call has a higher theta than the 1 month call, so the net position is theta-positive.

The table below shows the estimated profit/loss on the trade at the expiry of the shorter-dated option, for different underlying price scenarios.

Underlying Price	Profit/loss		
	Long 1 mth Call	Short 2 week Call	Net
91.00	-2.13	+1.85	**-0.28**
92.00	-1.89	+1.85	**-0.04**
93.00	-1.57	+1.85	**+0.28**
94.00	-1.18	+1.85	**+0.67**
95.00	-0.72	+1.85	**+1.13**
96.00	-0.17	+0.85	**+0.68**
97.00	+0.46	-0.15	**+0.31**
98.00	+1.15	-1.15	**0.0**
99.00	+1.91	-2.15	**-0.24**
100.00	+2.73	-3.15	**-0.42**

At expiry of the 2-week option the 1-month option is still live, so its profit/loss must be estimated from a pricing model.

The position profits in a stable market, but paradoxically it is vega-positive: an increase in implied volatilities makes the 1 month option relatively more expensive than the 2-week option, so other things being equal the trader should benefit. Calendar spreads are not specifically designed for volatility trading; there are other strategies which can do this more effectively (see *Volatility Trading*).

Diagonal Spreads

The concepts of vertical and calendar spreads may be combined into so-called diagonal spreads, where both the strikes and the expiries of the calls (or puts) may be different. By now you should appreciate that, in theory, there are many possible variations in spread trading.

3. Volatility Trading

In Option Risks - Delta we saw how by delta-hedging an option with the underlying, a trader can neutralise his exposure to underlying price movements, leaving the position exposed to volatility changes. In this section we explore two alternative volatility strategies – the **straddle** and the **strangle**.

The Straddle

A straddle involves buying (or selling) both a call and a put:

- With the same strikes
- Typically, such that the net position is delta-neutral

Example

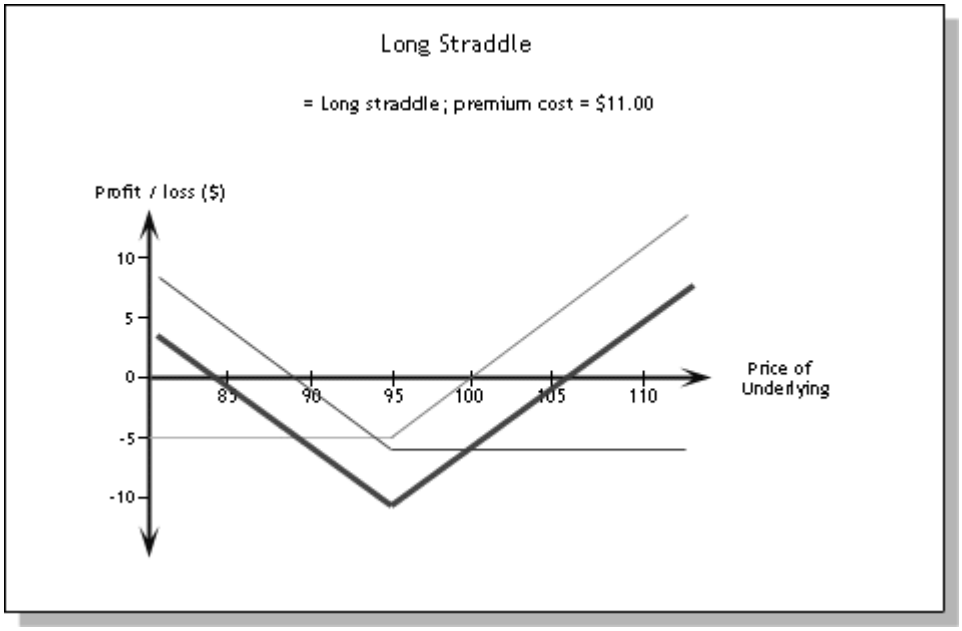
Underlying: $95.00

Scenario: The market is expected to break out of its current trading range. The trader has no strong views on the direction of the breakout, other than a general belief that the market will become more volatile.

Strategy: Buy a $95 **straddle**:

- Buy a $95 call; premium cost = $5.00; delta = +47%
- Buy a $95 put; premium cost = $6.00; delta = - 51%

The figure below shows the expiry profile of this long straddle.



Detailed analysis

The table below shows the profit/loss on the trade at expiry, for different underlying price scenarios.

Underlying Price	Profit/loss		
	Long 95 Call	Long 95 Put	Net
80.00	-5.00	+9.00	**+4.00**
84.00	-5.00	+5.00	**0.0**[9]
85.00	-5.00	+4.00	**-1.00**
90.00	-5.00	-1.00	**-6.00**
95.00	-5.00	-6.00	**-11.00**
100.00	0.0	-6.00	**-6.00**
105.00	+5.00	-6.00	**-1.00**
106.00	+6.00	-6.00	**0.0**[10]
110.00	+10.00	-6.00	**+4.00**

Strategy Features

- Both options are ATM (or close) and the net position is almost delta-neutral to begin with, so the trader is hardly exposed to small movements in the underlying
- Maximum downside is $11.00, which occurs if both options expire ATM
- In a straddle either the calls or the puts may expire ITM, but not both. The trade makes a profit at expiry if the market trades either below $84 (= 95 - 11) or above $106 (= 95 + 11)
- Maximum upside is unlimited

It is not necessary to wait until expiry to profit from a long straddle. The position may generate profits before expiry if:

- Implied volatilities rise, so both calls and the puts become more valuable; or
- The market rises significantly, so the calls gain more value than the puts lose - i.e. the position becomes delta-positive in a rising market; or
- The market falls significantly, so the puts gain more value than the calls lose - i.e. the position becomes delta-negative in a falling market

In any event, the position is long volatility. The downside of the strategy is time value decay: the position is theta-negative so, other things being equal, it loses money over time.

A trader who expects lower volatility and/or little movement in the underlying price could **sell a straddle**. The expiry profile is similar to the long straddle except that everything is inverted (see section *Exercises*).

[9] Breakeven
[10] Breakeven

3.1. The Strangle

A strangle involves buying (or selling) both a call and a put:

- With *different* strikes
- Typically, such that the net position is delta-neutral

Example

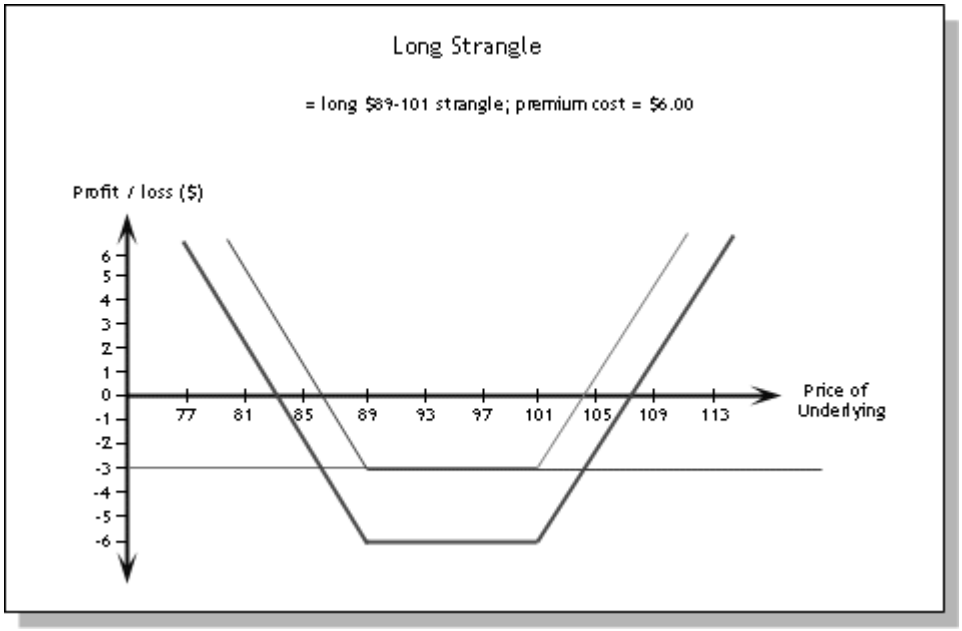
Underlying: $95.00

Scenario: Same as with the long straddle, except that the trader wishes to pay less premium.

Strategy: Buy a $89-101 strangle:

- Buy $101.00 call; premium cost = $3.00; delta = +35%
- Buy $89.00 put; premium cost = $3.00; delta = - 35%

Analysis: This is a variation of the straddle and its expiry profile is illustrated below.



The total premium cost is lower than in the straddle because both options are OTM. On the other hand, the strategy requires a larger move in the underlying price before it becomes profitable at expiry: the breakevens are now $83 (= 89 - 6) and $107 (= 101 + 6).

A trader who is bearish on volatility could short a strangle. Its expiry profile is the same as the long strangle except it would be upside-down: upside limited to the total premium earned; unlimited downside (see section *Exercises*).

4. Portfolio Insurance

4.1. Example: Protective Puts

Underlying: Corporate bond

Current price: 95.00

Scenario: Investor already holds a long position in this security. Medium term he is bullish but over the next month he is concerned about certain developments which could radically alter the picture, with negative price implications.

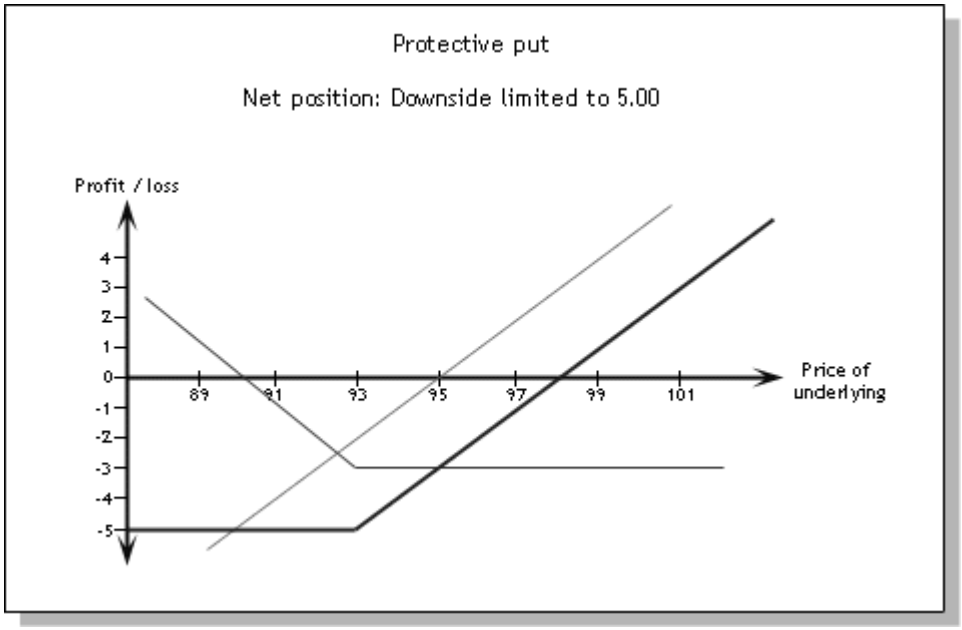
Alternatives:

1. Liquidate the investment
2. Lock in current market price by selling futures or entering into an asset swap
3. Buy puts on this security

With 1 and 2, the investor would miss out if his concerns proved to be unfounded and the market continues to advance, so 3 is preferable in this context.

Strategy: Buy a 93.00 put with 1 month expiry; premium cost = 3.00%. Investor does not want to deliver the underlying, so the contract is structured as cash settled, instead of physically settled.

The figure below shows the profile of the protective put strategy by the option's expiry.



Notice how the net profile of a long position in the underlying combined with a long put is identical to the payoff of a long call position. In fact, it is a synthetic long call with a strike of 93, for a net premium cost of 5.00% (see Option Pricing - Put-Call Parity).

The same market conditions that motivate a fund manager to purchase a protective put might persuade him to switch out of the underlying and into a call option instead.

Detailed Analysis

The table below shows the profit/loss on the investor's underlying position, as well as on his net position including the put option, by the option's expiry.

Underlying Price	Profit/loss		
	Underlying	Long 93 Put	Net
87.00	-8.00	+3.00	**-5.00**
89.00	-6.00	+1.00	**-5.00**
91.00	-4.00	-1.00	**-5.00**
93.00	-2.00	-3.00	**-5.00**[11]
95.00	0.0	-3.00	**-3.00**
96.00	+1.00	-3.00	**-2.00**
97.00	+2.00	-3.00	**-1.00**
98.00	+3.00	-3.00	**0.0**[12]
99.00	+4.00	-3.00	**+1.00**
101.00	+6.00	-3.00	**+3.00**

Strategy Features

- Maximum downside on the portfolio is now limited to 5%, which will be suffered if at the option's expiry the market trades at 93 or below. The investor is guaranteed a **floor** price of 90 for his asset (= 93 - 3)

- The position breaks even at 98 (=95 + 3): the bond needs to rise by 3% for the investor to recover the premium paid

- Maximum upside is unlimited: the investor profits if the market continues to advance

The analysis does not include the carry on the underlying position. If there is negative carry the breakeven would be slightly higher than 98.00, and vice-versa.

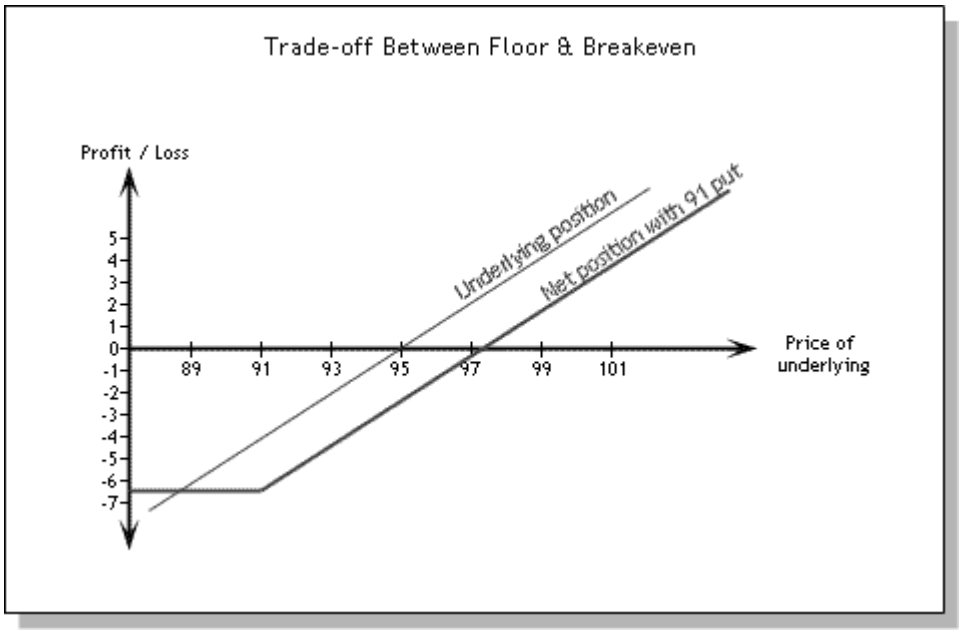
Arguably, the performance of this strategy should be compared with an equivalent futures hedge. If the futures traded at a premium to cash (reflecting negative carry) then the breakeven of this strategy, compared to a futures hedge, would again be higher than 98.00.

4.2. Fine-tuning the Strategy

Comparing the profile of the net position with that of the naked position in the underlying we can see the trade-off inherent in this strategy. For a given premium the investor buys a floor on his exposure in exchange for giving up some of the upside. We can see this trade-off clearly if we compare the risk-return profile offered by puts with different strikes:

Strike	Premium	Floor = Strike - Premium	Max Loss = Market - Floor	Breakeven = Market + Premium
91.00	2.50	88.50	-6.50	97.50
93.00	3.00	90.00	-5.00	98.00
95.00	3.50	91.50	-3.50	98.50
97.00	5.25	91.75	-3.25	100.25

[11] The floor
[12] The breakeven



- The lower the strike, the lower is the breakeven and also the floor
- The higher the strike, the higher is the breakeven and also the floor

A deeply OTM put leaves most of the upside intact but offers virtually no protection.
A deeply ITM put gives the best protection money can buy, but at the expense of the upside: it is almost equivalent to a short futures position.

Market Resistance

Risk managers would not think twice about insuring their buildings, but many seem reluctant to spend premium on portfolio insurance. One reason is that options are always a second-best strategy: with hindsight either selling the futures or not covering at all will always produce better results:

- If the investor is convinced that the market will fall, he should sell the futures, rather than buy puts

- If the investor is convinced that the market will rally, he should simply not hedge

More than one fund manager would argue against paying premium on the grounds that "we monitor market conditions daily and adjust our forward or futures cover accordingly". Managing exposures dynamically is fine in theory and it certainly saves on premium. The problem is one of timing. Whereas the option establishes a guaranteed stop-loss, there is no guarantee that the futures trade can be executed quickly enough in a fast-moving market.

Like all insurance, options come into their own when the investor is uncertain about the direction of the market - when he cannot afford to miss an opportunity to profit but neither can he afford to get the market wrong. In section *Collars & Participations* we explore some premium-saving strategies which make risk management with options appear less extravagant.

5. Collars & Participations

5.1. Definition

Many fund managers are sensitive to paying premium for portfolio insurance. One solution may be to buy OTM options; another one to insure only part of the underlying exposure. Both these alternatives save on premiums but at the expense of diluting the level of protection. In this section we examine two ways of saving premium without sacrificing insurance cover. Other variations are explored in the *Exercises*.

Collars

A collar involves the sale of options to reduce the cost of portfolio insurance. For example:

- If you buy an OTM put then you also sell an OTM call
- If you buy an OTM call then you also sell an OTM put

Also known as: **Cylinder**, **Range forward**, **Risk reversal**.

Example

Underlying: Corporate bond

Current price: 95.00

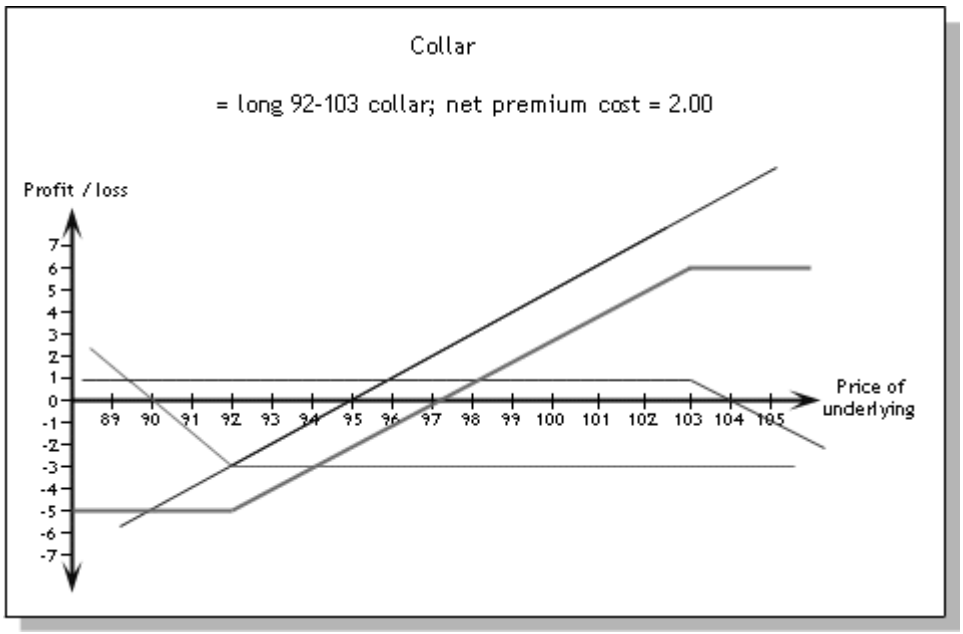
Scenario: Investor hold holds a long position in this security and is concerned about the possibility of a market setback short term. Medium term, the investor believes the market has upside but will fail to break through resistance at 103.00.

Strategy: Buy a 92 - 103 collar:

- Buy a 92.00 put; premium cost = 3.00%
- Sell a 103.00 call; premium income = 1.00%

Investor does not want to deliver the underlying, so the contract is structured as cash settled, instead of physically settled.

The figure below shows the profile of the collar strategy.



This is a similar situation as the example in section *Portfolio Insurance*, except that now the investor sells some market upside to reduce net premium cost, an acceptable trade-off since he wasn't expecting the market to rise above 103. The collar can be structured to suit the specific market view - and the budget - of the individual investor:

- The higher the strike of the puts, the higher is the floor and also the net premium cost, and vice versa
- The lower the strike of the calls, the lower is the cap level and also the net premium cost, and vice versa

It is possible to set the two strikes so as to achieve a **zero-cost collar** or **range forward**. Unlike a conventional forward (or futures) hedge, the range forward leaves a range of underlying prices within which the investor can profit, up to the cap level (see section *Exercises*).

Detailed analysis

The table below shows the profit/loss on the strategy by the options' expiry.

Underlying Price	Profit/loss			
	Underlying	Long 92 Put	Short 103 Calls	Net
87.00	-8.00	+2.00	+1.00	**-5.00**
89.00	-6.00	0.00	+1.00	**-5.00**
91.00	-4.00	-2.00	+1.00	**-5.00**[13]
93.00	-2.00	-3.00	+1.00	**-4.00**
95.00	0.00	-3.00	+1.00	**-2.00**
96.00	+1.00	-3.00	+1.00	**-1.00**
97.00	+2.00	-3.00	+1.00	**0.0**[14]
99.00	+4.00	-3.00	+1.00	**+2.00**
100.00	+5.00	-3.00	+1.00	**+3.00**
101.00	+6.00	-3.00	+1.00	**+4.00**
103.00	+8.00	-3.00	+1.00	**+6.00**[15]
105.00	+10.00	-3.00	-1.00	**+6.00**
107.00	+12.00	-3.00	-3.00	**+6.00**

Strategy Features

- Net premium cost is only 2.00%, compared with 3.00% for the simple put
- Maximum downside on the portfolio is now limited to 5.00, which will be suffered if the market trades at 92 or below. The investor is guaranteed an effective **floor** price of 90 for his asset (= 92 - 2) instead of 89 for the simple put
- The position breaks even at 97 (= 95 + 2), compared with 98 for the simple put
- Upside is now capped at 6.00 (from 103 or higher); with the protective put the upside is unlimited

[13] The floor
[14] The breakeven
[15] The cap

5.2. Participations

A different way of reducing premium cost is illustrated in the following example

Current price: 95.00

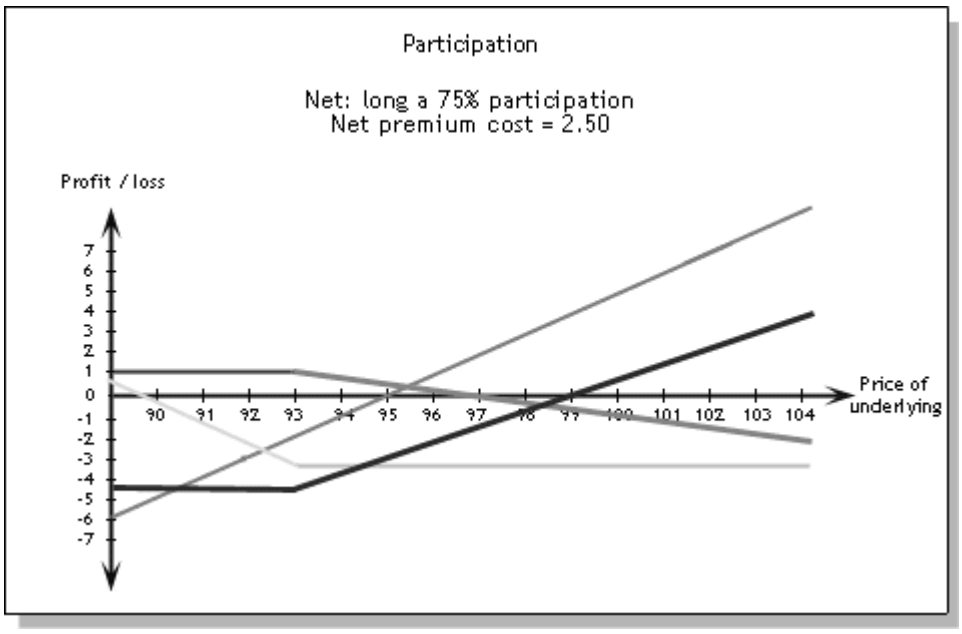
Scenario: Investor hold holds a long position in this security and is concerned about the possibility of a market setback short term. Medium term the investor believes the market has strong upside.

Strategy:

- Buy 93.00 puts covering 100% of the underlying
  Premium price = 3.50%

- Sell 93.00 calls covering only 25% of the underlying
  Premium income = 25% of 4.00 = 1.00%

The figure below shows the profile of this position, also known as a **profit-sharing forward**. The net position looks similar to a synthetic long call (see Option Pricing – Put-call Parity), except that the upside is less steep.



Detailed analysis

The table below shows the profit/loss on the strategy by the options' expiry.

Underlying Price	Profit/loss			
	Underlying	Long 93 Put	Short 93 Calls	Net
87.00	- 8.00	+2.50	25% x 4.00 = +1.00	**- 4.50**
89.00	- 6.00	+0.50	25% x 4.00 = +1.00	**- 4.50**
91.00	- 4.00	- 1.50	25% x 4.00 = +1.00	**- 4.50**
93.00	- 2.00	- 3.50	25% x 4.00 = +1.00	**- 4.50**[16]
95.00	0.00	- 3.50	25% x 2.00 = +0.50	**- 3.00**
97.00	+2.00	- 3.50	0.0	**- 1.50**
99.00	+4.00	- 3.50	25% x -2.00 = -0.50	**0.00**[17]
101.00	+6.00	- 3.50	25% x -4.00 = -1.00	**+1.50**
103.00	+8.00	- 3.50	25% x -6.00 = -1.50	**+3.00**
105.00	+10.00	- 3.50	25% x -8.00 = -2.00	**+4.50**
107.00	+12.00	- 3.50	25% x -10.00 = -2.50	**+6.00**

- The calls are ITM, therefore the investor needs to sell fewer.
- Net premium cost is only 2.50%
- Maximum downside on the portfolio is limited to 4.50 (at 93.00 or below)
- The position breaks even at 99.00
- Unlike the collar, the upside is now unlimited, although the investor gains only 75% of the market upside: for every 2.00 rise in the underlying price the investor gains only 1.50

[16] The floor
[17] The breakeven

6. Covered Sales

These strategies are designed primarily to enhance the yield on portfolios, rather than to insure them against a market downturn.

Example - Covered Call Writing

Underlying: Corporate bond

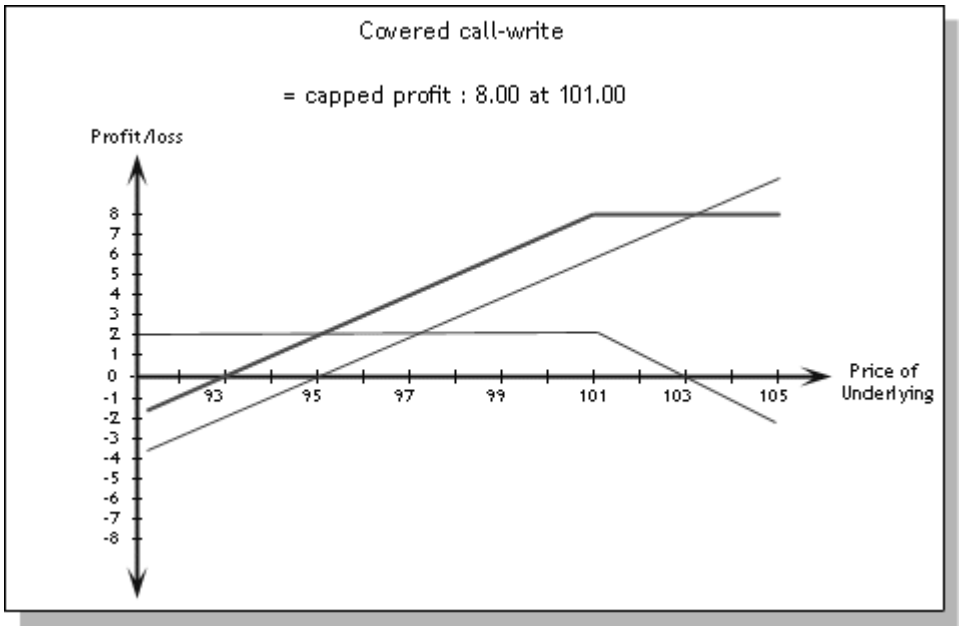
Current price: 95.00

Scenario: Investment manager hold holds a substantial long position in this security and would like to increase its yield. The market is expected to remain stable over the next month and there is upside resistance at 101.00.

Strategy: Sell a 101.00 call with 1 month expiry: premium income = 2.00%

If the call writer does not want to deliver the underlying the contract may be cash settled, rather than physically settled.

The premium income increases the return on the underlying asset but caps its upside - an attractive strategy in some circumstances, as the penalty for under-performing a target benchmark is higher than the benefits from extreme out-performance.



Detailed Analysis

The table below shows the net profit/loss on the strategy by the options' expiry.

Underlying Price	Profit/loss		
	Underlying	Short 101 Call	Net
87.00	-8.00	+2.00	**-6.00**
89.00	-6.00	+2.00	**-4.00**
91.00	-4.00	+2.00	**-2.00**
93.00	-2.00	+2.00	**0.0**[18]
94.00	-1.00	+2.00	**+1.00**
95.00	0.00	+2.00	**+2.00**
97.00	+2.00	+2.00	**+4.00**
99.00	+4.00	+2.00	**+6.00**
101.00	+6.00	+2.00	**+8.00**[19]
103.00	+8.00	0.0	**+8.00**
105.00	+10.00	-2.00	**+8.00**

Strategy Features

- Unlimited downside on the portfolio, although the breakeven on the underlying is improved to 93.00. The downside may be covered by purchasing puts, in which case the strategy becomes a collar (see *Collars & Participations*).

- Upside is now capped at +8 (from 101.00 or higher)

The fund manager sells some market upside to enhance the yield on the underlying - an acceptable trade-off, since the manager was not expecting the market to rise above 101.

Related Strategies

This strategy is sometimes used to structure two types of investment products out of the same pool of assets:

- A Capital Growth Fund which pays below-average dividend but is highly geared to the long term price performance of a selected market; this is marketed to younger investors with long term capital growth objectives

- A High Income Fund which pays above-average dividend but with limited capital growth; this is marketed to older investors who require more dependable income streams

Essentially, the High Income Fund sells call options to the Capital Growth Fund, allowing it to pay the higher dividend but at the cost of limiting its capital growth.

The covered call strategy is often embedded in structured securities (see Structured Option-based Notes - High Yielders).

[18] The breakeven
[19] The cap

6.1. Underwriting

Underlying: Corporate bond

Current price: 95.00

Scenario: Fund manager finds the current price of this bond a little high and is waiting to buy at the next dip. Following recent advances, the market is expected to retrace back to a support area around 93.00.

Strategy: Sell 93.00 puts: premium income = 5.00%
Since the investor wants to receive the underlying, the contract is physically settled.

Analysis
The strategy generates additional income for the fund but the investor enters into a commitment to buy the underlying asset, if its market price falls below the strike. The investor does not have an offsetting position in the underlying, so he risks potentially large losses if the market breaks below 88.00 (= 93 - 5).

New-issue underwriting is effectively selling puts at a strike equal to the issue price.

7. Exercise

7.1. Question 1

Question 1

Trading Options - Summary

Place the following strategies in their appropriate box on the matrix below:

Long the underlying	(LU)
Short the underlying	(SU)
Long a call or call spread	(LC)
Short a call or call spread	(SC)
Long a put or put spread	(LP)
Short a put or put spread	(SP)
Long a straddle or strangle	(LS)
Short a straddle or strangle	(SS)
No Strategy	(NS)

a)

		View on underlying market		
		Rising	**Don't know**	**Falling**
View on volatility	**Rising**			
	Don't know			
	Falling			