LM01 Option Strategies

Position equivalencies

Synthetic long position: Buying a call and writing a put on the same underlying with the same strike price and expiration creates a synthetic long position (or, a synthetic long forward position).

Synthetic short position: Selling a call and buying a put on the same underlying with the same strike price and expiration creates a synthetic short position.

Synthetic put: A synthetic long put position consists of a short stock and a long call position in which the call strike price equals the price at which the stock is shorted.

Synthetic call: A synthetic long call position consists of a long stock and a long put position in which the put strike price equals the price at which the stock is purchased.

Covered calls

A covered call is an option strategy in which an investor who owns a stock, sells a call option on that stock. It is known as a covered call because the short call position is 'covered' by owning the underlying stock.

Covered Call = Long Stock + Short Call.

The investment objectives of covered calls are:

- Yield enhancement
- Reducing position at a favorable price
- Target price realization

The profit and loss relationships for a covered call strategy can be expressed as:

- Maximum profit = $(X - S_0) + c_0$
- Maximum loss = $S_0 - c_0$
- Breakeven point = $S_0 - c_0$
- Expiration value = $S_T - \text{Max}\,[(S_T - X),0]$
- Profit at expiration = $S_T - \text{Max}\,[(S_T - X),0] + c_0 - S_0$

Protective puts

A protective put is a long position in a stock and a long position in a put option on that stock. It is known as a protective put because the put provides protection against loss in value of the underlying stock.

Protective Put = Long Stock + Long Put

The investment objectives of protective puts are:

- Loss protection
- Upside preservation

The profit and loss relationships of the protective put are given below:

- Maximum profit = $S_T - S_0 - p_0$ = Unlimited
- Maximum loss = $S_0 - X + p_0$
- Breakeven point = $S_0 + p_0$
- Expiration value = Max(S_T,X)
- Profit at expiration = Max(S_T, X) – $S_0 - p_0$

Equivalence to long asset/short forward position

Delta measures the sensitivity of an option's price to the underlying.

- Call deltas vary from 0 to 1. Delta of at-the-money call option ≈ 0.5.
- Put deltas vary from -1 to 0. Delta of at-the-money put option ≈ -0.5.

By definition, the delta for a stock is 1 and the delta for a long position in a forward contract is also 1.

Covered call delta: If we construct a covered call portfolio with 100 shares – 100 at-the-money call options, then the delta of this portfolio will be equal to 100 – 0.5 x 100 = 50

Protective put delta: Similarly, if we construct a protective put portfolio with 100 shares + long 100 at-the-money put options, then the delta of this portfolio will be equal to 100 – 0.5 x 100 = 50

Long stock/short forward delta: If we construct a portfolio with 100 shares + short forward position on 50 shares, then the portfolio delta will be equal to 100 – 50 x 1 = 50

These examples show three different positions: an ATM covered call, an ATM protective put, and a long stock/short forward position have the same delta. For small changes in the price of the underlying, these positions will provide similar payoffs.

Risk reduction of short positions using calls and puts

Buying calls on a short position: If an investor goes short on a stock, he is exposed to the risk that the stock price may go up. To hedge this risk, the investor can purchase a call option. If the stock price goes up, the loss from the short position will be offset by the gains on the long call.

Writing puts on a short position: The risk in a short position can also be hedged by writing put options. If the stock price goes up, the put will expire worthless, but the put premium that the investor received will help cushion some of the loss.

Spreads and combinations

Bull Spread

Investment objective: To benefit from an increase in the price of the underlying while keeping costs low.

Structure: Buy a call option with a low exercise price and sell a call option with a high exercise price.

The cost, breakeven stock price, and the maximum profit for bull spread are given by:

- Cost = $c_L - c_H$
- Maximum profit = $X_H - X_L$ – cost
- Breakeven price for a call bull spread = X_L + cost
- Maximum loss = cost

Bear Spread

Investment objective: To benefit from a decrease in the price of the underlying while keeping costs low.

Structure: Buy a put option with a high exercise price and sell a put option with a low exercise price.

The cost, breakeven stock price, and the maximum profit for bear spread are given by:

- Cost = $p_H - p_L$
- Maximum profit = $X_H - X_L$ – cost
- Breakeven price for a put bear spread = X_H – cost
- Maximum loss = cost

Straddle

Investment objective: To take advantage of volatility.

Structure: A long straddle is created by buying a call and buying a put. The call and put should be on the same underlying asset. The exercise price of the call and put should be the same.

The cost, max profit, breakeven and max loss of a long straddle are given by:

- Cost = $c_0 + p_0$
- Max profit = unlimited
- Breakeven = X + cost, X – cost (As seen in the profit diagram, a straddle has two breakeven points)
- Max loss = cost

Collars

Investment objective: To limit downside risk at a low cost

Structure: A collar consists of long shares of stock, a long put with an exercise price below the current stock price, and a short call with an exercise price above the current stock price.

The cost, max profit, and min profit of the strategy are given by:

- Cost = $S_0 + p_0 - c_0$
- Max profit = X_2 – cost

- Min profit = X_1 – cost

Calendar spreads

Investment objective: Take advantage of time decay when volatility is expected to change.

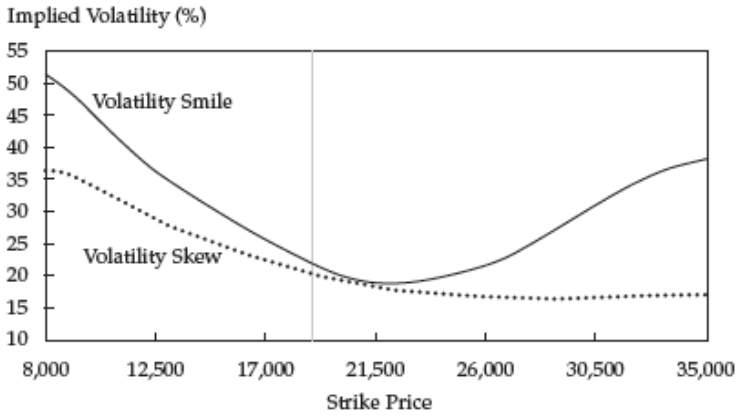
Structure: Sell an option and buy the same type of option with different exercise dates but the same strike price.

There are two types of calendar spreads:

- *Short calendar spread*: selling a longer-dated call, buying a near-term call. This strategy is profitable when greater price movements are expected in the near-term relative to price movements expected in the future.
- *Long calendar spread*: selling a near-dated call, buying a long-dated call. This strategy is profitable when investment outlook is flat in the near term, but greater price movements are expected in the future.

Volatility smile and skew

The implied volatility of options is a function of their strike price. The following graph plots the implied volatility (y-axis) against strike price (x-axis) for options on the same underlying with the same expiration.



- The underlying is trading at 19,000. Options with a strike price of 19,000 are ATM options. Call options with strike prices higher than 19,000 are OTM. Similarly, put options with strike prices lower than 19,000 are OTM.
- If the implied volatilities of both OTM puts and OTM calls are higher than the implied volatilities of ATM options, the curve is U-shaped and is called a **volatility smile** (since it resembles the shape of a smile.)
- However, the more common shape of a volatility curve is a **volatility skew** where the implied volatility increases for OTM puts and decreases for OTM calls, as the strike price moves away from the current price.

Identifying appropriate option strategies

Option strategies are often based on the outlook on the direction and volatility of the underlying asset. The following table outlines the appropriate strategy under different market conditions.

		Outlook on the Trend of Underlying Asset		
		Bearish	**Trading Range/ Neutral View**	**Bullish**
Expected Move in Implied Volatility	Decrease	Write calls	Write straddle	Write puts
	Remain Unchanged	Write calls and buy puts	Calendar spread	Buy calls and write puts
	Increase	Buy puts	Buy straddle	Buy calls

Few points to note:

- In general, if we expect volatility to decrease, we should write options. Whereas, if we expect volatility to increase, we should buy options.
- In general, if we expect the underlying price to go up, we should buy call options. Whereas, if we expect the underlying price to go down, then we should buy put options.

The following table provides a few sample scenarios and the appropriate strategies for these scenarios.

Objective/Outlook	**Strategy**
Buy the stock only if the price falls below the target price	Sell puts with X = target price
Benefit from a moderate increase in stock price	Bull spread
Implied volatility will rise in a given timeframe	Long straddle
Long-term bearish and near-term neutral outlook	Long calendar spread