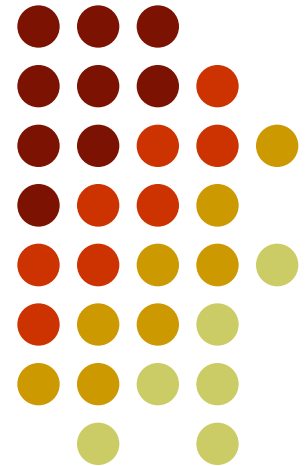


Trading Strategies Involving Options

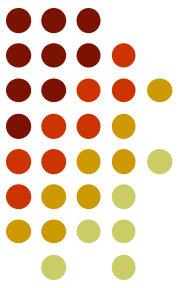
Chapter 11



Strategies to be Considered



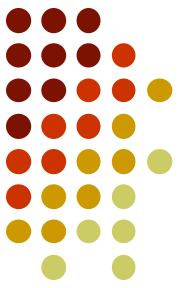
- **A risk-free bond and an option to create a principal-protected note**
- **A stock and an option**
- **Two or more options of the same type (a spread)**
- **Two or more options of different types (a combination)**



Principal-Protected Notes

- Allow an investor to take a risky position without risking any principal.
- Example: \$1,000 instrument consisting of
 - A 3-year zero-coupon bond with a principal or face value of \$1,000.
 - A 3-year at-the-money call option on a stock portfolio currently worth \$1,000.

Principal-Protected Notes (continued)



- Suppose the 3-year interest rate is 6% with continuous compounding.
- The price today of a risk-free \$1,000 par value bond is $1,000 \times e^{-0.06 \times 3}$ or \$835.27 and the dollar interest earned will be $1,000 - 835.27 = \$164.73$
- The bank finds a 3-year call option (on a stock or portfolio) costing less than \$164.73 and offers it to the client along with the risk-free bond.
- The client invests \$1,000 where \$835.27 go toward the bond and \$164.73 go toward the option (option cheaper but the bank pockets the difference)
- When both the bond and the option mature, collect face value of \$1,000 (get original invested amount back) + potential gains from the option.
- If the option made money, the client earns some extra return; if not, the client at least recovers the principal (original amount invested).

Principal-Protected Notes (continued)



- Viability depends on
 - Level of dividends
 - Level of interest rates
 - Volatility of the portfolio
- Reasons:
 - The factors listed above affect the price today of the zero-coupon bond as well as the price of the option.
 - The option might cost more than dollar interest earned on the risk-free bond, making the strategy not feasible/viable.
- However, the bank can “play” with the strike price or the life of the option and of the bond, so that the deal becomes feasible again.

Example with low interest rates



- Assume the 3-year risk-free rate is currently at 0.35% per annum.
- The price of a 3-year zero-coupon bond today is:
 - $1,000 \times e^{-0.0035 \times 3} = \989.55
 - The option thus cannot cost more than $1,000 - 989.55 = 10.45$
- The bank will thus have to “play” with the strike price or the life of the option so that the deal becomes feasible again.
- But it might entail such a long maturity and/or such a high strike price (with little possibility of ending up in the money) that the product won't look too appealing.

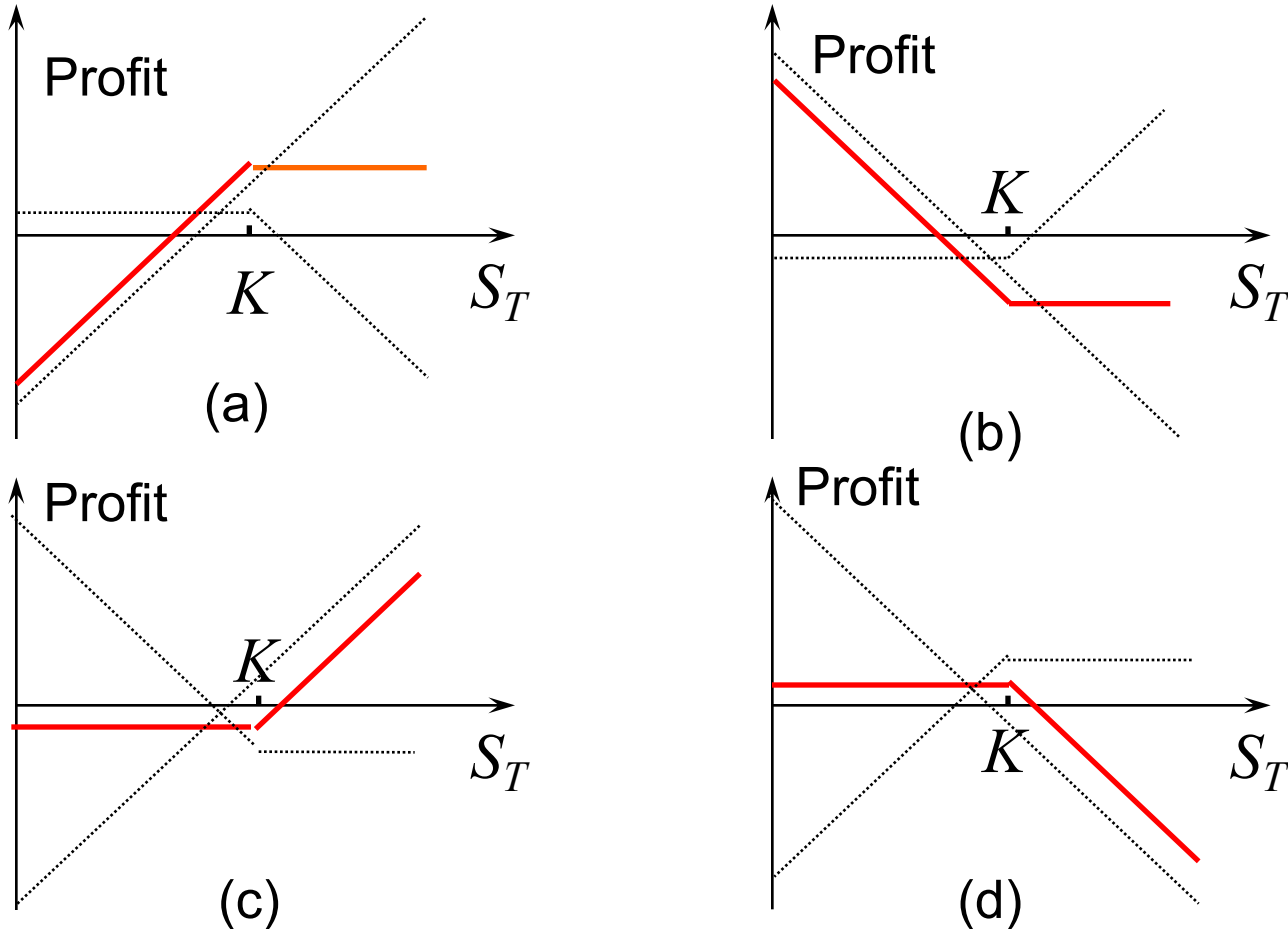
Strategies involving a single option and a stock



- There are multiple trading strategies involving a single option on a stock and the stock itself.
- Long position in a stock + short position in a European call option: “writing a covered call”.
- Short position in a stock + long position in a European call option: this is the reverse of writing a covered call.
- Long position in a stock + long position in a European put option: “protective put strategy”.
- Short position in a stock + short position in a European put option: this is the reverse of a protective put.



Positions in an Option & the Underlying Stock (Figure 11.1, page 257)



Put-Call Parity relationship



- There is a relationship between the price of a European call, European put, the underlying stock, and the strike (exercise) price.
- Put-Call parity says that: $p + S_0 = c + Ke^{-rT} + D$
- where p is the European put price, c the European call price, S_0 the current value of the stock price, Ke^{-rT} is the present value of the strike price, and D is the present value of the possible dividends to be paid throughout the life of the option (paid by the stock).

Put-Call Parity relationship (continued)



- This means that one can replicate a put option through a combination of the underlying stock, the call option, and a position in the risk-free asset.
- Alternatively, one can replicate a call option through a combination of the underlying stock, the put option, and a position in the risk-free asset.
- Alternatively, one can replicate a risk-free position through a combination of the underlying stock, the put option, and the call option.
- Finally, one can replicate the stock through a combination of the call option, the put option, and a position in the risk-free asset.

Put-Call Parity relationship (continued)



- This is because:
 - $p = -S_0 + c + Ke^{-rT} + D$
 - $c = S_0 + p - Ke^{-rT} - D$
 - $Ke^{-rT} = S_0 + p - c - D$
 - $S_0 = c - p + Ke^{-rT} + D$
- A “+” sign can be viewed as a long position in an asset, and a “-” sign as a short or written position in an asset.
- Note that the relationships can also be shown graphically.
- Also note that the relationship is valid right now, at time 0, and thus at anytime prior to expiration, up to and including expiration.
- At expiration, put-call parity becomes: $p_T + S_T = c_T + K$
- where p_T , S_T , and C_T are the *payoffs* at expiration (time T) of the put option, the stock, and the call option respectively.

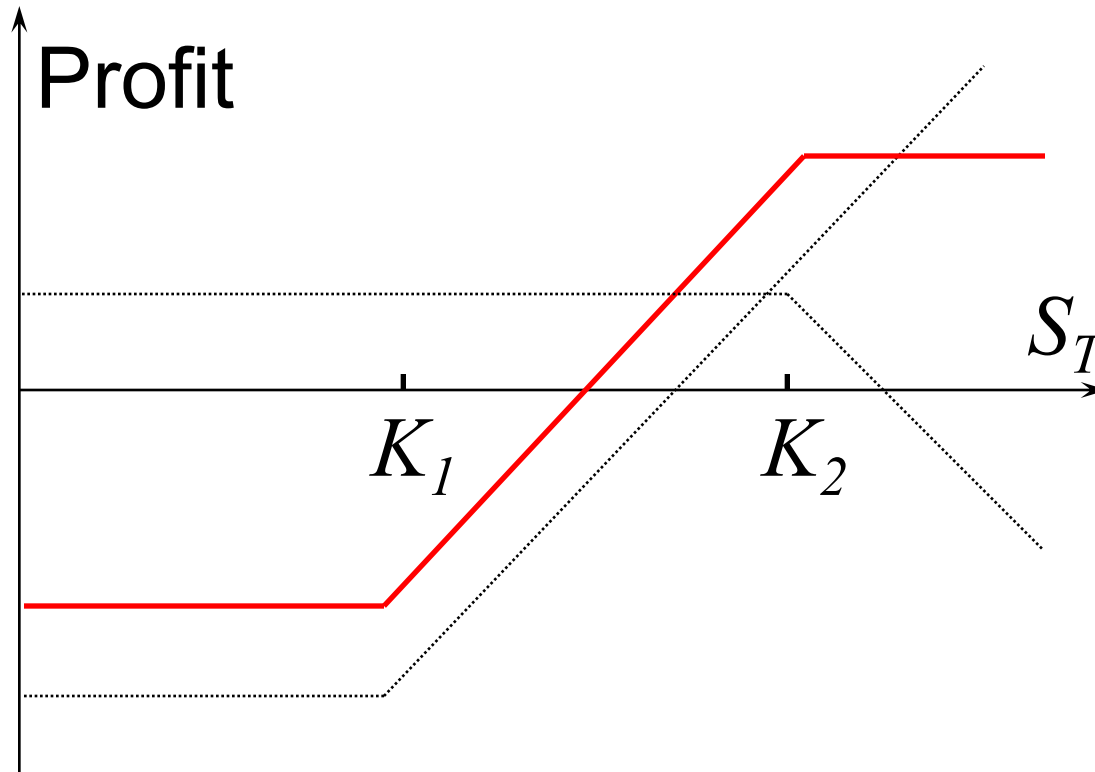
SPREADS

Strategy involving taking a position in two or more options of the same type (calls vs. puts)



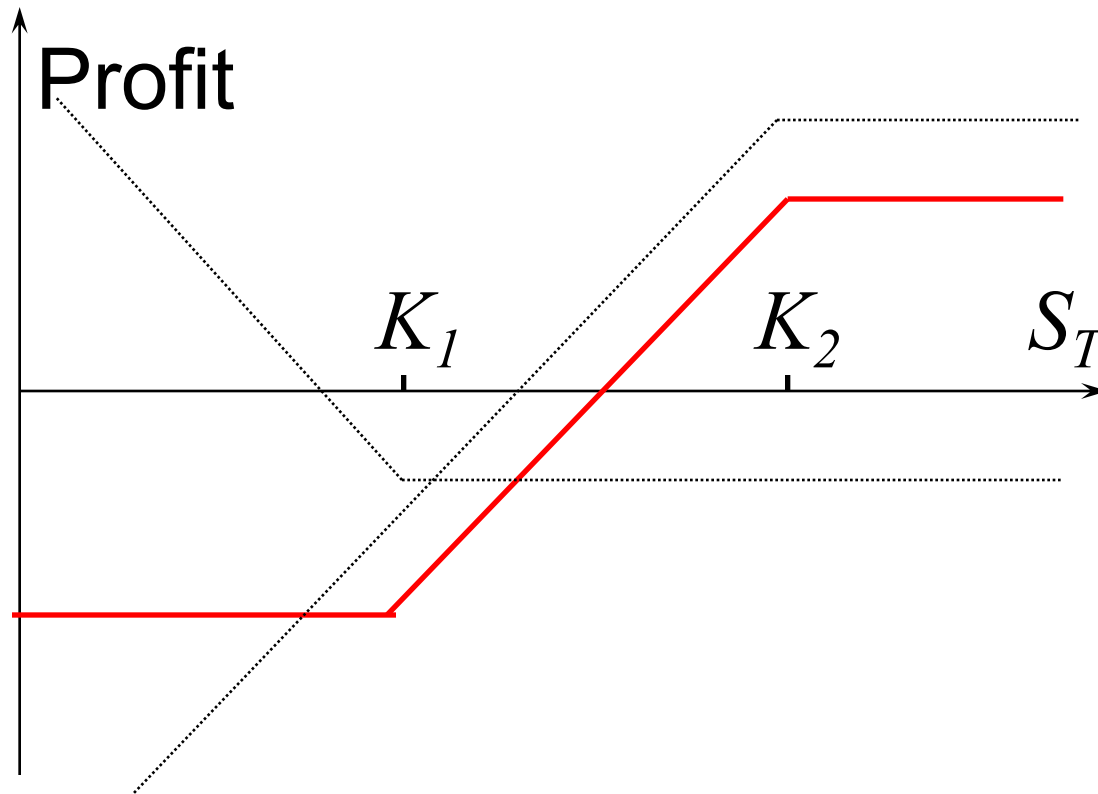
Bull Spread Using Calls

Created by buying a European call option on a stock with a certain strike price K_1 and selling/writing a call option on the same stock but with a higher strike price K_2 . Note that the option you buy is more expensive. Thus the strategy requires an initial investment.

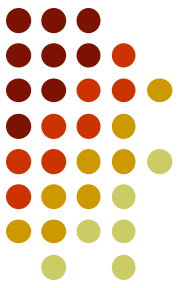


Bull Spread Using Puts

Created by buying a European put option on a stock with a certain strike price K_1 and selling/writing a put option on the same stock but with a higher strike price K_2 . Note that the option you buy is cheaper. Thus one receives a positive cash flow upfront.



Why is the shape the same?

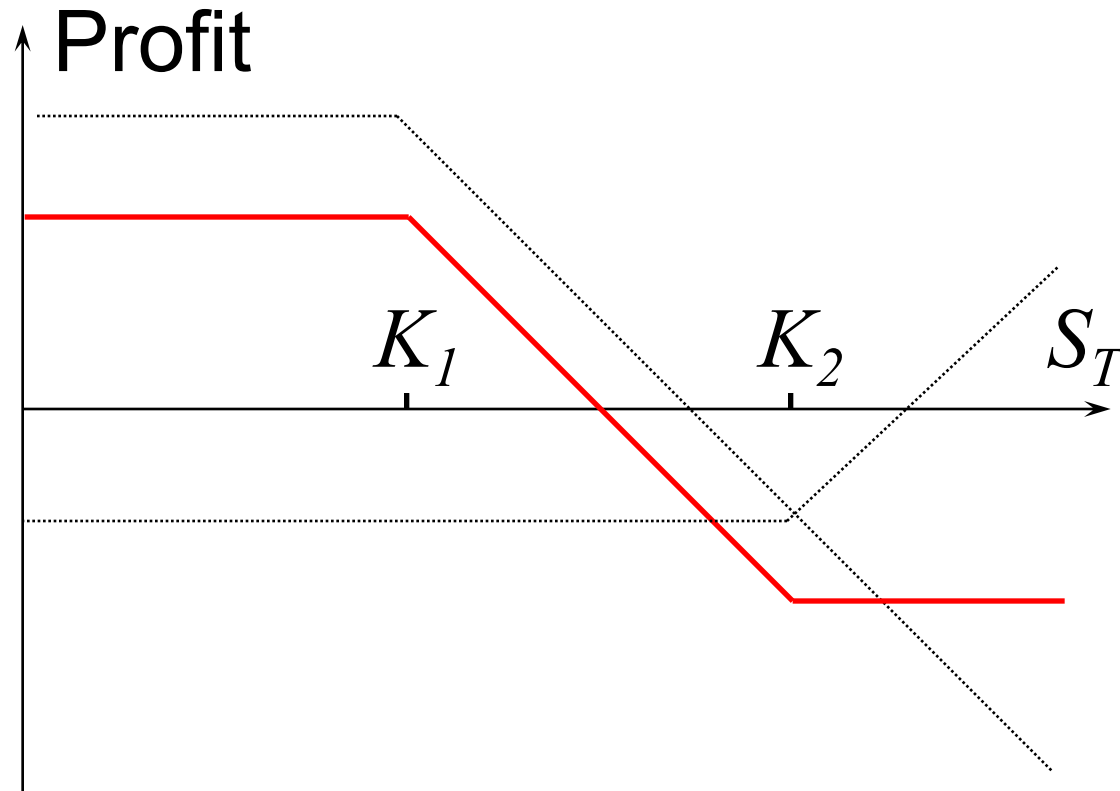


- Put-Call parity says that: $p + S_0 = c + Ke^{-rT} + D$
- Thus: $p_{K_1} + S_0 = c_{K_1} + K_1e^{-rT} + D$
- And: $p_{K_2} + S_0 = c_{K_2} + K_2e^{-rT} + D$
- Therefore: $p_{K_1} - p_{K_2} = c_{K_1} - c_{K_2} + (K_1 - K_2)e^{-rT}$
- Conclusion: going long an option with strike K_1 and short an option with strike K_2 will yield the same shape, regardless of whether done with a call or a put.

Bear Spread Using Calls



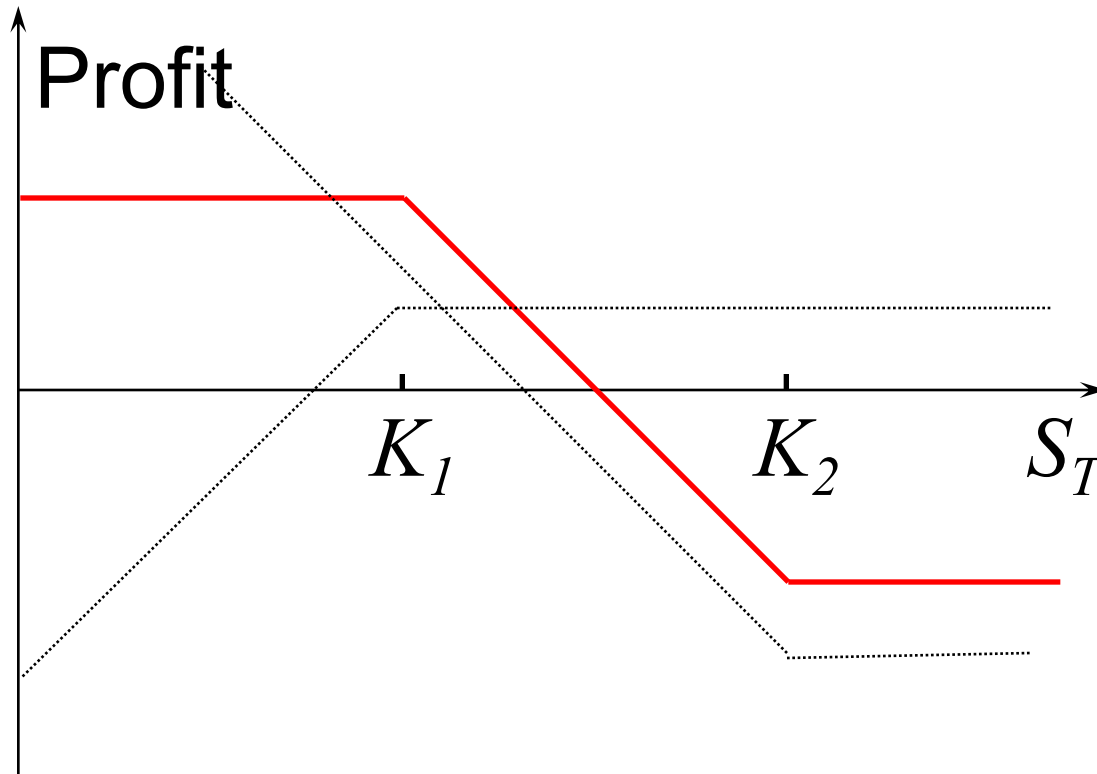
Created by buying a European call option on a stock with a certain strike price K_2 and selling/writing a call option on the same stock but with a lower strike price K_1 . Note that the option you buy is cheaper. Thus one receives a positive cash flow upfront.



Bear Spread Using Puts



Created by buying a European put option on a stock with a certain strike price K_2 and selling/writing a put option on the same stock but with a lower strike price K_1 . Note that the option you buy is more expensive. Thus the strategy requires an initial investment.



Box Spread

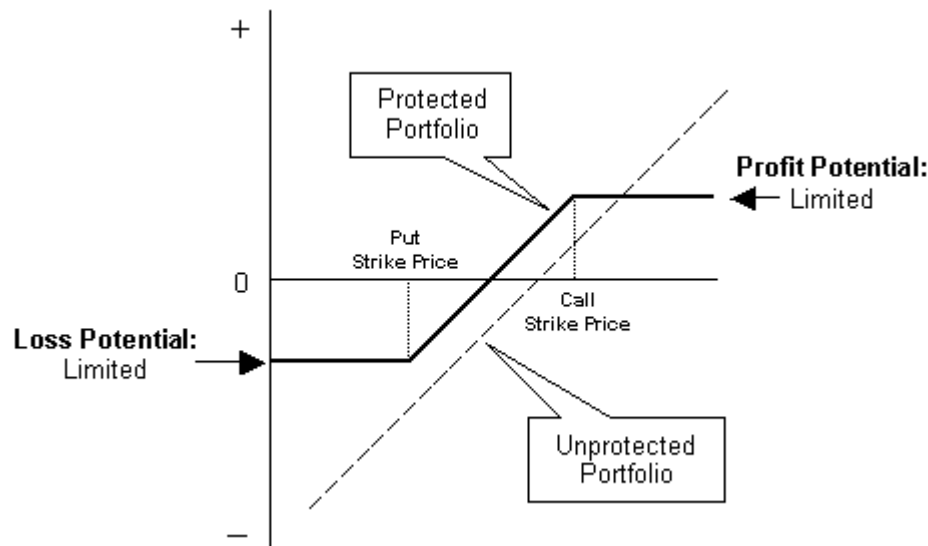


- A combination of a bull call spread and a bear put spread.
- If c_1 and p_1 have a strike of K_1 , and c_2 and p_2 a strike of K_2 (with $K_1 < K_2$), the bull call spread is $c_1 - c_2$ and the bear put spread is $p_2 - p_1$.
- By put-call parity:
 - $p_1 + S_0 = c_1 + K_1 e^{-rT} + D$
 - $p_2 + S_0 = c_2 + K_2 e^{-rT} + D$
- Subtracting one equation from the other gives us:
 - $c_1 - c_2 + p_2 - p_1 = (K_2 - K_1) e^{-rT}$ (value of the box spread today)
- At expiration, the payoff is $K_2 - K_1$ no matter what.
- If today's price differs from $(K_2 - K_1) e^{-rT}$, there is an arbitrage opportunity.
- But only if options are Europeans!

Related to spreads: strategy claimed to be used by Madoff



- Strategy: split-strike conversion or collar.
- Buy or already own stock, buy low-strike put, and sell high-strike call (Madoff claimed to use the market and index options, but same concept).



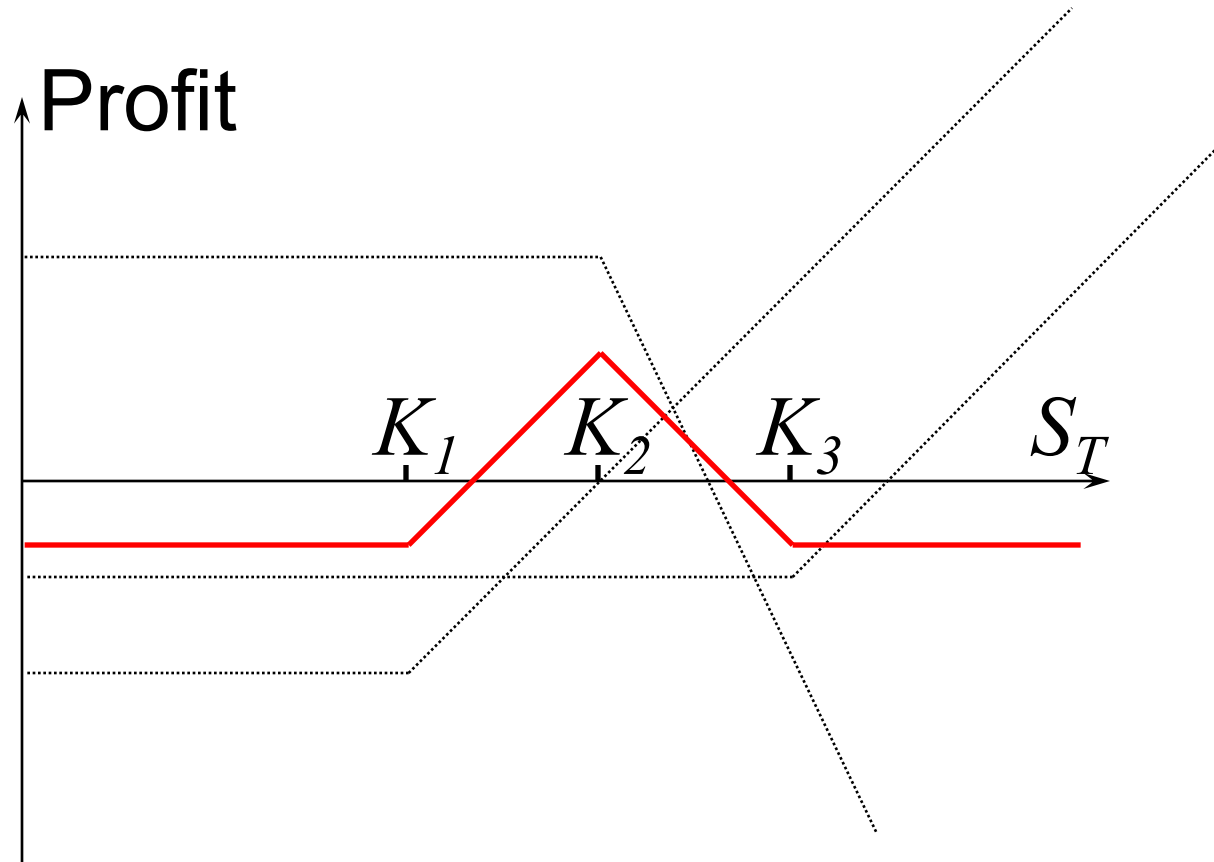
Butterflies Spreads



- A butterfly spread involves positions in options with three different strike prices: $K_1 < K_2 < K_3$
- Butterfly spread with call options:
 - Buy a K_1 -strike call option
 - Sell 2 K_2 -strike call options
 - Buy a K_3 -strike call option
- Butterfly spread with put options:
 - Buy a K_1 -strike put option
 - Sell 2 K_2 -strike put options
 - Buy a K_3 -strike put option
- Usually K_2 is close to the current stock price, “in the middle”.
- The strategy requires a small investment initially.

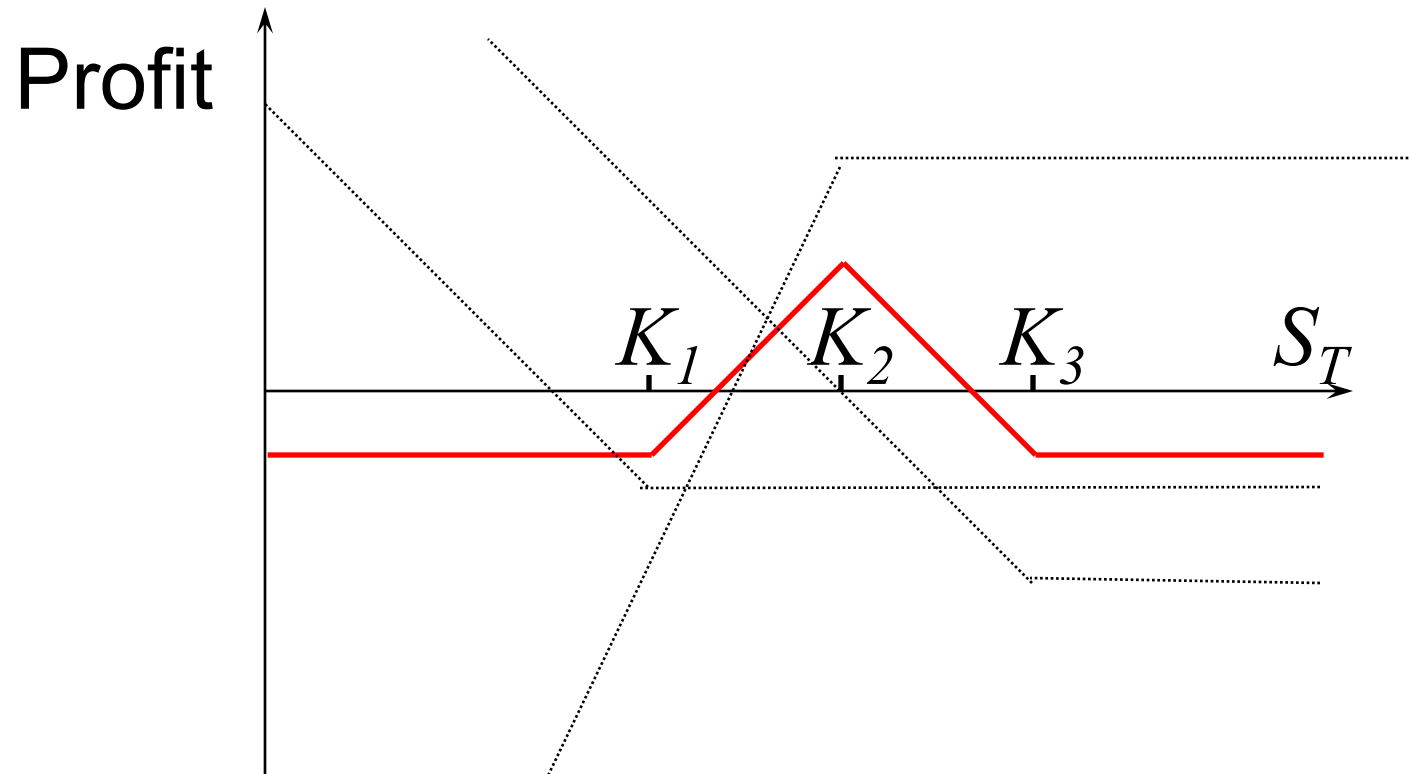
Butterfly Spread Using Calls

Figure 11.6, page 263



Butterfly Spread Using Puts

Figure 11.7, page 264



Butterflies Spreads



- A butterfly spread can also be shorted by following the reverse strategy. Hence:
- Reverse butterfly spread with call options:
 - Sell a K_1 -strike call option
 - Buy 2 K_2 -strike call options
 - Sell a K_3 -strike call option
- Reverse butterfly spread with put options:
 - Sell a K_1 -strike put option
 - Buy 2 K_2 -strike put options
 - Sell a K_3 -strike put option
- This strategy produces a modest profit if there is a large price movement.

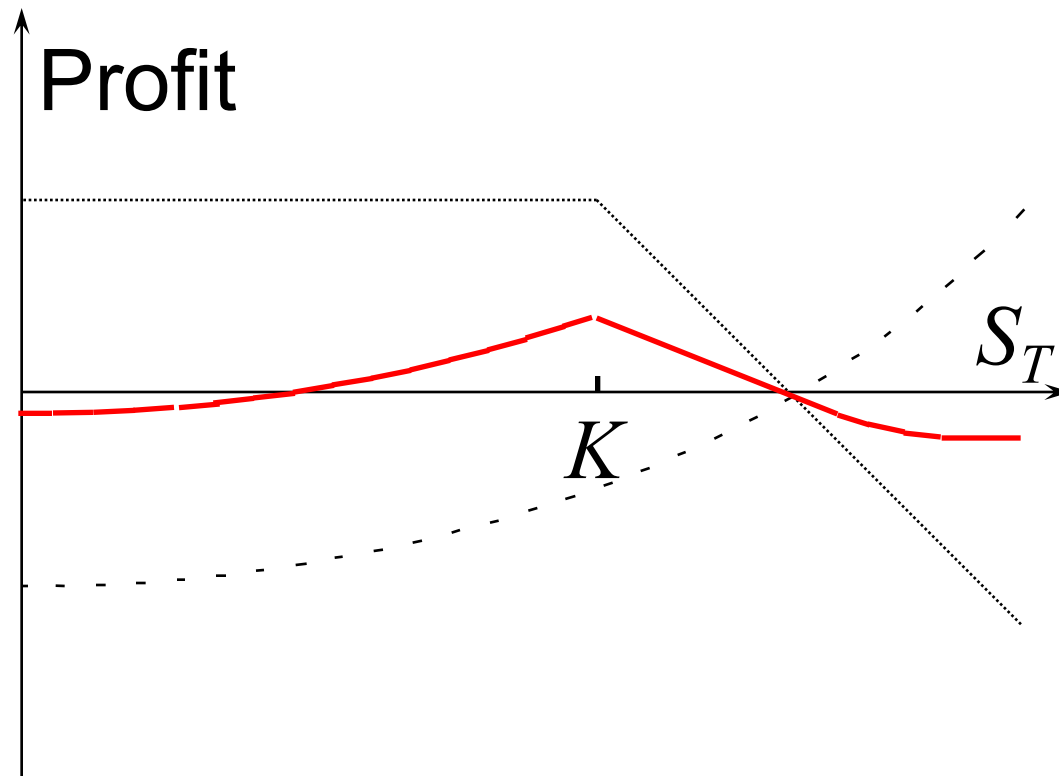
Calendar Spreads



- A calendar spread uses options of the same strike price K but of different maturities.
- Calendar spread with call options:
 - Buy a K -strike call option with a long maturity
 - Sell a K -strike call option with a shorter maturity
- Calendar spread with put options:
 - Buy a K -strike put option with a long maturity
 - Sell a K -strike put option with a shorter maturity
- They require an initial investment since the longer maturity option is more expensive. Profit diagrams for calendar spreads are usually produced showing the profit when the short maturity option expires.

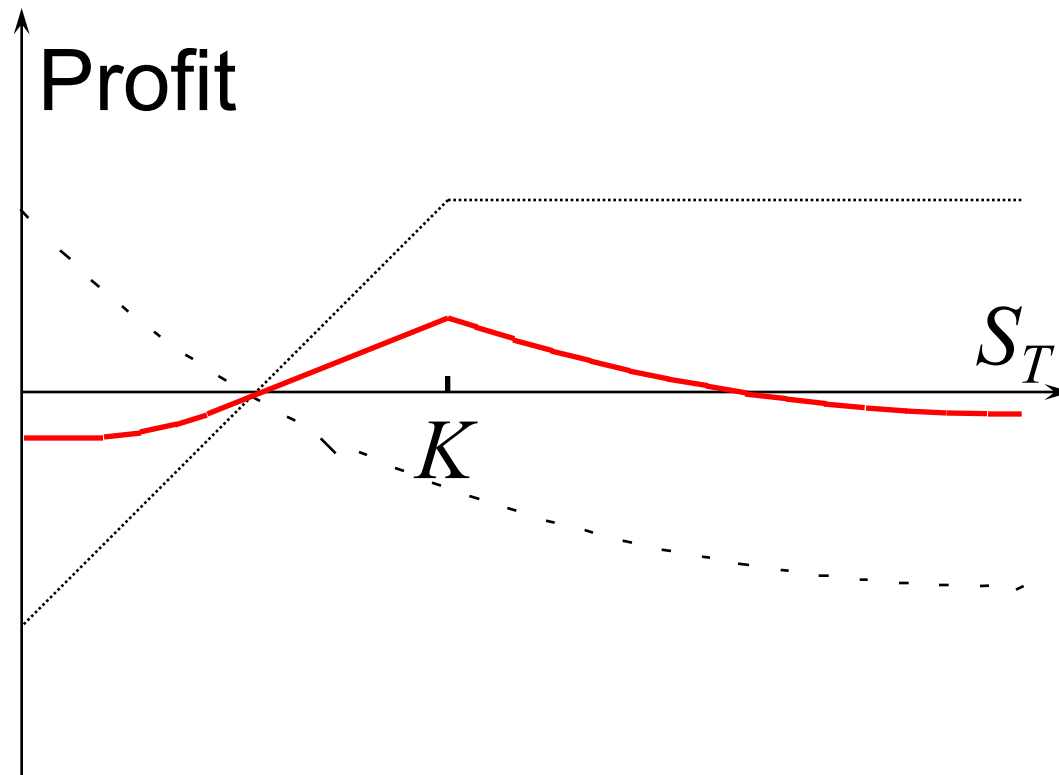
Calendar Spread Using Calls

Figure 11.8, page 265



Calendar Spread Using Puts

Figure 11.9, page 265



Calendar Spreads



- A *neutral calendar spread* has a strike price close to the current stock price.
- A *bullish calendar spread* involves a higher strike price.
- A *bearish calendar spread* involves a lower strike price.

- A calendar spread can also be shorted by following the reverse strategy.
- The strategy produces a modest profit if there is a large movement in the stock price.

- In a diagonal spread, both the expiration date and the strike price of the options are different, increasing the range of possible profit patterns.

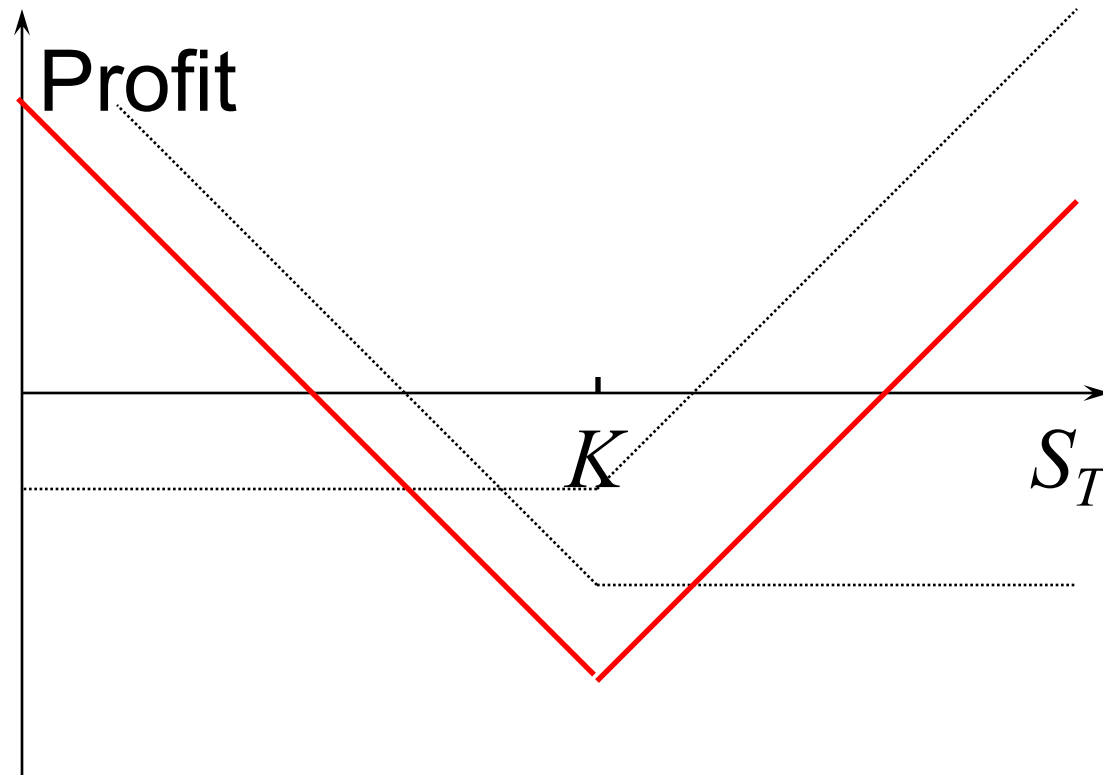
Straddles



- A (bottom) straddle involves buying both a European call and put with the same strike price and expiration date.
- If, at expiration, the stock price is near the strike price, the straddle leads to a loss.
- However, if there is a large enough movement in the stock price (up or down), a significant profit will result.
- A straddle makes sense if you are expecting a large move in a stock price do not know in which direction the move will be. But one must consider whether the possible “jump” might already be reflected in prices.
- A “top straddle” or “straddle write” is the reverse position: created by selling both a call and a put with the same strike and expiration.

A Straddle Combination

Figure 11.10, page 266



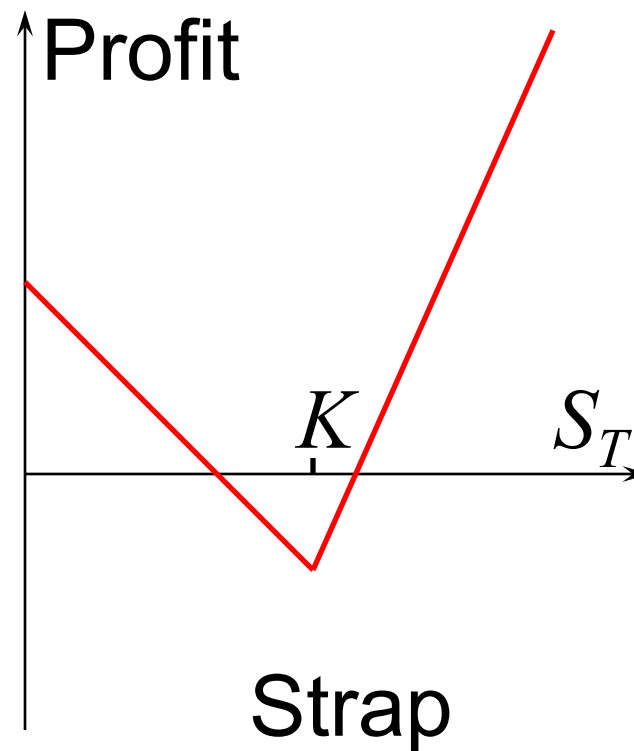
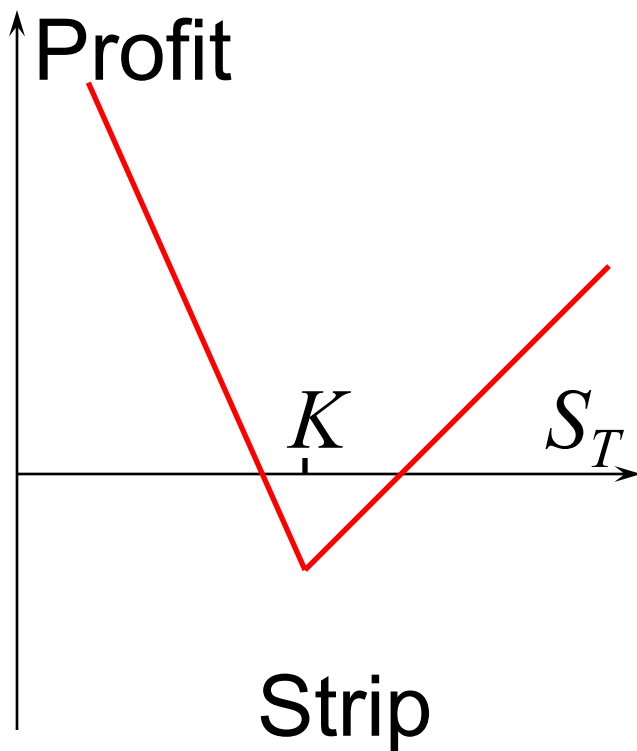
Strips and Straps



- A strip consists in a long position in one European call, and two European puts with the same strike and expiration date.
- A strap consists in a long position in two European calls, and one European put with the same strike and expiration date.
- The reasoning is similar to that of the straddle, but with a strip you are betting that a *decrease* in the stock price is more likely, and with a strap you are betting that an *increase* in the stock price is more likely.

Strip & Strap

Figure 11.11, page 267



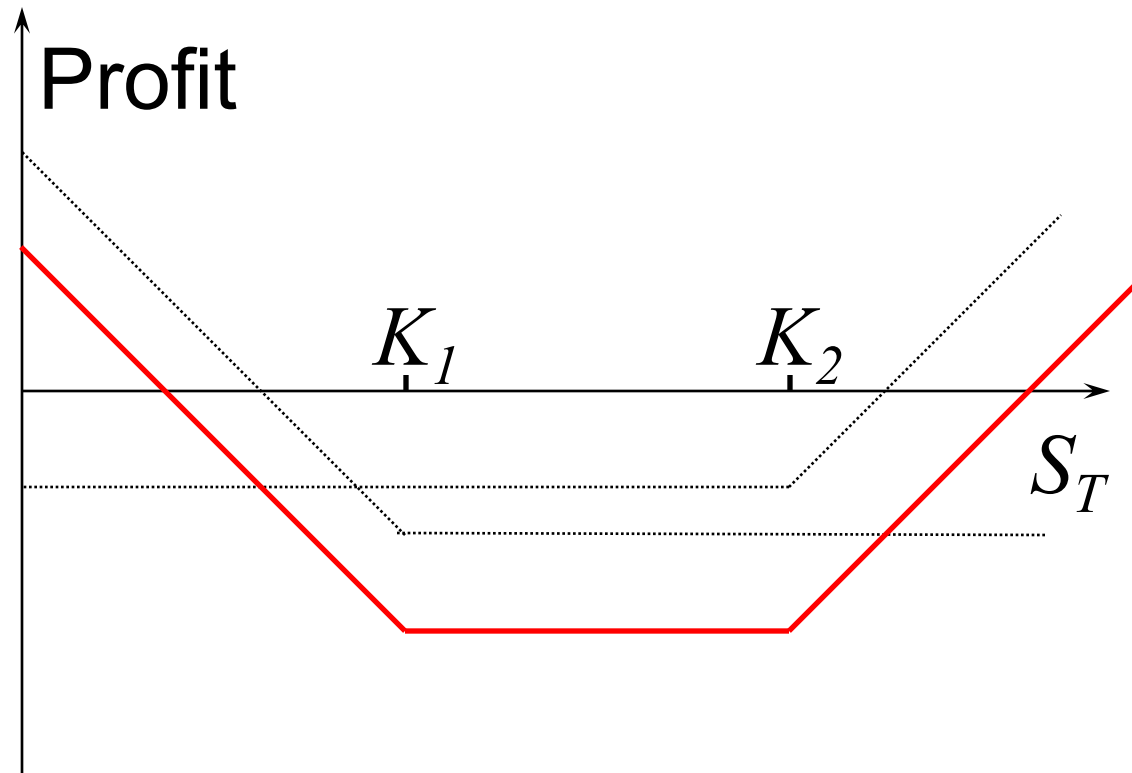
Strangle



- A strangle (a.k.a. “bottom vertical combination”) requires buying a European put with a low strike and a European call with a high strike, with the same expiration date (maturity).
- A strangle is cheaper than a straddle, but the stock has to move farther for a profit to be realized.
- The reverse position can be obtained by selling a strangle.
- The sale of a strangle is known as “top vertical combination”.

A Strangle Combination

Figure 11.12, page 268



What is going on with the names? Fifty Shades of option strategies?



- Strip
- Strap
- Spread
- Straddle
- Strangle
- Collar

Web source:

An option is a contract giving the purchaser the right, though not the obligation, to buy or sell a security at a specified price for a particular period of time. Options trading—conducted formally for stocks on U.S. exchanges since 1973—has given rise to a number of distinctively named investing strategies.

These strategies, confusingly enough, sound a lot like strategies used in a completely different context: The names of sex positions that the women's magazine *Cosmopolitan* suggests for its readers, in forums such as its Cosmopolitan.com website and its how-to guide [The Cosmo Kama Sutra: 99 Mind-Blowing Sex Positions](#).

So let's conduct a test of your financial—and erotic—expertise. Which of these are options investing strategies? Which are Cosmo sex positions?

Other Payoff Patterns



- When the strike prices are close together, a butterfly spread provides a payoff consisting of a small “spike”.
- If options with all strike prices were available, any payoff pattern could (at least approximately) be created by combining the spikes obtained from different butterfly spreads.