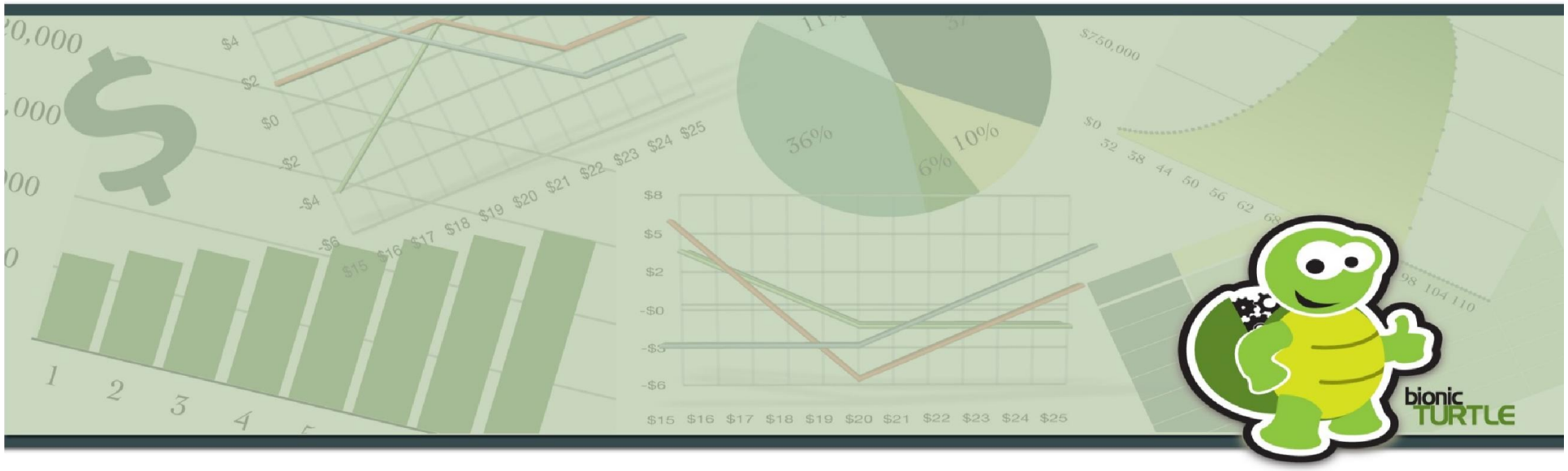


P1.T3. Financial Markets & Products

Hull, Options, Futures & Other Derivatives

Trading Strategies Involving Options

Bionic Turtle FRM Video Tutorials

By David Harper, CFA FRM

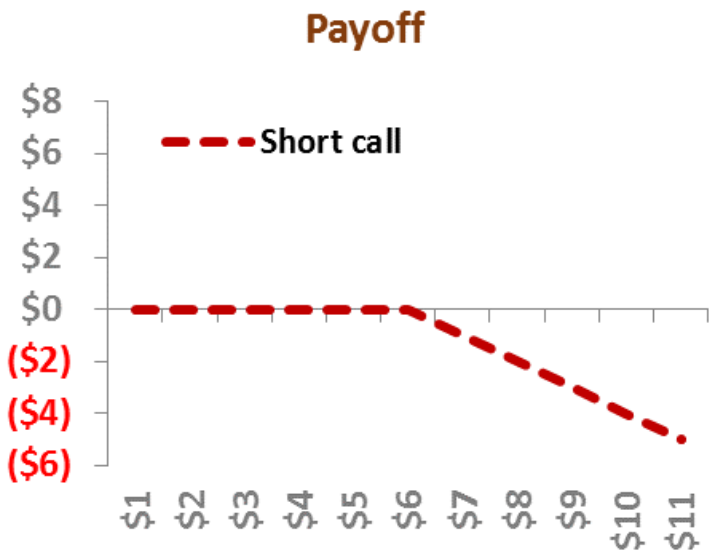
BIONIC TURTLE

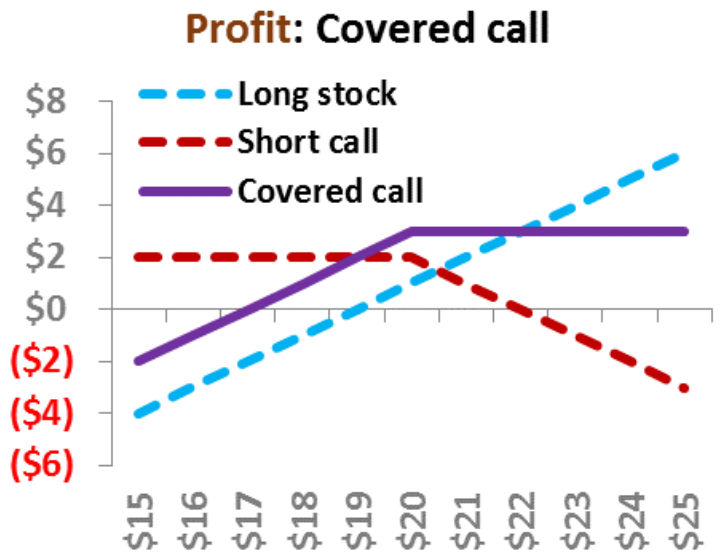
Trading Strategies Involving Options

- Explain the motivation to initiate a covered call or a protective put strategy.
- Describe the use and calculate the payoffs of various spread strategies.
- Describe the use and explain the payoff functions of combination strategies.

Payoff vs Profit diagrams

- Payoff is **future gain/loss** without regard to initial cost (or cash inflow)
- Profit = Payoff – cost (without regard to TVM)
  - For example, call option cost, c = $2.00 and payoff is $10.00, so profit is $8.00 (even as PV of profit is less than $8.00)





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Explain the motivation to initiate a covered call or a protective put strategy.

Covered Call

To "***write a covered call***" is to combine a long stock position with a short position in a call option.

Writing a covered call = **long stock + short call option**
= $S_0 - c$

Rationale of the covered call is either:

- **To cover the cost of the potential short call payoff with the stock**: The long stock position "covers" or protects the investor from the payoff on the short call that becomes necessary if there is a sharp rise in the stock price.
- **To generate income via the sale of the short call**: Writing a covered call is an income strategy.

Covered (with stock)

versus

Naked (no stock)

Explain the motivation to initiate a covered call or a protective put strategy (continued)

Covered Call (continued)

This trade reflects a *neutral to bullish* outlook.

- If the stock rises significantly, the call option will not be exercised; however, we have the underlying to protect ourselves from that scenario.
- On the other hand, by writing a call option we collect the premium. If the stock price stays about the same, we collect the premium. We can then use this strategy to roll over the options each month, collecting our premium.

CONCEPT:
If the payoff strategy for a covered call looks like a short put option, that's because it is! Remember the put-call parity $\boldsymbol{S_0 - c = Ke^{-rt} - p}$. We can infer from this that going long the stock and short a call is the same as going short a put with the PV of the strike price in the bank. By knowing the intuition behind the put-call parity you can often reason your way to the answer!

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Explain the motivation to initiate a covered call or a protective put strategy (continued)

Protective Put

- **A protective put can be viewed as insurance.** This strategy buys a European put option on a stock and the stock itself.
  - We have created a synthetic **long call option**!
- "Rolling over" protective puts is a strategy that attempts to benefit from the potential increase in the stock price while capping losses. However, the premium paid and transaction costs incurred dilute the profits from such a strategy, just like in the case of the covered call.

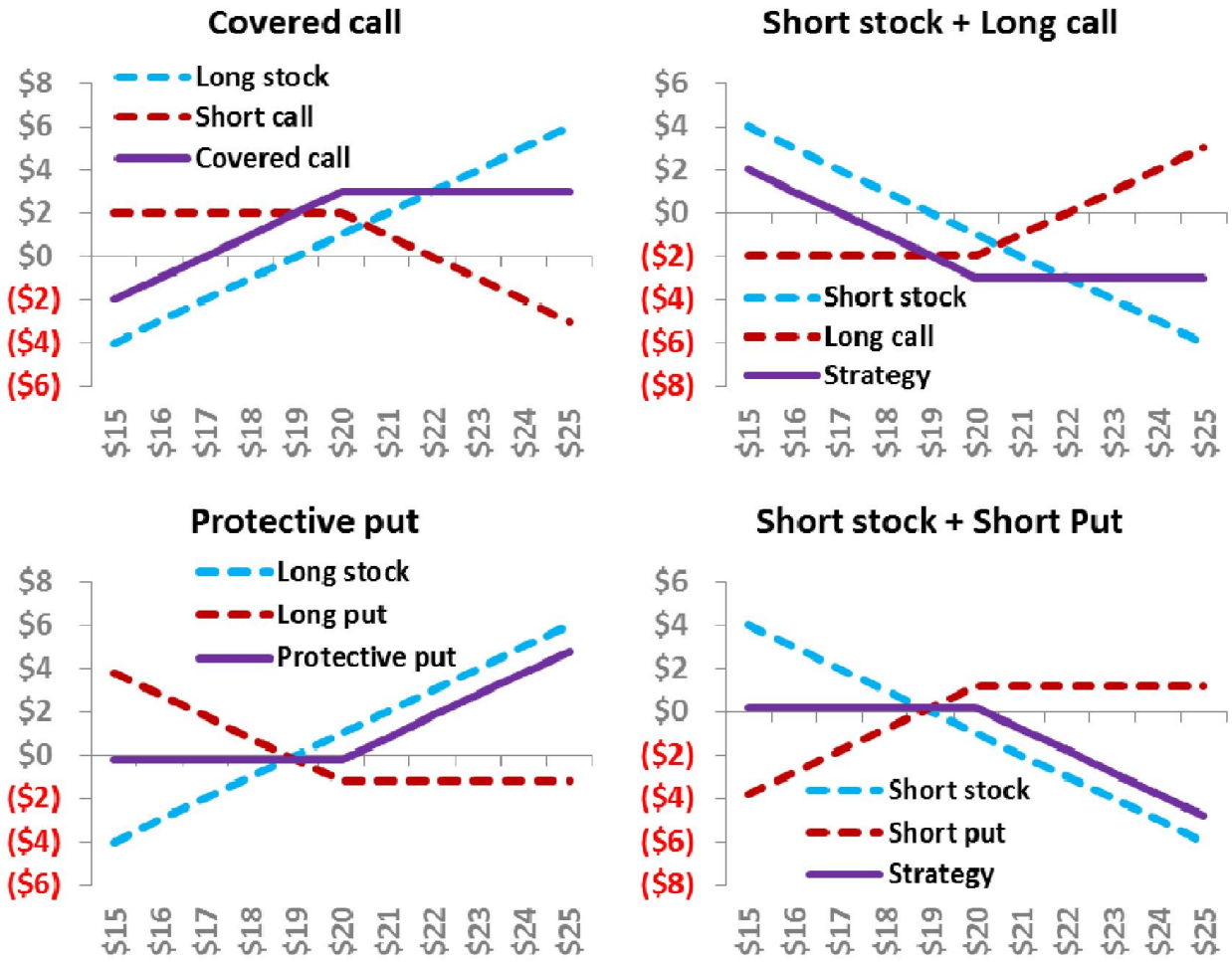
Protective put is one side of put-call parity!

$$c + Ke^{-rT} = p + S_0$$

BIONIC TURTLE

Explain the motivation to initiate a covered call or a protective put strategy (continued)

Assumptions: Stock price = $20, strike price of options = $20, call premium = $1.99, put premium = $1.20



Describe the use and calculate the payoffs of various spread strategies.

A spread strategy is a position with two or more options of the same type, i.e., two or more calls; or, two or more puts.

Bull spread (type of vertical spread)

- Buy European call option on a stock with a **lower strike** price, *plus* Sell European call option on the same stock with a **higher strike** price.
- Or: Buy European put with low strike price + Sell European put with high strike
  - In case of both call and put bull spreads, **we are bullish** and expect the price of the underlying to increase
  - Bull spread limits the investor's upside and downside risk
  - Initial cost: if created from calls requires an initial investment (cash outflow) but created from puts generates a cash inflow.

with calls	**Long call, K1 = $18.00, c1 = $3.21** **Short call, K2 = $22.00, c2 = $1.13**
With puts	**Long put, K1 = $19.00, p1 = $0.81** **Short put, K2 = $22.00, p2 = $2.27**

BIONIC TURTLE

Describe the use and calculate the payoffs of various spread strategies (continued)

Payoff: For a call bull spread, if (K_1) is the strike price of the long call option and (K_2) is the strike price of call option sold where $K_2 > K_1$, and S_T is the stock price at option expiration, then:

- If S_T is greater than the higher strike price(K_2), the payoff is the difference between the two strike prices, $K_2 - K_1$
- If S_T lies between the two strike prices, the payoff is $S_T - K_1$
- If S_T is below the lower strike price(K_1), the payoff is zero.

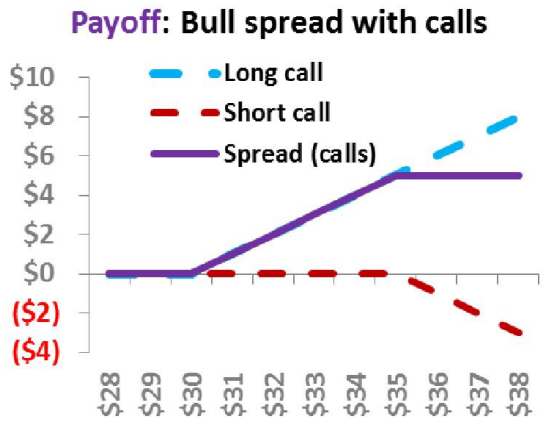
Unlike bull spreads created from calls, those created from puts have a payoff that is either negative or zero.

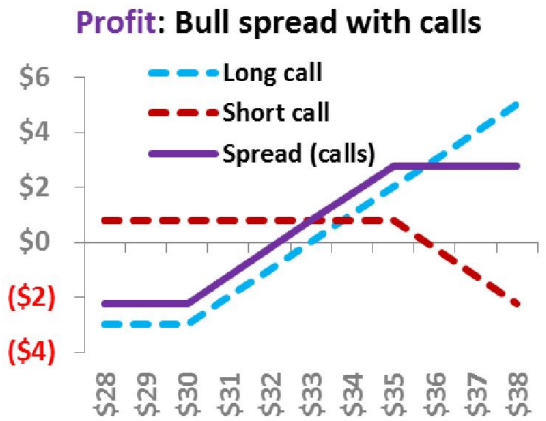
BIONIC TURTLE

Describe the use and calculate the payoffs of various spread strategies (continued)

Hull Ex 12.2

An investor buys for $3 a 3-month European call with a strike price of $30 and sells for $1 a 3-month European call with a strike price of $35.





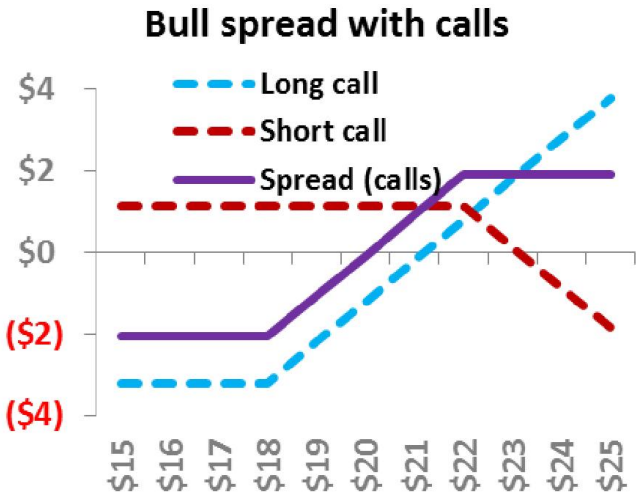
- The payoff from this bull spread strategy is $5 if the stock price is above $35, and zero if it is below $30.
- If the stock price is between $30 and $35, the payoff is the amount by which the stock price exceeds $30.
- The cost of the strategy is ~ $2 = 3-1. So, the profit is the payoff less this cost.

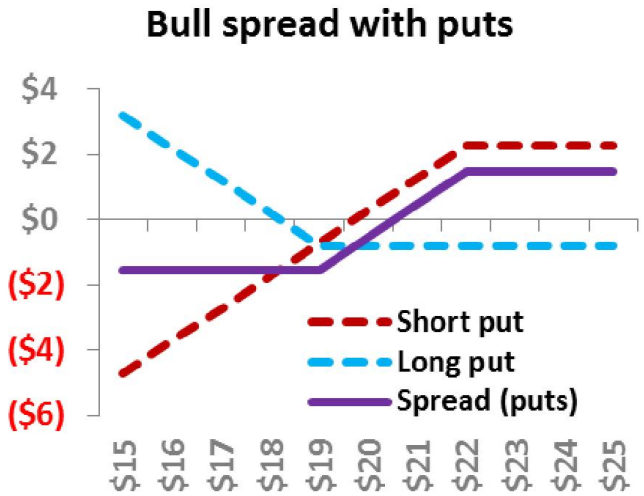
BIONIC TURTLE

Describe the use and calculate the payoffs of various spread strategies (continued)

The graphs here illustrate profits from bull spreads with call and puts. Assumptions:

- **Bull spread with calls** (*below left*)**:** Long call strike (K_1) = \$18 and premium = \$3.21. Short call has a **higher** strike(K_2) = \$22 and premium = \$1.13 on the same stock priced at \$20. Both with same time to expiration of 1 year.
- **Bull spread with puts** (*below right*)**:** Long put strike (K_1) = \$19 and premium = \$0.81. Short put has **higher** strike(K_2) = \$22 and premium = \$2.27 on the same stock priced at \$20. Both with same time to expiration of 1 year.





Describe the use and calculate the payoffs of various spread strategies (continued)

Bear spread (type of vertical spread)

A bear spread can be created by buying a European put with a higher strike price and selling a European put with a lower strike price on the same underlying stock.

We can create a bear spread using call options also.

- In the case of either a put or call bear spread, **we are bearish and expect the underlying stock price to decline.**
- A bear spread created from puts involves an **initial cash outflow** because the price of the put sold is less than the price of the put purchased while creating a bear spread with calls we have a cash inflow.
- Like bull spreads, bear spreads limit both the upside profit potential and the downside risk.

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Describe the use and calculate the payoffs of various spread strategies (continued)

Payoff

For a put bull spread, if (K_2) is the strike price of the long put option and (K_1) is the strike price of short put option where $(K_1 < K_2)$, and S_T is the stock price at option expiration, then

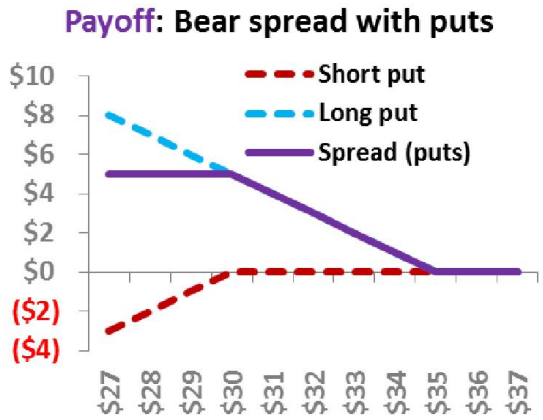
- If S_T is greater than K_2, the payoff is zero.
- If S_T is less than K_1, the payoff is $K_2 - K_1$
- If the stock price is between K_1 and K_2, the payoff is $K_2 - S_T$.

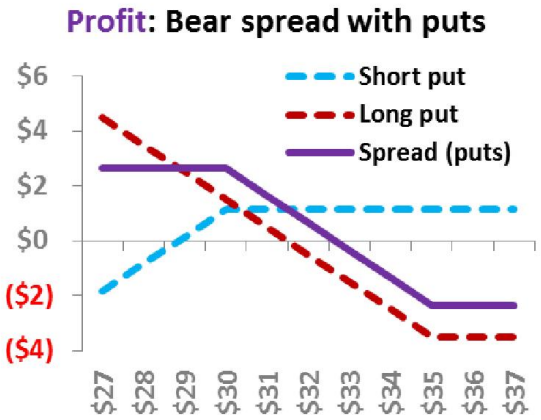
BIONIC TURTLE

Describe the use and calculate the payoffs of various spread strategies (continued)

Hull Ex 12.3

An investor buys for $3 a 3-month European put with a strike price of $35 and sells for $1 a 3-month European put with a strike price of $30.





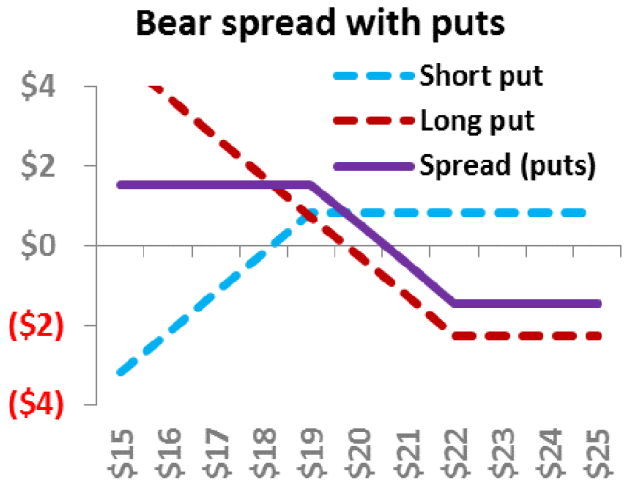
- The payoff from this bear spread strategy is zero if the stock price is above $35, and $5 if it is below $30.
- If the stock price is between $30 and $35, the payoff is $35 - S_T$.
- The options cost $2(=3-1) up front. The profit is calculated by subtracting this initial cost from the payoff.

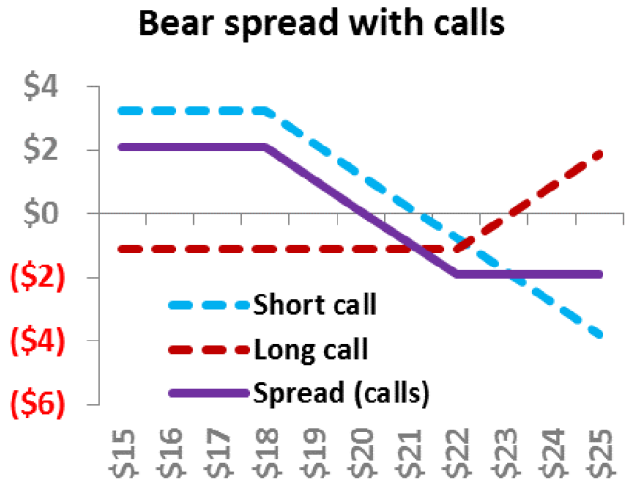
BIONIC TURTLE

Describe the use and calculate the payoffs of various spread strategies (continued)

Illustration of profits from bear spreads with puts and calls. Assumptions:

- **Bear spread with puts:** Long put with a strike (K_1) = \$22 and premium = \$2.27 while short put has a higher strike(K_2) = \$19 and a premium = \$0.81 on the same stock priced at \$20 . Both have same time to expiration of 1 year.
- **Bear spread with calls:** Long call has strike (K_1) = \$22 and premium = \$1.13 while short call has a higher strike(K_2) = \$18 and a premium = \$3.21 on the same stock priced at \$20. Both have same time to expiration of 1 year.





We have a range of possible payoff scenarios, however; our loss is capped at \$0 (excluding the premium), while our gain is capped at $K_2 - K_1$ (excluding the premium).

BIONIC TURTLE

Describe the use and calculate the payoffs of various spread strategies (continued)

Box Spread

- A ***box spread*** is a combination of a bull call spread with strike prices K_1 and K_2 and a bear put spread with the same two strike prices.
- **The payoff from a box spread is always $K_2 - K_1$.**
- The value of a box spread is therefore always the present value of this payoff or $(K_2 - K_1)e^{-rT}$. A value different from this would give rise to an arbitrage opportunity.

CONCEPT: "A box spread arbitrage only works with European options" (Hull)

BIONIC TURTLE

Describe the use and calculate the payoffs of various spread strategies (continued)

Butterfly spread (sideways strategy)

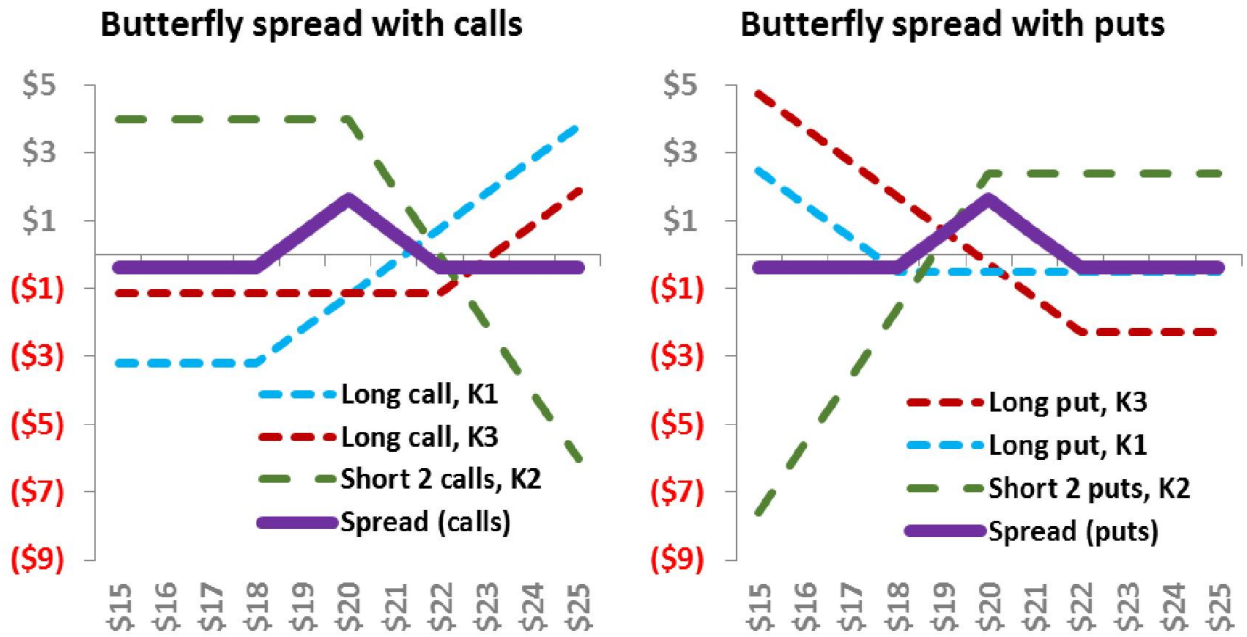
A ***butterfly spread*** involves **positions in options with three different strike prices.** It can be created with call or put options.

- For example, butterfly spread involves buying a European call option at a relatively low strike price K_1, buying a European call option with higher strike price K_3, and selling two European call options at strike price K_2 halfway between K_1 and K_2. Generally, K_2 is close to the current stock price.
- This **strategy leads to a profit if the stock price stays close to K_2, but gives rise to a small loss if there is a significant stock price move in either direction**. It is therefore appropriate for an investor who feels that large stock price moves are unlikely. It requires a small investment initially.

BIONIC TURTLE

Describe the use and calculate the payoffs of various spread strategies (continued)

In this graph below depicting the butterfly spread the assumptions are: Long call with strike K_1=\$18, premium = \$3.21, long call with strike K_3 =\$22, premium = \$1.13 short two calls with strike K_2=\$20, premium = \$1.99. **Why the butterfly?** The investor expects low volatility (range-bound), and wants to cap the risk.



Describe the use and calculate the payoffs of various spread strategies (continued)

Calendar spread (same strike, different expiration)

In a ***calendar spread***, the options have the same strike price but different expiration dates. The calendar spread can be created with calls or puts.

- Created from:
  - **Two calls:** Investor sells a call option with a certain strike price and buys a call option with same strike price but with a longer term to maturity.
  - **Two puts:** Investor sells a short-maturity put option and buys a long-maturity put option with the same strike price.

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Describe the use and calculate the payoffs of various spread strategies (continued)

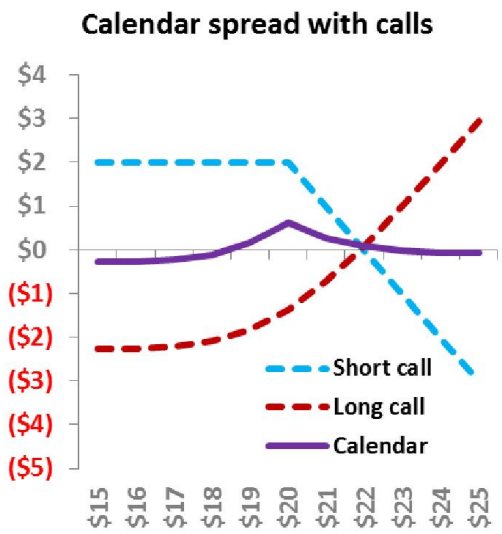
Payoff: The payoff for a calendar spread is as outlined below.

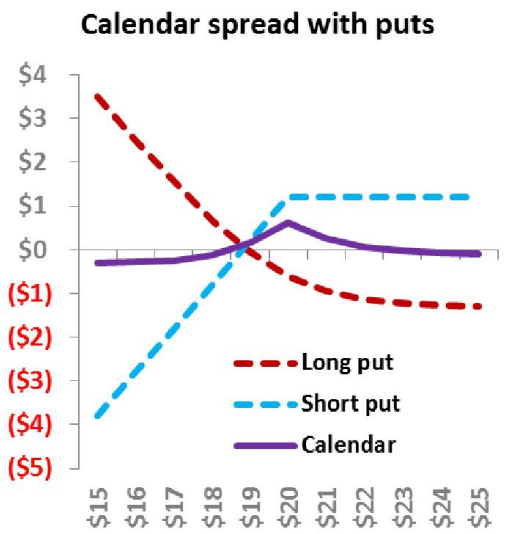
- If the stock price at expiration (S_T) is very low the short-maturity option expires worthless and the value of the long-maturity option is close to zero. The investor therefore incurs a loss that is close to the cost of setting up the spread initially.
- When S_T is very high, both the short and long- maturity options are worth close to $S_T - K$, if K is the strike price of the options. Again, the investor makes a net loss that is close to the cost of setting up the spread initially.
- If S_T is close to K, the short-maturity option costs the investor either a small amount or nothing at all. However, the long-maturity option is still quite valuable. In this case, a significant net profit can be made.

BIONIC TURTLE

Describe the use and calculate the payoffs of various spread strategies (continued)

- Short call with 1year maturity, premium = $1.99 and Long call with 1.25 year maturity, premium = $2.27 and both with a strike price of $20.
- Short put with 1year maturity, premium = $1.20 + Long put with 1.25 year maturity, premium = $1.29 and both with a strike price of $20.





The longer the maturity of an option, the more expensive it usually is. A calendar spread therefore usually requires an initial investment.

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

BIONIC TURTLE

Describe the use and explain the payoff functions of combination strategies.

A combination strategy involves taking a position in both call(s) and put(s) on the same stock.

Straddle

To straddle is to buy or sell a call and a put on the same stock with same strike price and expiration date. In what is called as a **straddle purchase** (***bottom straddle)***, the investor **buys** a call and put with the same strike price and expiration date. A **straddle write** (***top straddle***) is the reverse of this position which is created by **selling** a call and a put with the same exercise price and expiration date.

- **Why the bottom straddle?** This is appropriate when an investor is expecting a large move in a stock price but does not know in which direction the move will be. The worst-case scenario is that the stock settles at the strike price.
- **Why the top straddle?** The investor is highly confident that the stock will not stray from the strike price in either direction. If the stock price equals the strike price, the investor has collected two premiums for profit. This is a very risky strategy.

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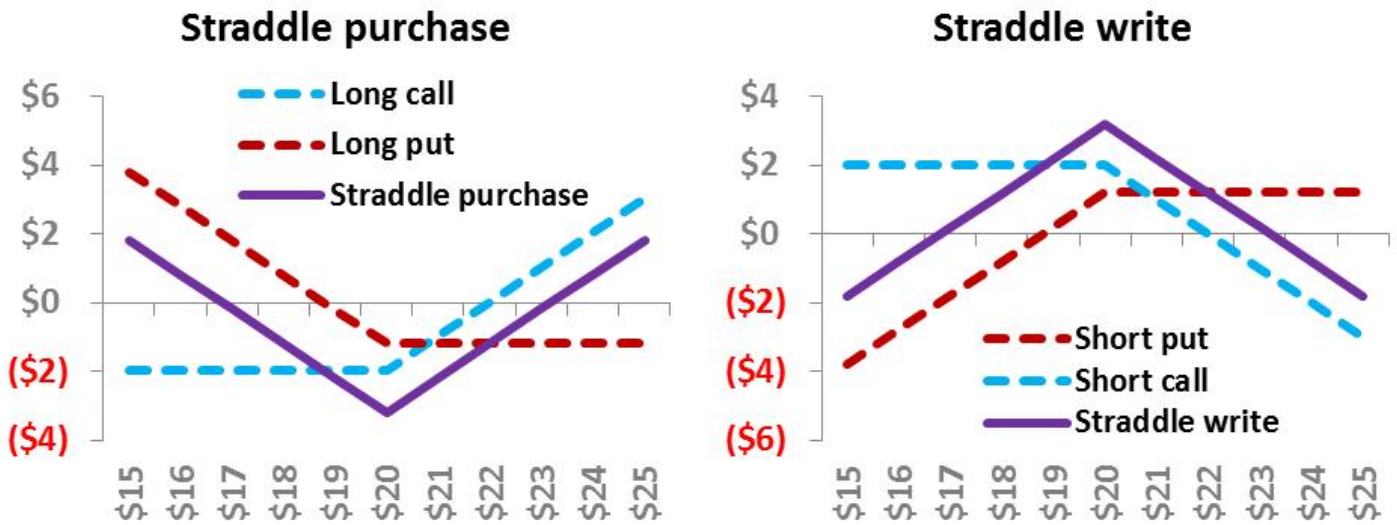
Describe the use and explain the payoff functions of combination strategies (continued)

For example

- **Bottom straddle consisting of a long call** with a premium = $1.99 and a long put with a premium = $1.20, both with a strike price of $20.
- **Top straddle consisting of a short call** with a premium = $1.99 and a short put with a premium =$1.20, both with a strike price of $20.



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Describe the use and explain the payoff functions of combination strategies (continued)

Strips and Straps

Strip consists of a long position in one call and two puts with same strike price and expiration date. **Strap** consists of a long position in two calls and one put with same strike price and expiration date.

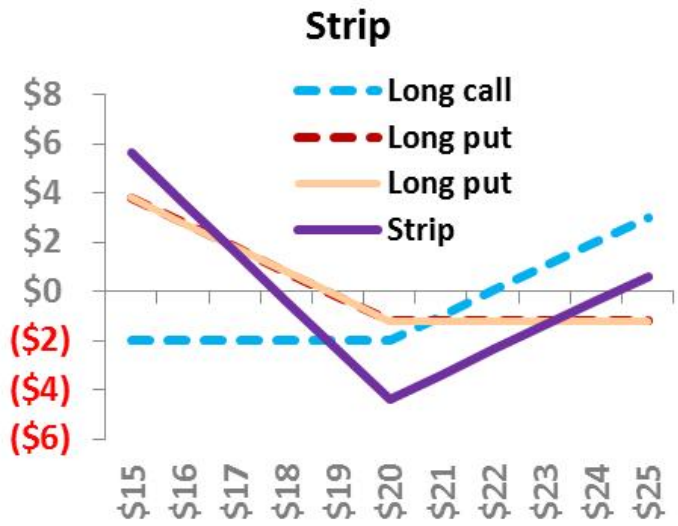
- **Why the strip?** The investor bets on a large stock price move but considers a decrease more likely than an increase.

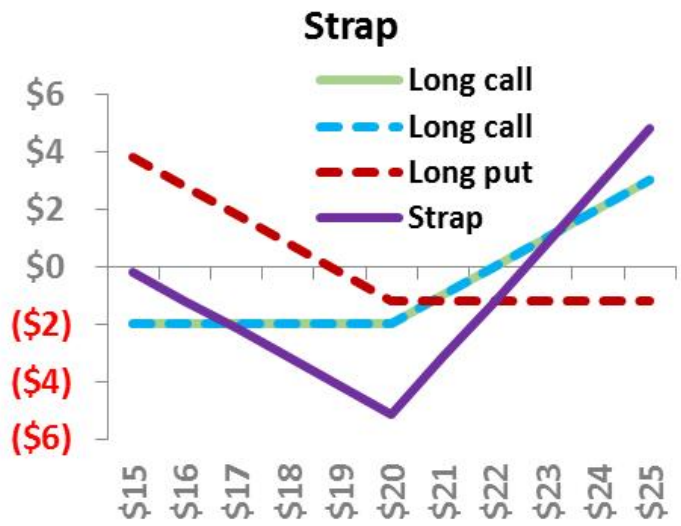
- **Why the strap?** Like the strip, the investor bets on a large stock price movement, but instead considers an increase more likely. In this regard, a strap is also similar to a straddle, but in this case, we are biased upwards.

Describe the use and explain the payoff functions of combination strategies (continued)

This illustrated strip consists of a long call with a premium = $1.99 plus two long puts priced at $1.20, all with a strike price of $20 and time to expiration of one year.

The graph related to the strap consists of two long calls, priced at $1.99 plus a long put with a premium of $1.20, all with a strike price of $20, and time to expiration of one year.





Describe the use and explain the payoff functions of combination strategies (continued)

Strangle

In a **strangle**, (aka ***bottom vertical combination***), investor **buys** a put and a call with the same expiration date and different strike prices. The call strike price is higher than the put strike price. The **sale of a strangle** where an investor **sells** a put and a call with the same expiration date and different strike prices is also referred to as a ***top vertical combination***.

- **Why the strangle?** The investor is betting on a large price movement but is uncertain whether it will be an increase or a decrease. A strangle is **similar to a straddle but cheaper to install**. But this comes at the cost of requiring more extreme price movements than with the straddle. This is a strategy that is bullish on volatility.
- **Why write a strangle?** Strangle writing can be appropriate for an investor who feels that large stock price moves are unlikely. Just as with sale of a straddle, this is a risky strategy involving unlimited potential loss to the investor.

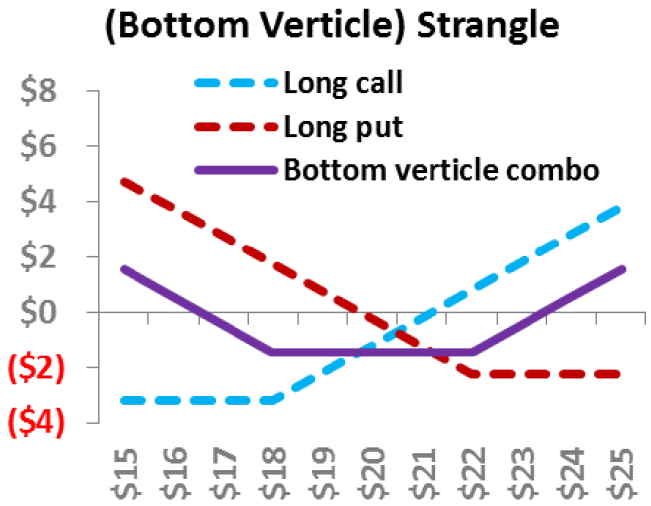
BIONIC TURTLE

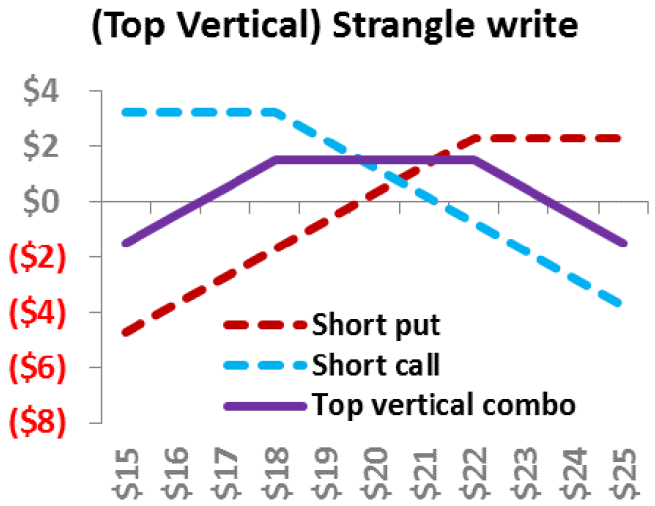
Describe the use and explain the payoff functions of combination strategies (continued)

Payoff: The profit pattern for a strangle depends on how close together the strike prices are. If strike prices are far apart, the less the downside risk and the farther the stock price has to move for a profit to be realized.

The illustrated graphs show a:

- strangle consists of a long call with strike = $18, premium = $3.21 plus a long put with strike =$22, premium = $2.27.
- strangle write consisting of a short call with strike = $18, premium=3.21$ plus a short out with strike =$22, premium = $2.27

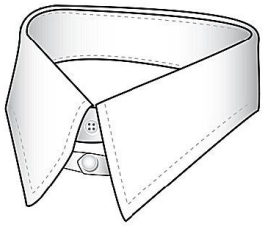




BIONIC TURTLE

Describe the use and explain the payoff functions of combination strategies (continued)

Collar and costless collar



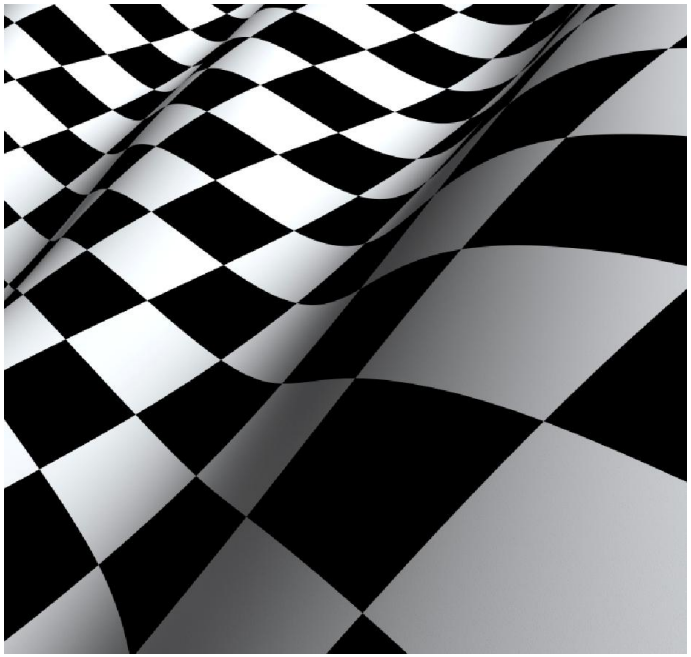
A **collar** (sometimes also referred to as a fence) is a combination strategy where we own the underlying, sell a call option with a strike price greater than the current price of the underlying ($K_{call} > S$), and buy a put option with a strike price less than the current price of the underlying ($K_{put} < S$). This strategy gives us a range of profit or losses.

When the premium collected from writing the call exactly matches the premium paid for the put, we have what is called a **zero cost, or *costless collar***.

The End

P1.T3. Financial Markets & Products

Hull, Options, Futures & Other Derivatives
Trading Strategies Involving Options



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