



- 1 B.1.1 Call Options - Part 1
 - Quick Review of a Long Forward
 - Call Option Details
 - To Exercise or Not To Exercise
 - Purchased Call Payoff
 - Exercises



If you take the long position in a forward contract then you are **obligated** to buy the asset at the forward price when the contract expires.

Two cases:

1. asset price at expiration $>$ forward price \Rightarrow you win 😊
2. asset price at expiration $<$ forward price \Rightarrow you lose 😞

You could lose as much as the forward price if the asset is worthless at expiration.

What if you don't want the downside risk of the long forward? Instead of an **obligation** to buy you would prefer the **option** to buy.

(ENTER CALL OPTION)



Call Option (or **Call**) – contract under which the buyer has the **option** to buy an asset, but not the obligation to buy.

Like the forward (and every other derivative) there are two parties involved:

- call option buyer (long position)
- call option seller or writer (short position)

If the call buyer has the **option** to buy the asset, then the call writer has an **obligation** to sell the asset to the buyer if she **exercises** her option.

What is in it for the option writer?

- **premium** – amount paid to the option writer at the time of the agreement.



If the call buyer exercises her option, what price does she pay?

- **strike price** (or **exercise price**) – what the buyer pays for the underlying asset.

How long does the call buyer have to exercise the option?

- **expiration date** – date by which the option must be exercised or become worthless.

Exercise Style – determines the time at which exercise can occur:

- **European** – only at **e**xpiration
- **American** – at **a**n anytime during the life of the option

Both styles can be traded anywhere in the world.

We will always assume European unless stated otherwise.



Putting it all together:

- two parties (buyer and seller) make an agreement
- buyer pays a premium to the seller
- buyer gets the option to buy underlying asset on expiration date at strike price

Notation:

K – strike price

T – time until expiration

S_T – underlying asset spot price at expiration

$C(S, K, T)$ – call premium



John buys a call option on stock XYZ with 6 months to expiration with a strike price of 100. If the price of XYZ in 6 months is 120, will John exercise his option? What if the price of XYZ is 80?

XYZ is 120:

→ John can exercise his option to buy for 100 and then

← sell for 120 in the market

to earn $120 - 100 = 20$ immediately (ignoring transaction costs).

Clearly, John will exercise his option to buy at 100.

XYZ is 80:

If John wants to buy XYZ, then he can do so in the market for 80. Why exercise his option to buy at 100?

John does not exercise.

Call option will only be exercised if asset price $>$ strike price.

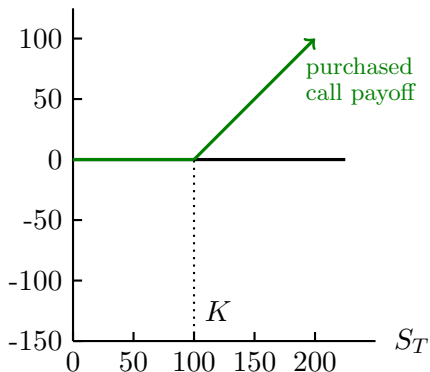
Purchased Call Payoff at Expiration



Call option will only be exercised if the asset price is greater than the strike price.

$$\text{purchased call payoff} = \max(0, S_T - K)$$

Graph call option payoff with strike of 100 and expiration time of T as a function of S_T .





True or false:

- A. A purchased call is an obligation to buy the underlying asset.
 - B. A purchased call is an option to buy the underlying asset.
 - C. A written call is an obligation to sell the underlying asset if the purchaser of the call exercises his option.
 - D. A written call is an option to sell the underlying asset.
 - E. A call option is a derivative.
-
- A. False. Option to buy the underlying asset.
 - B. True.
 - C. True. The call buyer has the option, thus the call writer has an obligation if the buyer exercises her option.
 - D. False.
 - E. True. It derives its value from the underlying asset.



For a call option with a strike price of 70:

- write the payoff for a purchased call as a function of the spot price at expiration.
- graph the payoff of the purchased call.

$$\text{purchased call payoff} = \max(0, S_T - 70)$$

