Module 4

Corporate Financial Decision-Making for Value Creation

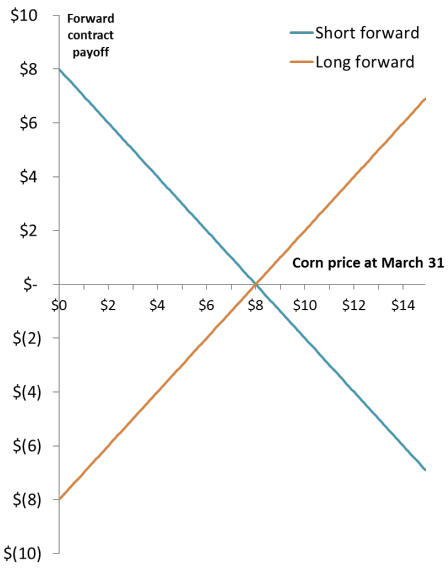
Introducing Options
(Flexibility has value… but someone has to pay for it!)

Presenter: Sean Pinder

THE UNIVERSITY OF MELBOURNE

BNY MELLON

Recall the payoff to forward/futures



Introducing options

- Options – unlike forward contracts – give the holder the **right** but not the **obligation** to **buy** or **sell** an asset at a predetermined **exercise** price at some time in the **future**.

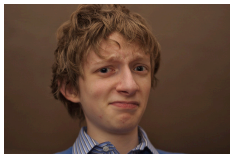
- A **call** option gives you the right to **buy** the asset.
- A **put** option gives you the right to **sell** the asset.

- We can buy or sell calls and puts… so we can…

Introducing options

So we can:

- Buy the right to buy (buy a call)
- Buy the right to sell (buy a put)
- Sell the right to buy (sell a call)
- Sell the right to sell (sell a put).



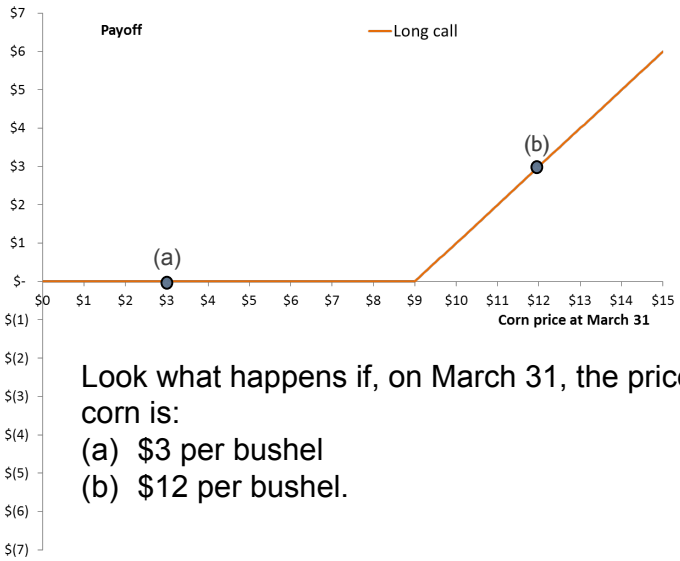
Another way of talking about buying and selling is going **long** (buying) or going **short** (selling).

Buy the right to buy (buy a call) = **long call**
Buy the right to sell (buy a put) = **long put**
Sell the right to buy (sell a call) = **short call**
Sell the right to sell (sell a put) **= short put.**

Back to our (fictional) setup

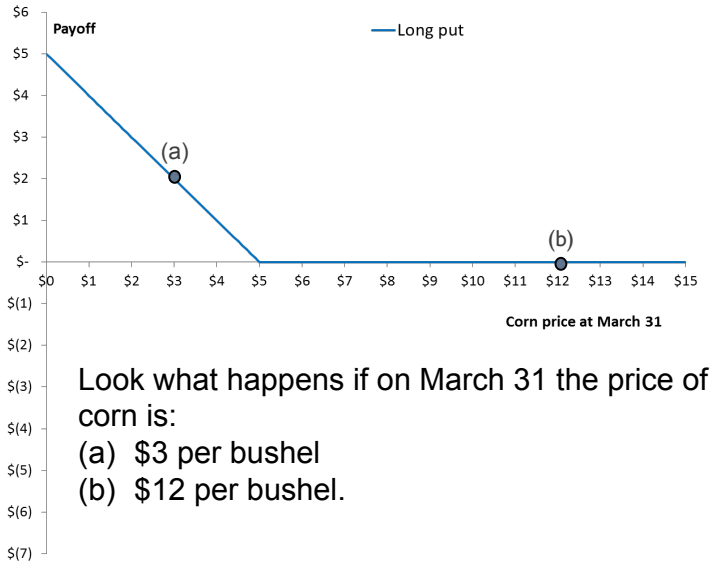
- The problem with a forward/futures contract is that if spot prices move in your favor – then you don't get to benefit as you have already locked in a price.
- Options provide insurance against adverse price movements while preserving the upside associated with beneficial price movements.
- Let's re-consider Judy's position – assuming that she wants to put a cap on the price she pays for corn at $9.
- So she buys a call option with an exercise price of $9 (long call).
- Frank wants to put a floor on the price he receives – so he buys a put option with an exercise price of $5 (long put).

Option payoff: Long call



Look what happens if, on March 31, the price of corn is:
(a) $3 per bushel
(b) $12 per bushel.

Option payoff: Long put



Look what happens if on March 31 the price of corn is:

(a) $3 per bushel

(b) $12 per bushel.

Pause: Intrinsic value a.k.a. Moneyness

The **intrinsic value** of an option is the payoff from the option if it were to expire immediately.

So for a call option we have:

$$Payoff = Max(P_{Expiry} - X, 0)$$

$$and$$

$$Intrinsic\ Value = Max(P_{Now} - X, 0)$$

For a put option:

$$Payoff = Max(X - P_{Expiry}, 0)$$

$$and$$

$$Intrinsic\ Value = Max(X - P_{Now}, 0)$$

Pause: Intrinsic value a.k.a. Moneyness

So for different current prices of the asset we have different intrinsic values:

$Price_{Now}$	Call option intrinsic value (Exercise price=$9)	Put option intrinsic value (Exercise price=$5)
$0	$0	$5
$2	$0	$3
$4	$0	$1
$5	$0	$0
$6	$0	$0
$8	$0	$0
$9	$0	$0
$10	$1	$0
$12	$3	$0

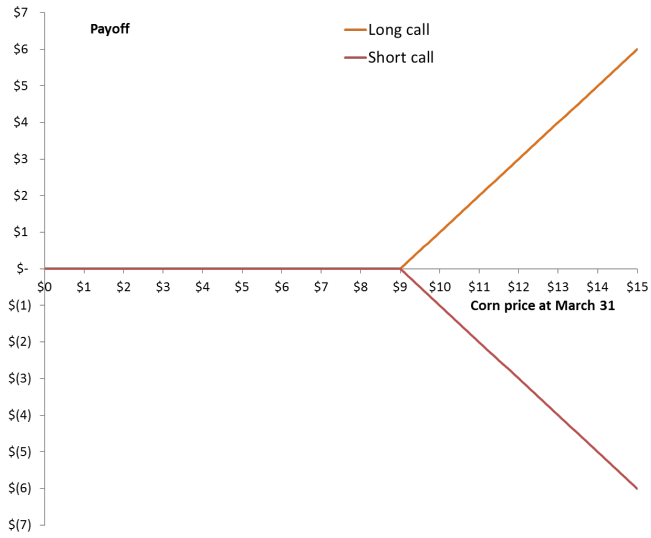
Pause: Intrinsic value a.k.a. Moneyness

An option's "moneyness" refers to the value of the asset relative to the exercise price.

$Price_{Now}$	Call option intrinsic value (Exercise price=$9)	Call option moneyness
$3	$0	Deep-out-of-the-money
$8	$0	Out-of-the-money
$9	$0	At-the-money
$10	$1	In-the-money
$15	$6	Deep-in-the-money

Short positions in options

- It is now easy to demonstrate that the opposite to buying a call is <u>not</u> buying a put but instead selling a call.



Short positions in options

… and the opposite of buying a put option (long put) is selling a put option (short put).

But looking at this… *why would anyone sell an option?*

Payoff diagrams versus profit diagrams

The diagrams we have just been through show the **payoff** at expiry – they don't include the price paid for the option.

The price paid for an option is called the **option premium.**

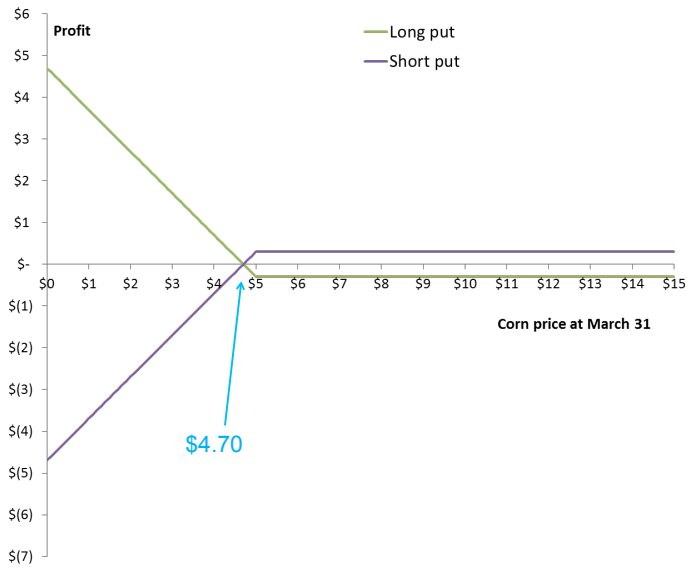
If the option is unexercised at expiry – the option seller gets to keep the option premium without paying anything out!

When we include option premiums in our payoff diagram – we end up with **profit** diagrams.

Profit diagram – Long call

Profit diagram – Short call

Profit diagram – Long and short puts



Other features of options…

Time of exercise

- European-style options can only be exercised at maturity.
- American-style options can be exercised at any time up to maturity.
- Therefore: $\text{Value}_{\text{American}} \geq \text{Value}_{\text{European}}$

Summary

- Options – unlike forwards and futures – enable hedgers to keep their upside intact while removing downside risk.
- Unlike forwards/futures there is a **cost** associated with establishing the position – this is an **option premium.**
- We distinguish between:
  - Call options vs put options
  - Long vs short positions
  - Payoffs vs intrinsic values
  - Payoffs vs profits.

But what determines how much we have to pay for an option…???

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