



Module 4

Corporate Financial Decision-Making for Value Creation

The Drivers of Option Values
(Why does my option cost more than theirs?)

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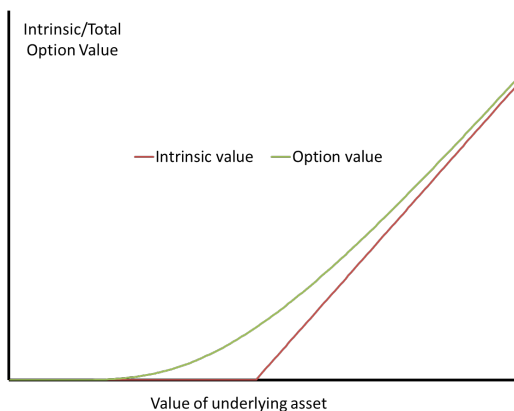


BNY MELLON

Option value, intrinsic value and time value

An option's value is made up of two parts:

1. **Intrinsic value:** The payoff if the option were to expire immediately
2. **Time value:** Whatever is left over!





Option value drivers

There are six drivers of the value of an option **written** on an asset:

1. Exercise price of the option
2. Value of the underlying asset
3. Interest rate
4. Dividends over the life of the option

Impact on
intrinsic
value

5. Volatility of prices for the asset
6. Term to expiry of the option.

Impact on
time value

We analyze each of these factors in turn while assuming that all others are held constant (Latin: *ceteris paribus*).

1. Exercise price of the option

Call Options: Negative Relationship

- As exercise price increases – you have the right to **pay more** for the asset and the option becomes cheaper

Put Options: Positive Relationship

- As exercise price increases – you have the right to **receive more** for the asset and the option becomes more expensive



2. Value of the underlying asset

Call Options: Positive Relationship

- As the asset becomes more valuable the right to purchase at a fixed price becomes more expensive

Put Options: Negative Relationship

- As the asset becomes more valuable the right to sell at a fixed price becomes cheaper

3. Interest rate

Call Options: Positive Relationship

- A call option involves a possible future cash **outflow**
- The **present value** of this cash **outflow** decreases with increases in interest rates – which increases the value of the option.

Put Options: Negative Relationship

- A put option involves a possible future cash **inflow**
- The **present value** of this cash **inflow** decreases with increases in interest rates – which decreases the value of the option.



4. Dividends

Call Options: Negative Relationship

- When an asset goes “ex-dividend” the asset’s value declines by the dividend amount
- This decreases the intrinsic value of a call option.

Put Options: Positive Relationship

- A decline in the value of the asset – on the ex-dividend date – increases the value of a put option.

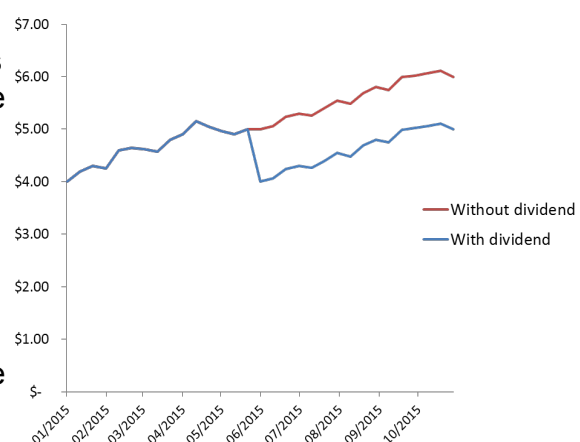
A moment to reflect... early exercise

- Recall that American-style options are options that can be exercised early.
- Holding an American-style option gives you all the benefits of holding the share – in terms of upside price movements – but without the downside of downward price movements ... except...

DIVIDENDS

- It may make sense to exercise an American call early – so as to avoid the fall in intrinsic value – and pocket the dividend.

Share price illustration





Early exercise and put options

- On the other hand – put options involve receiving cash early.
- By not exercising you are incurring an opportunity cost associated with being able to generate a return from the proceeds received.
- It makes sense to exercise American-style put options if they are **deep-in-the-money**.
 - So deep that you are fairly certain that you won't regret selling at the exercise price.

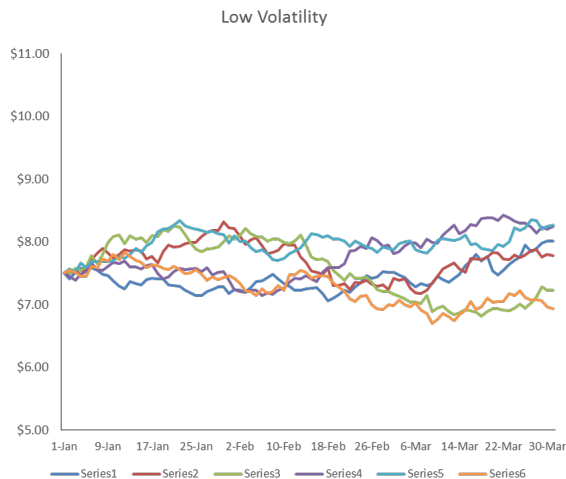
5. Volatility

To demonstrate the impact of volatility on option values – let's assume the following on 1/1/2014:

- The current price of corn is \$7.50
- The option expires on 31 March 2014
- Judy has purchased a call option with an exercise price of \$7.50
- Frank has purchased a put option with an exercise price of \$7.50.

5. Volatility: A simulation

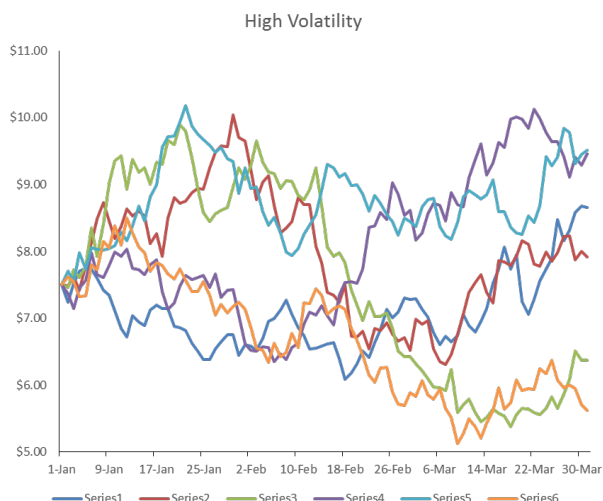
Let's run 6 simulations of what happens to the price of corn and hence the payoff from the options – firstly assuming low volatility in prices:



Series	Final price	Call Payoff	Put Payoff
1	\$8.01	\$0.51	\$0
2	\$7.77	\$0.27	\$0
3	\$7.23	\$0	\$0.27
4	\$8.25	\$0.75	\$0
5	\$8.27	\$0.77	\$0
6	\$6.93	\$0	\$0.57
Avg _{Low}		\$0.38	\$0.14

5. Volatility: A simulation

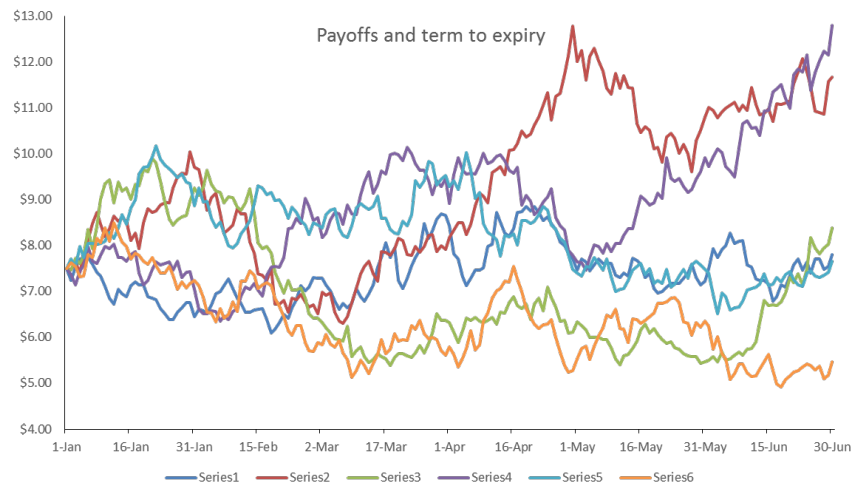
Now let's re-run the simulations using high volatility:



Series	Final price	Call Payoff	Put Payoff
1	\$8.65	\$1.15	\$0
2	\$7.92	\$0.42	\$0
3	\$6.37	\$0	\$1.13
4	\$9.45	\$1.95	\$0
5	\$9.52	\$2.02	\$0
6	\$5.62	\$0	\$1.88
Avg _{High}		\$0.92	\$0.50
Avg _{Low}		\$0.38	\$0.14

6. Time to expiry

An increase in time to expiry has a similar effect to an increase in volatility as it increases the chance that the option will finish deeper in (and out of) the money.



Summary

- Option values can be decomposed into
 - Intrinsic value
 - Time value.
- Six factors that affect the value of options:

Factor	Call Value	Put Value
Exercise price	–	+
Asset value	+	–
Interest rate	+	–
Dividends	–	+
Volatility	+	+
Time to expiry	+	+

... so how else might options be used?

Source list

Slide 2, 8, 11, 12, 13, 14:

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