

FINANCIAL DERIVATIVES

Financial Option

➤ Financial Option

- A contract that gives its owner the right (but not the obligation) to purchase or sell an asset *at a fixed price* in some future date

<https://www.youtube.com/watch?v=gWp3op51ZzI>

Make a note of

- 1) What is the strike price of option contract for StoneCurve coffee?
- 2) Is the call buyer better off when the price of the stock StoneCurve becomes 70\$? If so, what is her net profit?
- 3) Is the call seller better off when the price of the stock StoneCurve becomes 70\$? If so, what is his net profit?

Options



Financial Option

➤ Financial Option

- A contract that gives its owner the right (but not the obligation) to purchase or sell an asset *at a fixed price* in some future date

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Make a note of

- 1) What is the strike price of option contract for StoneCurve coffee?
- 2) Is the call buyer better off when the price of the stock StoneCurve becomes 70\$? If so, what is her net profit? $(70 - 55) \times 100 - 1 \times 100 = 1400$
- 3) Is the call seller better off when the price of the stock StoneCurve becomes 70\$? If so, what is his net profit? $-(70 - 55) \times 100 + 1 \times 100 = -1400$

Note that even though option premium is a very important concept for option trading, it is not exam-relevant in this course.

Financial Option

➤ Call Option

- A financial option that gives its owner the **right to buy** an asset

➤ Put Option

- A financial option that gives its owner the **right to sell** an asset

Financial Option

- Option Buyer
 - The buyer of an option contract, have the **right** to buy or sell
- Option Seller
 - The seller of an option contract, have the **obligation** to buy or sell

A Summary of Financial Option

	Buyer /Long	Seller /Short
Call option	Right to buy	Obligation to sell
Put option	Right to sell	Obligation to buy

Understanding Option Contracts (1 of 3)

➤ Exercising an Option

- When a holder/buyer of an option enforces the agreement and buys or sells a share of stock at the agreed-upon price

➤ Strike Price (Exercise Price, denoted as K)

- The agreed-upon price at which an option holder buys (call) or sells (put) a share of stock when the option is exercised
- Another relevant concept is current stock price, denoted as S . Buyer decide whether to exercise the option by comparing \underline{K} and \underline{S} .

➤ Expiration Date

- The last date on which an option holder has the right to exercise the option

Understanding Option Contracts (2 of 3)

➤ The option buyer (holder)

- Holds the right to exercise the option and has a **long position** in the contract

➤ The option seller (writer)

- Sells (or writes) the option and has a **short position** in the contract
- Because the long side has *the option to exercise, the short side has an obligation to fulfill* the contract if it is exercised.

➤ The buyer pays the writer a premium (let us not focus on this for now)

Example 1

Long Call Options (call option buyer/holder)

It is the afternoon of September 10, 2018, and you have decided to purchase January **call** contract on eBay stock with an exercise price of \$35.

The above the current stock price is \$36.

Will you exercise the option or do nothing? If you exercise, what is the payoff?

You will exercise the option;

You can buy eBay stock at the contracted/pre-agreed/exercise price of 35\$;

And sell it right away at 36\$;

You can earn the payoff of 1.00\$

Option
market

Stock spot market

What if the current stock prices falls to 34\$. You can do nothing and let option expire
*Hence, you gain 1 dollar when price goes **up**, gain/lose nothing when price goes down.*

Example 2

Long Put Options (put option buyer/holder)

It is the afternoon of September 10, 2018, and you have decided to purchase 10 January **put** contracts on eBay stock with an exercise price of \$35.

The above the current stock price is \$34.

Will you exercise the option or do nothing? If you exercise, what is the payoff?

You will exercise the option;

You can buy eBay stock right away at 34\$, and SELL eBay stock at the contracted/pre-agreed/exercise price for 35\$,

You can earn the payoff of 1.00\$.

Stock spot
market

Option market

What if the current stock prices goes up to 36\$. You can do nothing and let option expire

*Hence, you gain 1 dollar when price goes **down**, gain/lose nothing when price goes up.*

Example 1 & 2 (Buyer/Long)

	Long Call	Long Put
Current stock price (S)	36	34
Exercise price (K)	35	35
Payoff	1; exercise	1; exercise

Positive payoff when
S goes up

Bull

Positive payoff when
S goes down

Bear

	Long Call	Long Put
Current stock price (S)	34	36
Exercise price (K)	35	35
Payoff	0; do nothing	0; do nothing

Back to Example 1

Short Call Options (call option seller)

It is the afternoon of September 10, 2018, and you have decided to purchase January **call** contracts on eBay stock with an exercise price of \$35. The above the current stock price is \$36.

You (as a buyer) will exercise the option to buy since $S (36\$) > K (\$35)$.

The seller of the call option is obliged to sell it to you if you decide to exercise.

The seller -> buy the ebay stock (from spot market) at 36\$, and sell it to you for only 35\$

Suffer a loss of 1 dollar

That is why Seller of the option always charge a Premium

Back to Example 2

Short Put Options (put option seller)

It is the afternoon of September 10, 2018, and you have decided to purchase 10 January **put** contracts on eBay stock with an exercise price of \$35. The above the current stock price is \$34.

You will exercise the option to sell since $S (34\$) < K (\$35)$.

The seller of the put option is obliged to buy it from you if you decide to exercise.

The seller must buy eBay stock from you at 35\$, and sell it immediately for ONLY 34\$,

A loss of 1.00\$

Example 1 & 2 (Seller/short)

	Short Call	Short Put
Current stock price (S)	36	34
Exercise price (K)	35	35
Seller Payoff	-1 since buyer exercise	-1 since buyer exercise

Loss when S goes up

Loss when S goes down

	Short Call	Short Put
Current stock price (S)	34	36
Exercise price (K)	35	35
Seller Payoff	0 since buyer will do nothing	0 since buyer will do nothing

0 when S goes down

0 when S goes up

Four Positions -> Bull Market

exercise when $S > K$ exercise when $S < K$

	Long Call	Long Put	Short Call	Short Put
Current stock price of Ebay (S)	36	36	36	36
Exercise price (K)	35	35	35	35
Payoff	1	0	-1	0
Action	exercise the right to buy @35 from option market, sell it @36 at the spot market	Do nothing, let option expire	need to buy @36 from the spot market, obligation to sell @35 from option market	Since buyer did nothing

Payoff: Choose from -1 , 0 and 1.

Action: e.g., option to buy the stock @35 strike price@option market, and sell it @36@spot market

Do nothing, let option expire

obliged to sell it to the buyer @35 from the option market, need to buy it @36 from the spot market.

Four Positions -> Bear market

	Long Call	Long Put	Short Call	Short Put
Current stock price (S)	34	34	34	34
Exercise price (K)	35	35	35	35
Payoff	0	1	0	-1
Action	Let option expire/do nothing	need to buy @ 34 at the spot market, exercise the right to sell @ 35 at the option market	since buyer does nothing/ option expire	obliged to buy @ 35 from the option market, and sell @ 34 from the spot market

call: exercise when $S > K$ put: exercise when $S < K$

Payoff of Call and Put

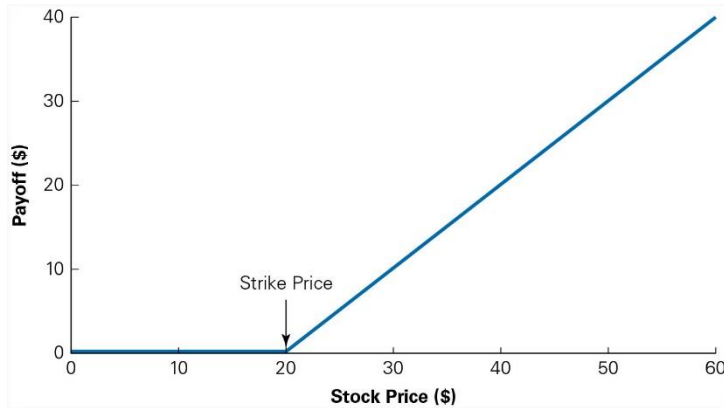
	Call	Put
Long	Exercise when price goes up $S > K$ <u>Payoff :</u> $S - K$ when $S > K$ 0 when $S < K$	Exercise when price goes down $S < K$ <u>Payoff :</u> $K - S$ when $S < K$ 0 when $S > K$
Short	<u>Payoff :</u> $-(S - K)$ when $S > K$ 0 when $S < K$	<u>Payoff :</u> $-(K - S)$ when $S < K$ 0 when $S > K$

S -> Current stock price at the spot market

K-> Strike price (exercise price)

Graphical Presentation of Payoff

Long Position in a Call Option



Exercise when price goes up $S > K$

Payoff

$S - K$ when $S > K$

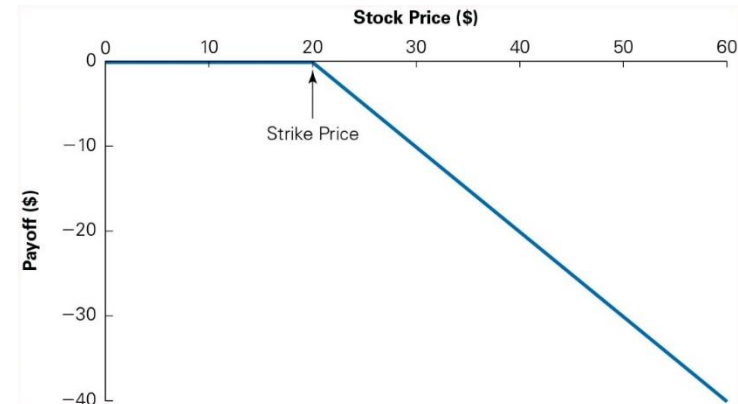
0 when $S < K$

Payoff

$-(S - K)$ when $S > K$

0 when $S < K$

Short Position in a Call Option



Graphical Presentation of Payoff

Long Position in a Put Option



Exercise when price goes down $S < K$
Payoff
 $K - S$ **when $S < K$**
0 **when $S > K$**

Short Position in a Put Option



Payoff
 $-(K - S)$ **when $S < K$**
0 **when $S > K$**

Understanding Option Contracts (3 of 3)

➤ American Option

- Options that allow their holders to exercise the option on any date up to, and including, the expiration date

➤ European Option

- Options that allow their holders to exercise the option only on the expiration date

Interpreting Stock Option Quotations

➤ At-the-money

- Describes an option whose exercise price is equal to the current stock price

$$S = K$$

➤ In-the-money

- Describes an option whose value, if immediately exercised, would be positive

$$\text{call (ITM): } S > K$$

$$\text{put (ITM): } S < K$$

➤ Out-of-the-money

- Describes an option whose value, if immediately exercised, would be negative

$$\text{call (OTM) : } S < K$$

$$\text{put (OTM): } S > K$$

Exercise

You **buy/long a call option** on Dellibar with a strike price of \$15. What is the payoff of your call option if the current share price of Dellibar is

1) 13

0 ; expire; OTM

2) 15

0; expire ; ATM

3) 17

2; exercise the right to buy @15 from the option market, sell it @17 at the spot market; ITM

You **sell a call option** on Dellibar with a strike price of \$15. What is the payoff of your short call option if the current share price of Dellibar is

1) 13

0; expire, do nothing

2) 15

0; expire,do nothing

3) 17

-2; need to buy @17 from the spot market, obliged to sell @ 15 from the option market

Exercise

You **buy/long a put option** on Dellibar with a strike price of \$15. What is the payoff of your long put option if the current share price of Dellibar is

1) 13 +2; buy it from the spot market @13, exercise the right to sell @15 from the option

2) 15 0; expire

3) 17 0; expire

You **sell a put option** on Dellibar with a strike price of \$15. What is the payoff of your short put option if the current share price of Dellibar is

1) 13 -2; obliged to BUY @ 15 from the option market, sell it for 13 dollars from the spot market

2) 15 0; since buyer choose to let it expire

3) 17 0; since buyer choose to let it expire

Exam

- You can bring one-page A4 double-sided (or two-page single-sided) help note (**But this is only for the first attempt, 2nd or 3rd attempts are strictly closed-book**)
- Excel formula (NPER(rate....)) is provided in the exam
- In general, the exam contains
 - ❑ Long questions (show steps) that include
 - ❑ Capital budgeting (free cash flows)
 - ❑ NPV/IRR(trial and error)/payback
 - ❑ Mortgage Schedule -> fixed payment schedule
 - ❑ Options -> Payoff and how you obtain the payoff
 - ❑ Time value of money -> (Growing) Annuity, annuity in the future, how long does it take, present value/future value of annuity
 - ❑ Multiple Choices Questions