

## Chapter

# 15

## Stock Options

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## Option Basics

- A stock option is a **derivative security**, because the value of the option is "derived" from the value of the underlying common stock.
- There are two basic option types.
  - **Call options** are options to **buy** the underlying asset.
  - **Put options** are options to **sell** the underlying asset.
- Listed option contracts are standardized to facilitate trading and price reporting.
  - Listed stock options give the option holder the right to buy or sell 100 shares of stock.

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## Option Basics, Cont.

- Option contracts are legal agreements between two parties—the buyer of the option, and the seller of the option.
- The minimum terms stipulated by stock option contracts are:
  - The identity of the underlying stock.
  - The strike price, or exercise price.
  - The option contract size.
  - The option expiration date, or option maturity.
  - The option exercise style (*American* or *European*).
  - The delivery, or settlement, procedure.
- Stock options trade at organized options exchanges, such as the CBOE, as well as over-the-counter (OTC) options markets.

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## Option Price Quotes

- A list of available option contracts and their prices for a particular security is known as an **option chain**.
- Stock option ticker symbols include:
  - Letters to identify the underlying stock.
  - A letter to identify the expiration month as well as whether the option is a call or a put. (A through L for calls; M through X for puts).
  - A letter to identify the strike price (a bit more complicated—see Yahoo or Stock-Trak for tables to explain this letter.)

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## Stock Option Ticker Symbol and Strike Price Codes

TABLE 15.1

Stock Option Ticker Symbol and Strike Price Codes					
Expiration Month	Calls	Puts	Strike	Strike	
January	A	M	5	A	70
February	B	N	10	B	75
March	C	O	15	C	80
April	D	P	20	D	85
May	E	Q	25	E	90
June	F	R	30	F	95
July	G	S	35	G	100
August	H	T	40	H	7.5
September	I	U	45	I	12.5
October	J	V	50	J	17.5
November	K	W	55	K	22.5
December	L	X	60	L	27.5
			65	M	32.5
					Z

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## The Options Clearing Corporation

- The Options Clearing Corporation (OCC) is a private agency that guarantees that the terms of an option contract will be fulfilled if the option is exercised.
- The OCC issues and clears all option contracts trading on U.S. exchanges.
- Note that the exchanges and the OCC are all subject to regulation by the Securities and Exchange Commission (SEC).

Visit the OCC at: [www.optionsclearing.com](http://www.optionsclearing.com).

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## Stock Index Options

- A stock index option is an option on a stock market index.
- The most popular stock index options are options on the S&P 100, S&P 500, and Dow Jones Industrial Average.
- Because the actual delivery of all stocks comprising a stock index is impractical, stock index options have a **cash settlement procedure**.
  - That is, if the option expires in the money, the option writer simply pays the option holder the intrinsic value of the option.
  - The cash settlement procedure is the same for calls and puts.

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## Option “Moneyness”

- “In-the-money” option: An option that would yield a positive payoff if exercised
- “Out-of-the-money” option: An option that would NOT yield a positive payoff if exercised
- Use the relationship between S (the stock price) and K (the strike price):

	In-the-Money	Out-of-the-Money
Call Option	$S > K$	$S \leq K$
Put Option	$S < K$	$S \geq K$

Note for a given strike price, only the call or only the put can be “in-the-money.”

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## Option Writing

- The act of selling an option is referred to as **option writing**.
- The seller of an option contract is called the **writer**.
  - The **writer** of a call option contract is **obligated** to sell the underlying asset to the call option holder.
  - The call option **holder has the right** to exercise the call option (i.e., buy the underlying asset at the strike price).
  - The **writer** of a put option contract is **obligated** to buy the underlying asset from the put option holder.
  - The put option **holder has the right** to exercise the put option (i.e., sell the underlying asset at the strike price).
- Because **option writing obligates the option writer**, the option writer receives the price of the option today from the option buyer.

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## Option Exercise

- Option holders have the **right to exercise** their option.
  - If this right is only available at the option expiration date, the option is said to have **European-style** exercise.
  - If this right is available at any time up to and including the option expiration date, the option is said to have **American-style** exercise.
- Exercise style is not linked to where the option trades. **European-style** and **American-style** options trade in the U.S., as well as on other option exchanges throughout the world.
- *Very Important: Option holders also have the **right to sell their option at any time**. That is, they do not have to exercise the option if they no longer want it.*

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## Option Payoffs versus Option Profits

- Option investment strategies involve initial and terminal cash flows.
  - Initial cash flow: option price (often called the option premium).
  - Terminal cash flow: the value of an option at expiration (often called the option payoff).
- The terminal cash flow can be realized by the option holder by exercising the option.

**Option Profits = Terminal cash flow – Initial cash flow**

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## Option Intrinsic Values

- The **intrinsic value** of an option is the payoff that an option holder receives if the underlying stock price does not change from its current value.
- That is, if S is the current stock price, and K is the strike price of the option:
- Call option intrinsic value =  $\text{MAX} [0, S - K]$ 
  - In words: The call option intrinsic value is the **maximum** of zero or the stock price minus the strike price.
- Put option intrinsic value =  $\text{MAX} [0, K - S]$ 
  - In words: The put option intrinsic value is the **maximum** of zero or the strike price minus the stock price.

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## More Option “Moneyiness”

- “**In the Money**” options have a *positive* intrinsic value.
  - For calls, the strike price is **less** than the stock price.
  - For puts, the strike price is **greater** than the stock price.
- “**Out of the Money**” options have a *zero* intrinsic value.
  - For calls, the strike price is **greater** than the stock price.
  - For puts, the strike price is **less** than the stock price.
- “**At the Money**” options is a term used for options when the stock price and the strike price are about the same.

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## Arbitrage and Option Pricing Bounds

- **Arbitrage:**
  - No possibility of a loss
  - A potential for a gain
  - No cash outlay
- In finance, arbitrage is not allowed to persist.
  - “Absence of Arbitrage” = “No Free Lunch”
  - The “Absence of Arbitrage” rule is often used in finance to calculate option prices.
- Think about what would happen if arbitrage were allowed to persist. (Easy money for everybody)

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## The Upper Bound for a Call Option Price

- **Call option price must be less than the stock price.**
- Otherwise, **arbitrage** will be possible.
- How?
  - Suppose you see a \$65 call option selling for \$1, and the underlying stock is selling for \$60.
  - The **Arbitrage**: option is exercised and you pocket \$4.

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## The Lower Bound on Option Prices

- Option prices must be at least zero.
  - An option holder can simply discard the option.
  - This means that no one would pay someone to take an option off their hands.
  - Therefore, the price of the option cannot be negative.

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## Put-Call Parity

- Put-Call Parity is perhaps the most fundamental relationship in option pricing.
- Put-Call Parity is generally used for options with European-style exercise.
- Put-Call Parity states: the difference between the call price and the put price equals the difference between the stock price and the discounted strike price.

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## The Put-Call Parity Formula

$$C - P = S - K/(1+r)^T$$

- In the formula:
  - C is the call option price today
  - S is the stock price today
  - r is the risk-free interest rate
  - P is the put option price today
  - K is the strike price of the put and the call
  - T is the time remaining until option expiration

• Note: this formula can be rearranged:

$$K/(1+r)^T = S + P - C$$

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