

FN211

Financial Futures and Options Markets

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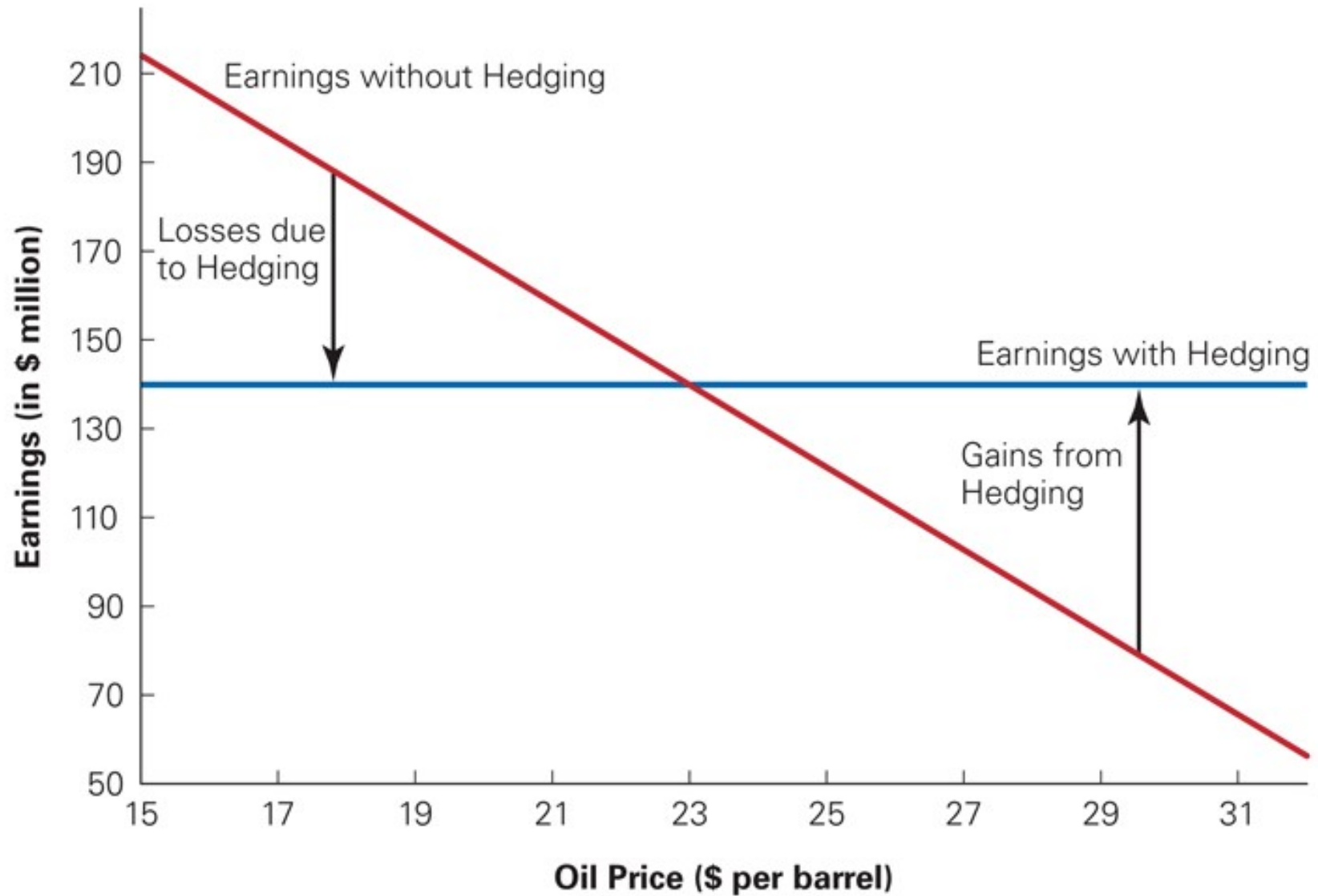
Intro to financial contracts

- Consider Southwest Airlines.
 - In early 2000, when oil prices were close to \$20 per barrel, the CFO developed a hedging strategy to protect the airline from a surge in oil prices.
 - By the time oil prices soared above \$30 per barrel later that year, Southwest had signed contracts guaranteeing a price for its fuel equivalent to \$23 per barrel.

Intro to financial contracts

- However, had oil prices fallen below \$23 per barrel in the fall of 2000, Southwest's hedging policy would have obligated it to pay \$23 per barrel for its oil.
- Southwest accomplished its objective by locking in its cost of oil at \$23 per barrel, regardless of what the price of oil did on the open market.

Commodity Hedging Smoothens Earnings



BD Figure 30.1

Intro to financial contracts

- Long-term supply contracts have several potential disadvantages.
 - They expose each party to the risk that the other party may default and fail to live up to the terms of the contract.
 - Thus, while they insulate the firms from commodity price risk, they expose them to credit risk.

Intro to financial contracts

- Long-term supply contracts cannot be entered into anonymously; the buyer and seller know each other's identity.
 - This lack of anonymity may have strategic disadvantages.
- The market value of the contract at any point in time may not be easy to determine, making it difficult to track gains and losses
- And it may be difficult or even impossible to cancel the contract if necessary

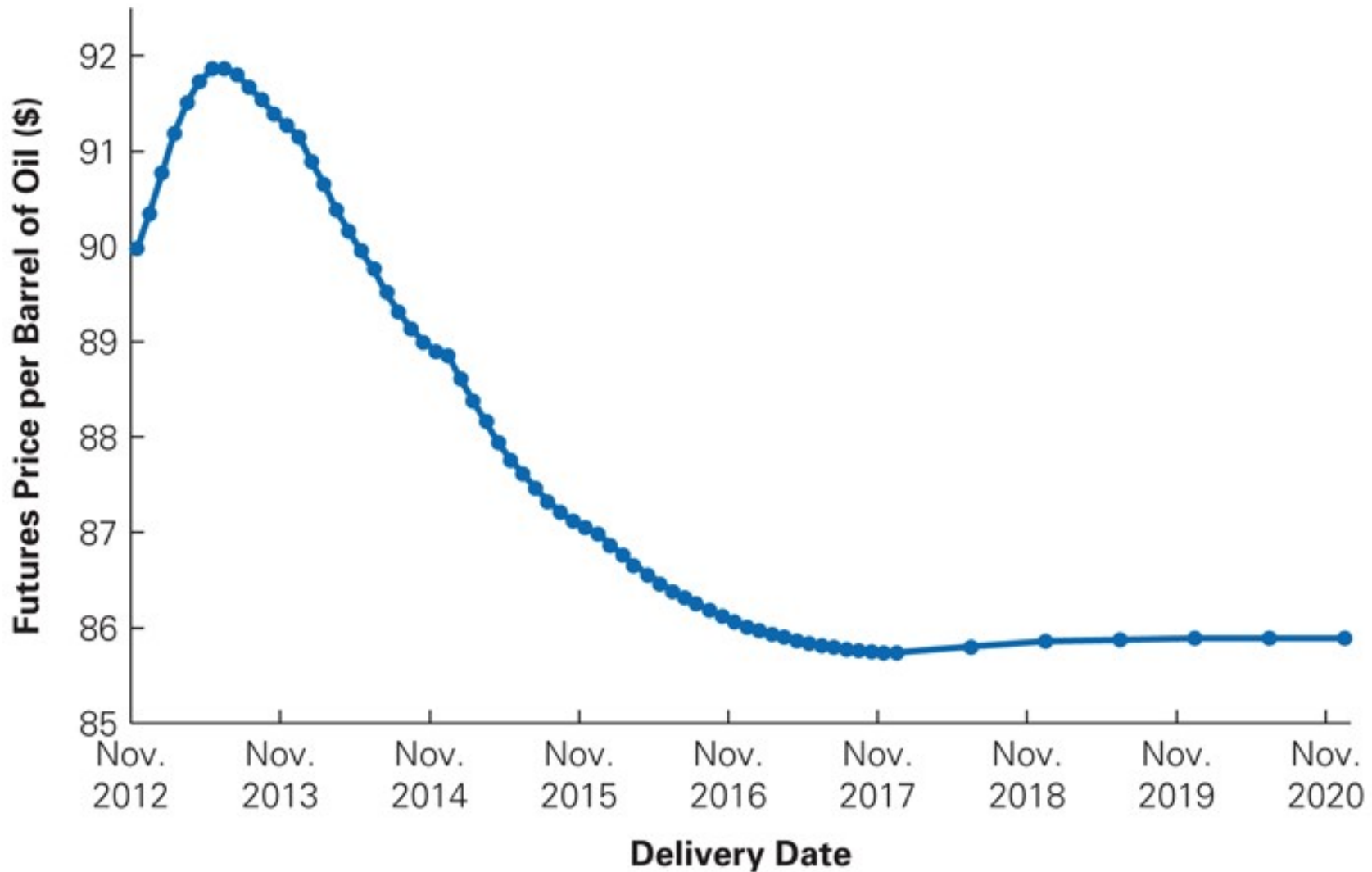
Financial Futures

- An agreement to trade an asset on some future date, at a price that is locked in today
- Futures prices are not prices that are paid today
 - Rather, they are prices *agreed* to today, to be paid in the future
 - The futures prices are based on the supply and demand for each delivery date
- A financial futures contract is a **standardized agreement** to deliver or receive a specified amount of a specified financial instrument at a specified price and date
- Financial futures contracts are **traded on organized exchanges**, which establish and enforce rules for such trading
- The operations of financial futures exchanges are regulated

Financial Futures

- Futures contracts are traded anonymously on an exchange at a publicly observed market price and are generally very liquid
- Both the buyer and the seller can get out of the contract at any time by selling it to a third party at the current market price
- Futures contracts **eliminate credit/counterparty risk**

Futures Prices for Light, Sweet Crude Oil, September 2012



Financial Futures

- Eliminating Credit/Counterparty Risk
 - Futures exchanges use 2 mechanisms to prevent buyers or sellers from defaulting.
 - 1) Traders are required to post collateral when buying or selling commodities using futures contracts.
 - This collateral, called **margin**, serves as a guarantee that traders will meet their obligations.
 - 2) Marking to Market
 - Computing gains and losses each day based on the change in the market price of a futures contract.

Marking to market – An example

- Suppose a buyer who enters into the contract has committed to pay the futures price of \$87 per barrel for oil.
 - If the next day the futures price is only \$85 per barrel, the buyer has a loss of \$2 per barrel on her position.
 - This loss is settled immediately by deducting \$2 from the buyer's margin account.
 - If the price rises to \$86 per barrel on the following day, the gain of \$1 is added to the buyer's margin account.

Marking to market – An example

- The buyer's cumulative loss is the sum of these daily amounts and always equals the difference between the original contract price of \$87 per barrel and the current contract price.
- If the oil price is ultimately \$65 per barrel, the buyer will have lost \$22 per barrel in her margin account.
 - Thus her total cost is $\$65 + \$22 = \$87$ per barrel, the price for oil she originally committed to.
 - Through this daily marking to market, buyers and sellers pay for any losses as they occur, rather than waiting until the final delivery date. In this way, the firm avoids the risk of default.

Marking to market – An example

- Example of Marking to Market and Daily Settlement for the November 2015 Light, Sweet Crude Oil Futures Contract (\$/bbl)

	September 2012								November 2015
Trading Day	0	1	2	3	4	...	798	799	800
Futures price	87	85	86	84	83	...	62	64	65
Daily marked to market profit/loss		-2	1	-2	-1	...	...	2	1
Cumulative profit/loss		-2	-1	-3	-4	...	-25	-23	-22

Futures vs. Forward

- Standardized vs. non-standardized contracts
- Organized market / Exchange vs. OTC
- Anonymous vs. known identity
- Trading liquidity
- Cash settlement vs. physical settlement
- Credit/counterparty risk
 - Margin
 - Marking to market

Financial Futures

Popular Futures Contracts

- Interest rate futures
 - Debt securities such as Treasury bills, Treasury notes, Treasury bonds, and Eurodollar CDs.
- Commodity futures
- Stock index futures
 - Allows for the buying and selling of a stock index for a specified price at a specified date
 - There are various index future contracts. (Next slide)

Stock Index Futures Contracts

TYPE OF STOCK INDEX FUTURES CONTRACT	CONTRACT IS VALUED AS
S&P 500 index	\$250 times index
Mini S&P 500 index	\$50 times index
S&P Midcap 400 index	\$500 times index
S&P Small Cap index	\$200 times index
Nasdaq 100 index	\$100 times index
Mini Nasdaq 100 index	\$20 times index
Mini Nasdaq Composite index	\$20 times index
Russell 2000 index	\$500 times index

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Financial Futures

Purpose of Trading Financial Futures

- Financial futures are traded to speculate on prices of securities or to hedge existing exposure.
- **Speculators** in financial futures markets take positions to profit from expected changes in the futures prices.
 - **Day traders** attempt to capitalize on price movements during a single day.
 - **Position traders** maintain their futures positions for longer periods of time.
- **Hedgers** take positions in financial futures to reduce their exposure to future movements in interest rates or stock prices.

Financial Futures

Institutional Trading of Futures Contracts

- Financial institutions generally use futures contracts to reduce risk.

TYPE OF FINANCIAL INSTITUTION	PARTICIPATION IN FUTURES MARKETS
Commercial banks	• Take positions in futures contracts to hedge against interest rate risk.
Savings institutions	• Take positions in futures contracts to hedge against interest rate risk.
Securities firms	• Execute futures transactions for individuals and firms. • Take positions in futures contracts to hedge their own portfolios against stock market or interest rate movements.
Mutual funds	• Take positions in futures contracts to speculate on future stock market or interest rate movements. • Take positions in futures contracts to hedge their portfolios against stock market or interest rate movements.
Pension funds	• Take positions in futures contracts to hedge their portfolios against stock market or interest rate movements.
Insurance companies	• Take positions in futures contracts to hedge their portfolios against stock market or interest rate movements.

Stock Index Futures

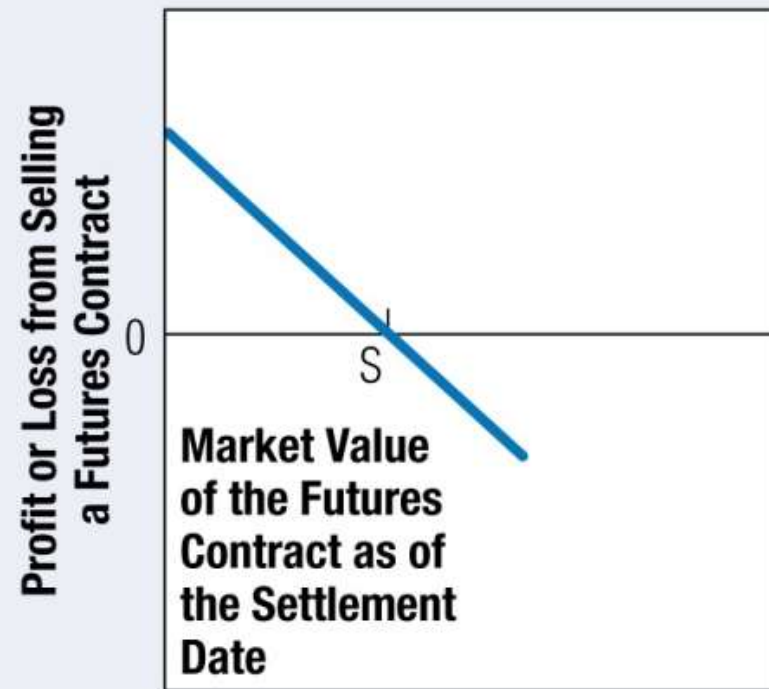
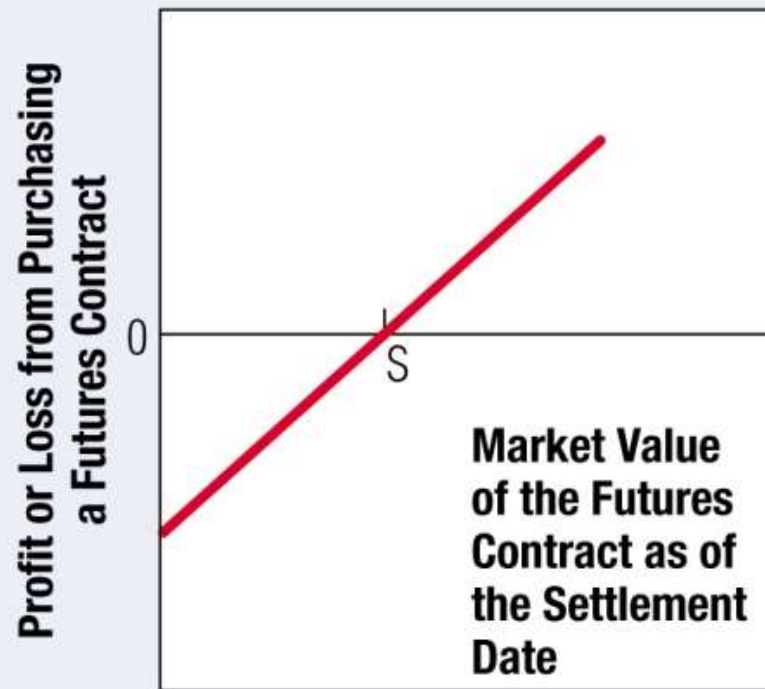
- The purchase of an S&P500 futures or SET50 contract obligates the purchaser to purchase the index at a specified settlement date for a specified amount
- The securities underlying the stock index futures contracts are not actually deliverable, so settlement occurs through a **cash payment**
- Like other financial futures contracts, stock index futures can be closed out before the settlement date by taking an offsetting position

Stock Index Futures

Speculating in Stock Index Futures

- Stock index futures can be traded to make profits on expectations about general stock market movements
- Speculators who expect the stock market to perform well before the settlement date may consider purchasing stock index futures
- Participants who expect the stock market to perform poorly before the settlement date may consider selling stock index futures

Potential Payoffs from Speculating in Financial Futures



Stock Index Futures

Hedging with Stock Index Futures

- Stock index futures are used to hedge the market risk of an existing stock portfolio.
- **Test of Suitability of Stock Index Futures** - The suitability of stock index futures can be measured by the sensitivity of the portfolio's performance to market movements over a period prior to taking a hedge position.
- **Determining the Proportion of the Portfolio to Hedge**
Portfolio managers do not necessarily hedge their entire stock portfolio, because they may wish to be partially exposed in the event that stock prices rise.
(next slide)

Net Gain (on Stock Portfolio and Short Position in Stock Index Futures) for Different Degrees of Hedging

SCENARIO FOR MARKET RETURN	PROPORTION OF STOCK PORTFOLIO HEDGED			
	0%	33%	67%	100%
–20%	–20%	–13.4%	–6.7%	0%
–10	–10	–6.7	–3.3	0

Note: Numbers are based on the assumption that the stock portfolio moves in perfect tandem with the market.

Stock Index Futures

Dynamic Asset Allocation with Stock Index Futures

- Investors switch between high-risk and low-risk investment positions over time in response to changing expectations
- Stock index futures allow portfolio managers to alter their risk–return position without restructuring their existing stock portfolios

Single Stock Futures

- Agreements to buy or sell a specified number of shares of a specified stock on a specified future date
- Investors who expect a particular stock's price to rise over time may consider buying futures on that stock

Single Stock Futures

Market Risk

- Refers to fluctuations in the value of the instrument as a result of market conditions

Basis Risk

- The risk that the position being hedged by the futures contracts is not affected in the same manner as the instrument underlying the futures contract
- Applies only to those firms or individuals who are using futures contracts to hedge

Liquidity Risk

- Refers to potential price distortions due to a lack of liquidity

Interest Rate Futures Contracts

- Interest rate futures contracts specify a face value of the underlying securities, a maturity of the underlying securities, and the settlement date when delivery would occur
- There is a minimum price fluctuation for each contract

Thailand Interest Rate Futures

หัวข้อ	ลักษณะสัญญา
สินค้าอ้างอิง	อัตราดอกเบี้ย BIBOR ประเภท 3 เดือน (3M BIBOR)
ชื่อย่อสัญญา	BB3
ขนาดของสัญญา	มูลค่าเท่ากับ 10,000,000 บาท
เดือนที่สัญญาสิ้นสุดอายุ	เดือนมีนาคม มิถุนายน กันยายน และธันวาคม โดยนับไปไม่เกิน 2 ไตรมาส
ราคาเสนอซื้อขาย	เสนอซื้อขายต่อหน่วยเป็นค่า 100 - อัตราดอกเบี้ยล่วงหน้าของ 3M BIBOR
ราคาที่ใช้ชำระราคา ในวันซื้อขายวันสุดท้าย	กำหนดให้เท่ากับ 100 - อัตราดอกเบี้ย 3M BIBOR ซึ่งประกาศโดย ธนาคารแห่งประเทศไทย ณ เวลา 11:00 น. ในวันซื้อขายวันสุดท้าย
วิธีการส่งมอบ/ชำระราคา	ชำระราคาเป็นเงินสด

Thailand Government Bond Futures

หัวข้อ	ลักษณะสัญญา
สินค้าอ้างอิง	พันธบัตรรัฐบาล อายุ 5 ปี ที่มีอัตราดอกเบี้ยหน้าตัว 5% ต่อปี จ่ายดอกเบี้ย 2 ครั้งต่อปี โดยมีกลุ่มพันธบัตร (Basket of Eligible Bonds) เป็นตัวแทนของสินค้าอ้างอิง
ชื่อย่อสัญญา	TGB5
ขนาดของสัญญา	มูลค่าเท่ากับ 1,000,000 บาท
เดือนที่สัญญาสิ้นสุดอายุ	เดือนมีนาคม มิถุนายน กันยายน และธันวาคม โดยนับไปไม่เกิน 2 ไตรมาส
ราคาเสนอซื้อขาย	เสนอซื้อขายเป็นราคาต่อพันธบัตรมูลค่า 100 บาท
ราคาที่ใช้ชำระราคาในวันซื้อขายวันสุดท้าย	กำหนดเป็นราคาต่อพันธบัตรมูลค่า 100 บาท และคำนวณจากอัตราคิดลด (Yield) ของกลุ่มพันธบัตร (Basket of Eligible Bonds) ในวันสุดท้ายของการซื้อขาย ซึ่งอัตราคิดลดของพันธบัตรแต่ละรุ่นในกลุ่มพันธบัตรนั้น จะเป็นข้อมูลที่ได้รับจากสถาบันการเงินที่ตลาดสัญญาซื้อขายล่วงหน้ากำหนด
วิธีการส่งมอบ/ชำระราคา	ชำระราคาเป็นเงินสด

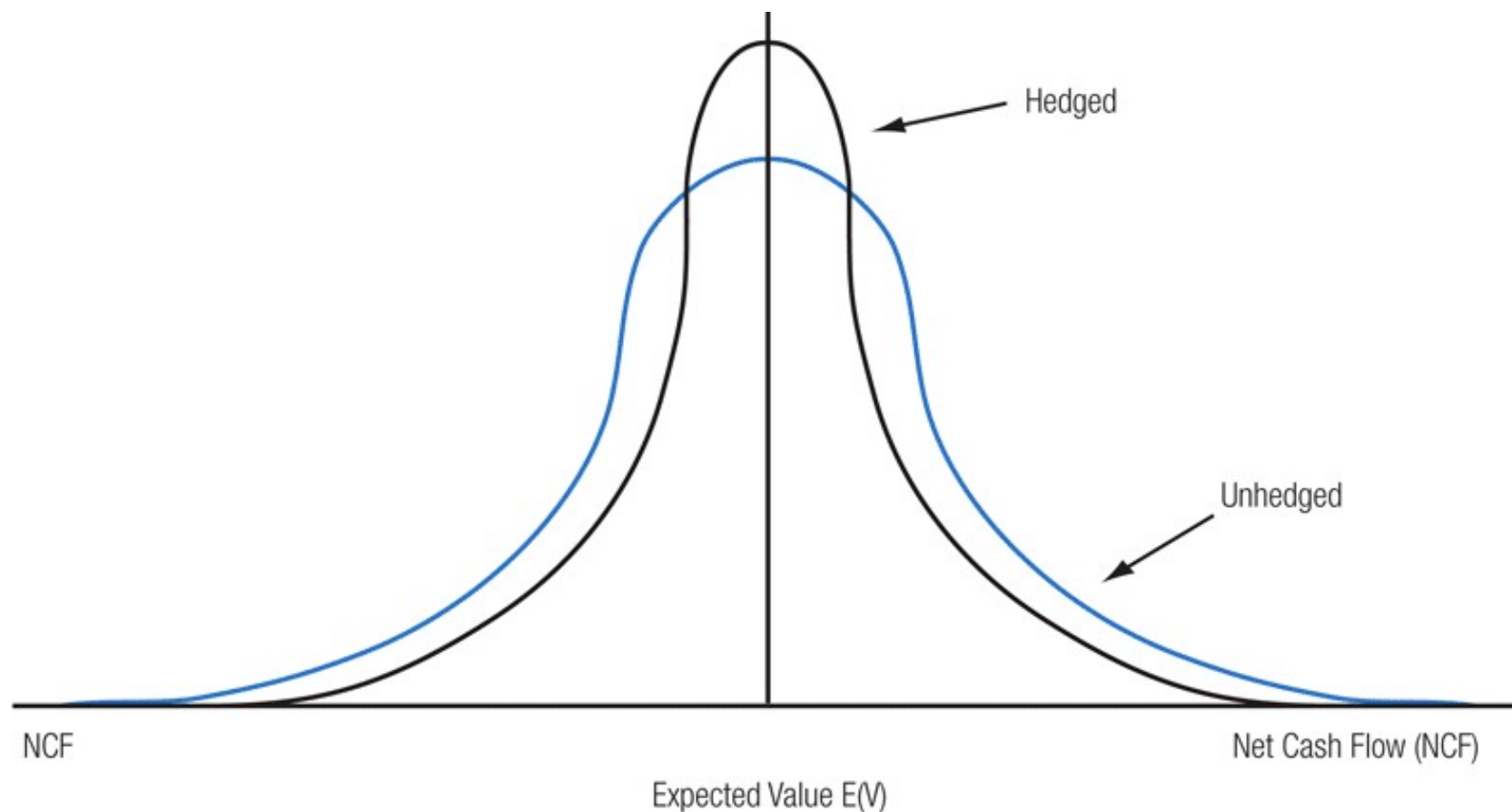
The Futures Contract

Foreign Currencies	Agricultural	Metals and Energy	Interest Rate Futures	Equity Indexes
British pound	Corn	Copper	Eurodollars	Dow Jones Industrials
Canadian dollar	Oats	Aluminum	Euroyen	S&P Midcap 400
Japanese yen	Soybeans	Gold	Euro-denominated	NASDAQ 100
Euro	Soybean meal	Platinum	bond	NYSE Index
Swiss franc	Soybean oil	Palladium	Euroswiss	Russell 2000 Index
Australian dollar	Wheat	Silver	Sterling	Nikkei 225 (Japanese)
Mexican peso	Barley	Crude oil	British gov't bond	FTSE Index (British)
Brazilian real	Flaxseed	Heating oil	German gov't bond	CAC Index (French)
New Zealand dollar	Canola	Gas oil	Italian gov't bond	DAX Index (German)
	Rye	Natural gas	Canadian gov't bond	All ordinary (Australian)
	Cattle	Gasoline	Treasury bonds	Toronto 35 (Canadian)
	Milk	Propane	Treasury notes	Titans 30 (Italian)
	Hogs	Commodity index	Treasury bills	Dow Jones Euro STOXX 50
	Pork bellies	Electricity	LIBOR	Industry indexes, e.g.,
	Cocoa	Weather	EURIBOR	banking
	Coffee		Municipal bond index	natural resources
	Cotton		Federal funds rate	chemical
	Orange juice		Bankers' acceptance	health care
	Sugar		S&P 500 Index	technology
	Lumber		Interest rate swaps	retail
	Rice			utilities
				telecom

Why Hedge?

- Many companies (especially MNEs) possess a multitude of cash flows that are sensitive to changes in **exchange rates, interest rates, and commodity prices**
- These 3 financial price risks are the subject of the growing field of *financial risk management*
- Many firms attempt to manage their currency exposures through hedging

Hedging's Impact on the Expected Cash Flows of the Firm



Hedging reduces the variability of expected cash flows about the mean of the distribution. This reduction of distribution variance is a reduction of risk.

Why Hedge?

- However, is a reduction in the variability of cash flows sufficient reason for risk management? Opponents of hedging state (among other things):
 - Shareholders are much more capable of diversifying currency risk than the management of the firm
 - Risk management does not increase the expected cash flows of the firm
 - Management often conducts hedging activities that benefit management at the expense of the shareholders (*agency* conflict)
 - Managers cannot outguess the market

Background on Options

Call Option: right to buy underlying financial instrument at exercise price (or strike price) within a specified period of time.

- **In the money** when market price $>$ exercise price
- **At the money** when market price = exercise price
- **Out of the money** when market price $<$ exercise price

Put Option: right to sell underlying financial instrument at exercise price (or strike price) within a specified period of time.

- **In the money** when market price $<$ exercise price
- **At the money** when market price = exercise price
- **Out of the money** when market price $>$ exercise price

Background on Options

Comparison of Options and Futures

- To obtain an option, a premium must be paid in addition to the price of the financial instrument.
- The owner of an option can choose to let the option expire on the expiration date without exercising it.

Background on Options

Markets Used to Trade Options

The Chicago Board Options Exchange (CBOE), created in 1973, is the most important exchange for trading options.

As the popularity of stock options increased, various stock exchanges began to list options.

- **Listing Requirements** - One key requirement is a minimum trading volume of the underlying stock.
- **Role of the Options Clearing Corporation** - serves as a guarantor on option contracts traded in the United States.
- **Regulation of Options Trading** – SEC and others.

Background on Options

How Option Trades Are Executed

- Computer technology allows investors to have trades executed electronically.
- Market-makers can execute stock option transactions for customers.

Types of Orders

- An investor can use either a market order or a limit order for an option transaction.
- **Online Trading** - Option contracts can also be purchased or sold online.

Background on Options

Stock Option Quotations

	STRIKE	EXP.	VOLUME	CALL	VOLUME	PUT
Option 1	45	Jun	180	4½	60	2¾
Option 2	45	Oct	70	5¾	120	3¾
Option 3	50	Jun	360	1⅛	40	5⅛
Option 4	50	Oct	90	3½	40	6½

Institutional Use of Options

- Although options positions are sometimes taken by financial institutions for speculative purposes, they are more commonly used for hedging.

TYPE OF FINANCIAL INSTITUTION	PARTICIPATION IN OPTIONS MARKETS
Commercial banks	• Sometimes offer options to businesses.
Savings institutions	• Sometimes take positions in options on futures contracts to hedge interest rate risk.
Mutual funds	• Stock mutual funds take positions in stock index options to hedge against a possible decline in prices of stocks in their portfolios. • Stock mutual funds sometimes take speculative positions in stock index options in an attempt to increase their returns. • Bond mutual funds sometimes take positions in options on futures to hedge interest rate risk.
Securities firms	• Serve as brokers by executing stock option transactions for individuals and businesses.
Pension funds	• Take positions in stock index options to hedge against a possible decline in prices of stocks in their portfolio. • Take positions in options on futures contracts to hedge their bond portfolios against interest rate movements.
Insurance companies	• Take positions in stock index options to hedge against a possible decline in prices of stocks in their portfolio. • Take positions in options on futures contracts to hedge their bond portfolios against interest rate movements.

Determinants of Stock Option Premiums

Call option

- **Influence of the Market Price** - The higher the existing market price of the underlying financial instrument relative to the exercise price, the higher the call option premium, other things being equal
- **Influence of the Stock's Volatility** - The greater the volatility of the underlying stock, the higher the call option premium, other things being equal
- **Influence of the Call Option's Time to Maturity** - The longer the call option's time to maturity, the higher the call option premium, other things being equal
- **Strike Price of Options** - the right to buy at a fixed price becomes more valuable at a lower price

Determinants of Stock Option Premiums

EXERCISE PRICE	PREMIUM FOR APRIL EXPIRATION DATE
\$130	$11\frac{5}{8}$
135	$7\frac{1}{2}$
140	$5\frac{1}{4}$
145	$3\frac{1}{4}$
150	$1\frac{7}{8}$

Determinants of Stock Option Premiums

EXPIRATION DATE	PREMIUM FOR OPTION WITH A \$135 EXERCISE PRICE
March	4½
April	7½
July	13¼

Determinants of Stock Option Premiums

Put option

- **Influence of the Market Price** - The higher the existing market price of the underlying stock relative to the exercise price, the lower the put option premium, other things being equal
- **Influence of the Stock's Volatility** - The greater the volatility of the underlying stock, the higher the put option premium, other things being equal
- **Influence of the Put Option's Time to Maturity** - The longer the time to maturity, the higher the put option premium, other things being equal
- **Strike Price of Options** - the right to buy at a fixed price becomes more valuable at a higher price

Determinants of Stock Option Premiums

EXERCISE PRICE	PREMIUM FOR JUNE EXPIRATION DATE
\$130	$1\frac{7}{8}$
135	$3\frac{1}{8}$
140	$5\frac{3}{8}$
145	$8\frac{1}{2}$
150	$12\frac{1}{4}$

Determinants of Stock Option Premiums

EXPIRATION DATE	PREMIUM FOR OPTION WITH A \$135 EXERCISE PRICE
March	$\frac{1}{2}$
April	$3\frac{1}{8}$
July	$7\frac{1}{4}$

Determinants of Stock Option Premiums

How Option Pricing Can Be Used to Derive a Stock's Volatility

- Some investors assess a specific stock's risk by using the option-pricing formula to estimate the stock's anticipated volatility
- By using the prevailing option premium and values for the other factors in the option-pricing formula, the **implied volatility** or **implied standard deviation** can be estimated

Speculating with Stock Options

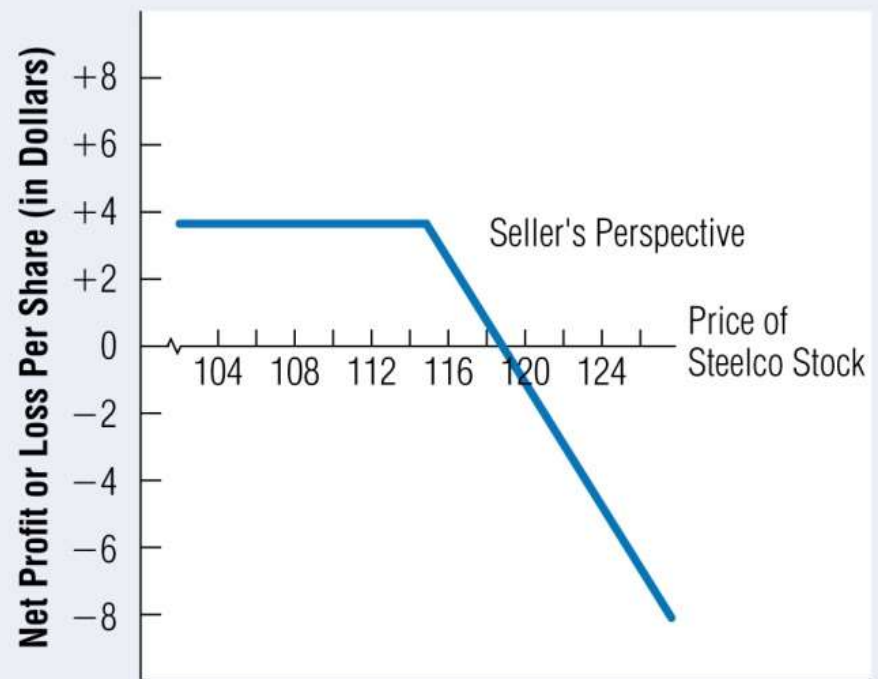
Speculating with Call Options

- Call options can be used to speculate on the expectation of an increase in the price of the underlying stock

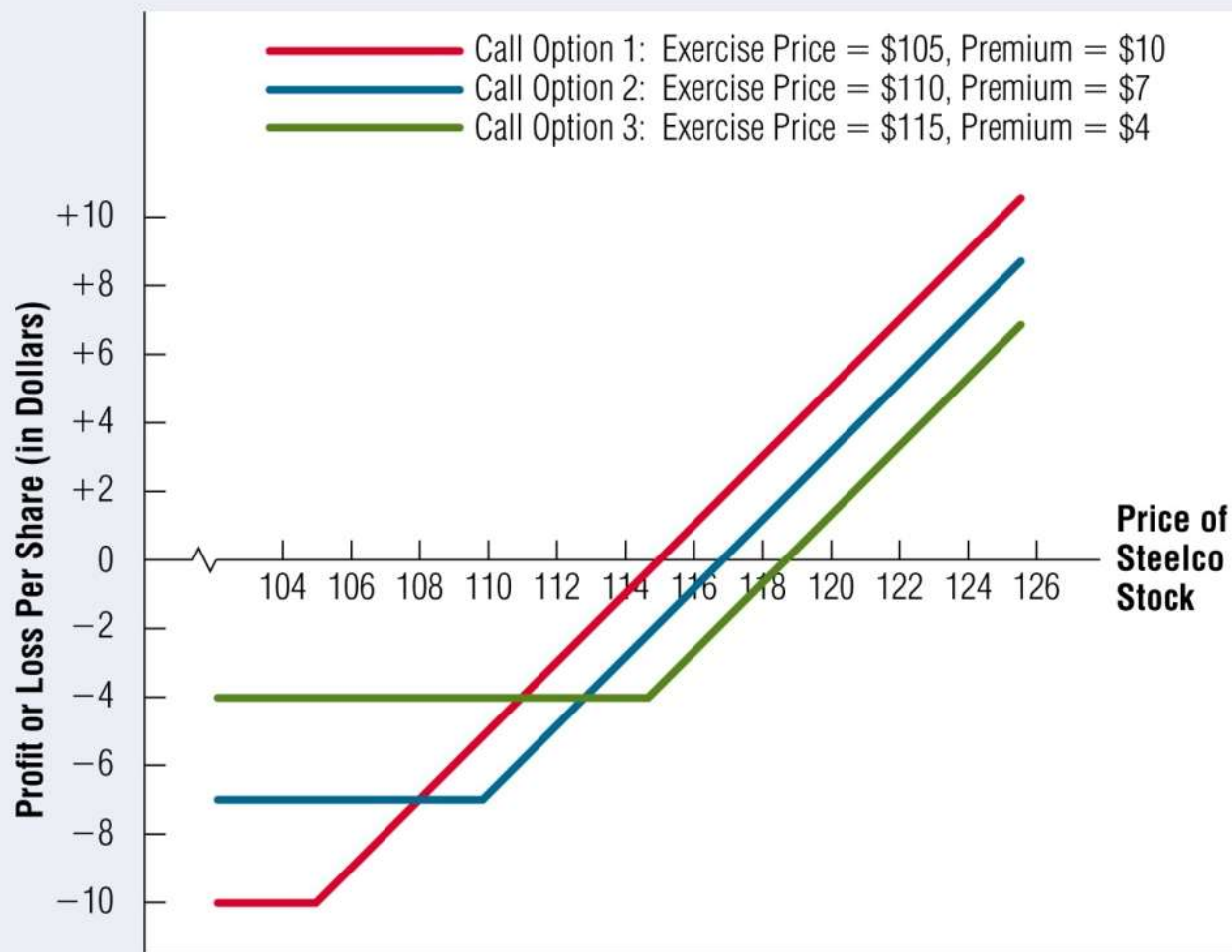
Speculating with Put Options

- Put options can be used to speculate on the expectation of a decrease in the price of the underlying stock

Potential Gains or Losses on a Call Option: Exercise Price = \$115, Premium = \$4



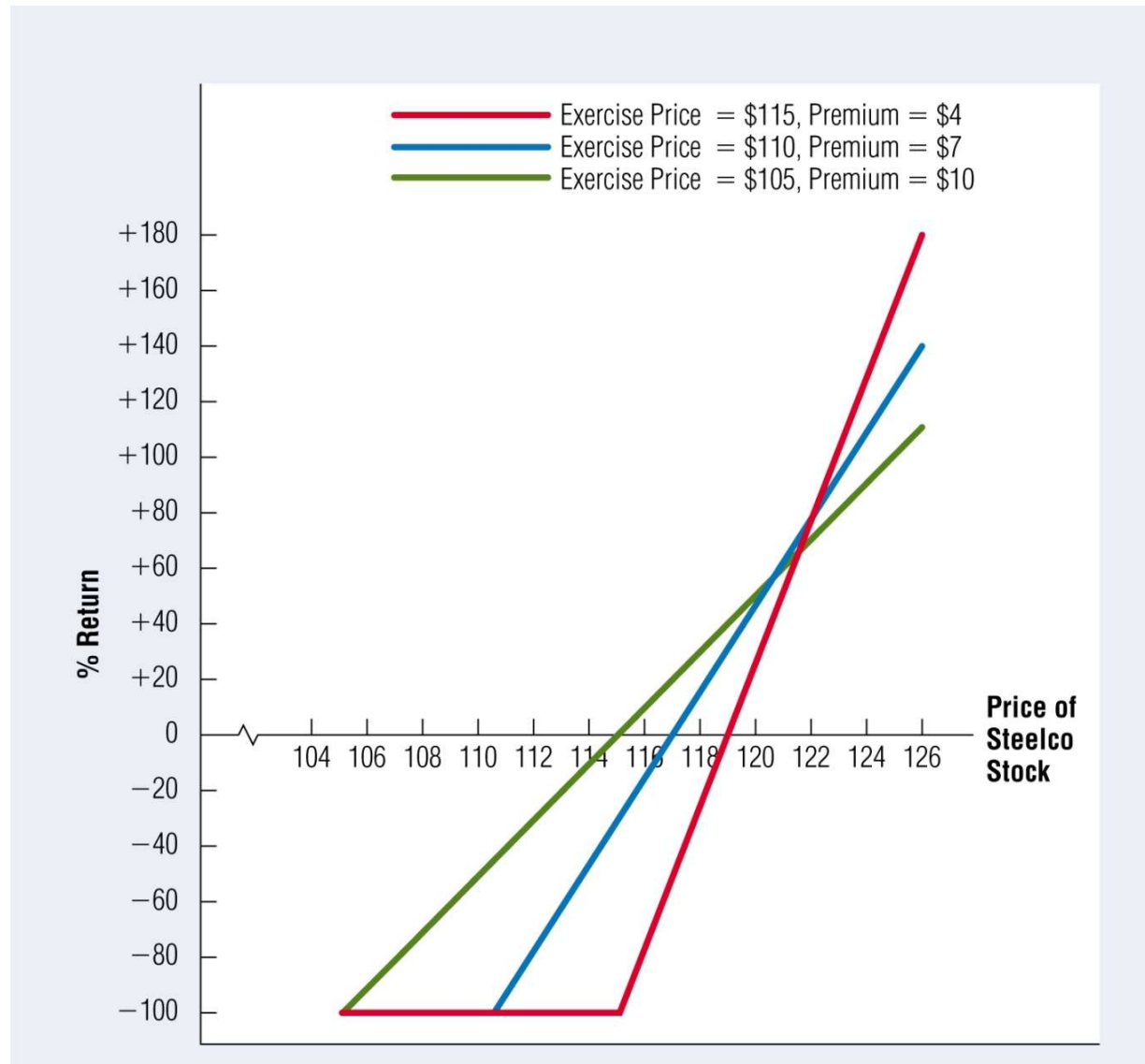
Potential Gains or Losses for 3 Call Options (Buyer's Perspective)



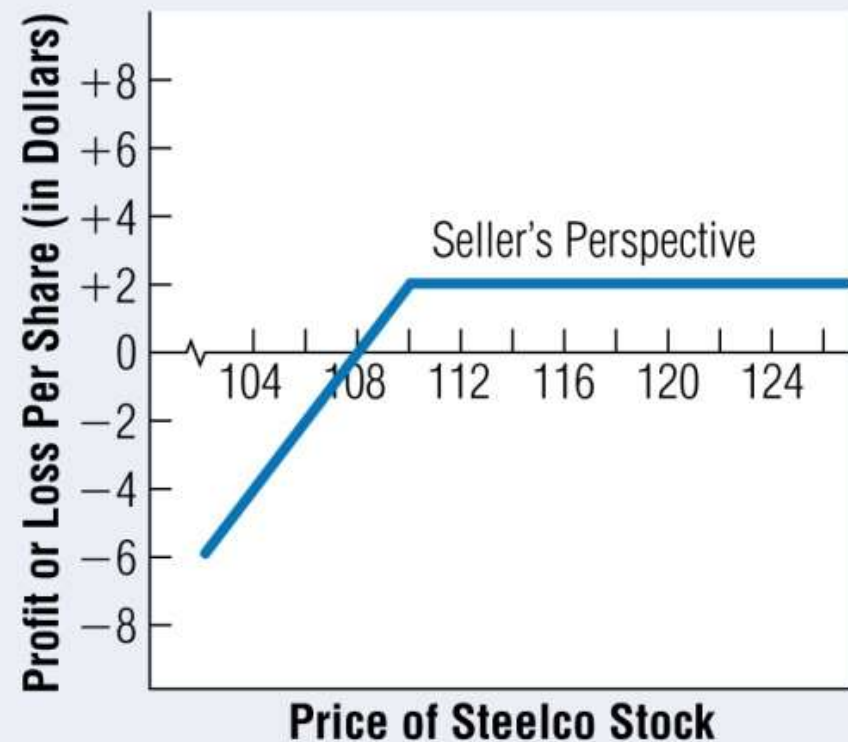
Potential Returns on 3 Different Call Options

PRICE OF STEELCO	OPTION 1: EXERCISE PRICE = \$105 PREMIUM = \$10		OPTION 2: EXERCISE PRICE = \$110 PREMIUM = \$7		OPTION 3: EXERCISE PRICE = \$115 PREMIUM = \$4	
	PROFIT PER UNIT	PERCENTAGE RETURN	PROFIT PER UNIT	PERCENTAGE RETURN	PROFIT PER UNIT	PERCENTAGE RETURN
\$104	-\$10	-100%	-\$7	-100%	-\$4	-100%
106	-9	-90	-7	-100	-4	-100
108	-7	-70	-7	-100	-4	-100
110	-5	-50	-7	-100	-4	-100
112	-3	-30	-5	-71	-4	-100
114	-1	-10	-3	-43	-4	-100
116	1	10	-1	-14	-3	-75
118	3	30	1	14	-1	-25
120	5	50	3	43	1	25
122	7	70	5	71	3	75
124	9	90	7	100	5	125
126	11	110	9	129	7	175

Potential Returns for 3 Call Options (Buyer's Perspective)



Potential Gains or Losses on a Put Option: Exercise Price = \$110, Premium = \$2



Options on ETFs and Stock Indexes

- Options are also traded on exchange-traded funds (ETFs) and stock indexes
- A **stock index option** provides the right to trade a specified stock index at a specified price by a specified expiration date
- Call options on stock indexes allow the right to purchase the index, and put options on stock indexes allow the right to sell the index
- Options on indexes have become popular for speculating on general movements in the stock market

Sampling of ETFs and Indexes on Which Options Are Traded

SAMPLING OF ETFs ON WHICH OPTIONS ARE TRADED	
iShares Nasdaq Biotechnology	iShares Russell 1000 Growth Index Fund
iShares Goldman Sachs Technology Index	Energy Select Sector SPDR
iShares Goldman Sachs Software Index	Financial Select Sector SPDR
iShares Russell 1000 Index Fund	Utilities Select Sector SPDR
iShares Russell 1000 Value Index Fund	Health Care Select Sector SPDR
SAMPLING OF INDEXES ON WHICH OPTIONS ARE TRADED	
Asia 25 Index	S&P SmallCap 600 Index
Euro 25 Index	Nasdaq 100 Index
Mexico Index	Russell 1000 Index
Dow Jones Industrial Average	Russell 1000 Value Index
Dow Jones Transportation Average	Russell 1000 Growth Index
Dow Jones Utilities Average	Russell Midcap Index
S&P 100 Index	Goldman Sachs Internet Index
S&P 500 Index	Goldman Sachs Software Index
Morgan Stanley Biotechnology Index	

Options on ETFs and Stock Indexes

Hedging with Stock Index Options

- Financial institutions and other firms commonly take positions in options on ETFs or indexes to hedge against market or sector conditions that would adversely affect their asset portfolio or cash flows

Dynamic Asset Allocation with Stock Index Options

- Dynamic asset allocation involves switching between high-risk and low-risk investment positions in response to changing expectations
- Some portfolio managers use stock index options as a tool for dynamic asset allocation

Options on ETFs and Stock Indexes

Using Index Options to Measure the Market's Risk

- A stock index's implied volatility can be derived from information about options on that stock index
- The same factors that affect the option premium on a stock affect the option premium on an index

Options as Executive Compensation

Many firms distribute stock options to executives as a reward for good performance

Limitations of Option Compensation

- Many option compensation programs do not account for general market conditions
- Executives with substantial options may be tempted to manipulate the stock's price upward in the short term, even though doing so adversely affects the stock price in the long term

Currency Options Contracts

- A **currency call option** provides the right to purchase a specified currency for a specified price within a specified period of time
 - Speculators purchase call options on currencies that they expect to strengthen against the dollar
- A **currency put option** provides the right to sell a specified currency for a specified price within a specified period of time
 - Speculators purchase put options on currencies they expect to weaken against the dollar
- For every buyer of a currency call or put option, there must be a seller (or writer)