Chapter 15 - Options Markets

- Option contract
- Option trading
- Values of options at expiration
- Options vs. stock investments
- Option strategies
- Option-like securities

- Option contract

  Options are rights to buy or sell something at a predetermined price on or before a specified date

  American options vs. European options
  American options can be exercised at any time on or before the expiration date
  European options can only be exercised on the expiration date

  Assuming everything else is the same, which option should be worth more?

  Premium: the purchase price of an option

  Call option gives its holder the right to buy an asset for a specified price, call the exercise price (strike price) on or before the a specified date (expiration date)

  Example: buy an IBM October call option with an exercise price of $200 for $5.00 (the premium is $500). IBM is currently trading at $191 per share.

  Details: this is a call option that gives the right to buy 100 share of IBM stock at $200 per share on or before the third Friday in October

  Profits or losses on the expiration date
  If IBM stock price remains below $200 until the option expires, the option will be worthless. The option-holder will lose $500 premium.

  If IBM stock price rises to $204 on the expiration date, the value of the option will be worth (204 – 200) = $4.00. The option-holder will lose $100.

  If IBM stock price rises to $210 on the expiration date, the value of the option will be worth (210 – 200) = $10.00. The option-holder will make $500 net profit.

  At what stock price, will the option-holder be break-even? Answer: at $205

  Rationale: if you expect that the stock price is going to move higher, you should buy call options

Put option gives its holder the right to sell an asset for a specified price, call the exercise price (strike price) on or before the a specified date (expiration date)

Example: Buy an IBM October put option with an exercise price of $185 for $3.00. IBM is currently trading at $191 per share.

Details: this is a put option that gives the right to sell 100 shares of IBM stock at $185 per share on or before the third Friday in October

Profits or losses on the expiration date
If IBM stock price falls to $170 on the expiration date, the option will be worth (185 – 170) = $15. The option-holder will make $1,200 net profit.

If IBM stock price drops to $183 on the expiration date, the value of the option will be worth (185 – 183) = $2.00. The option-holder will lose $100.

If IBM stock price remains above $185 until the expiration date, the value of the option will be worthless. The option-holder will lose $300 premium.

At what stock price, will the option-holder be break-even? Answer: at $182

Rationale: if you expect that the stock price is going to move lower, you should buy put options

In-the-money option: an option where exercise would generate a positive cash flow

Out-of-the-money option: an option where, if exercised, would generate a negative cash flow. Out of the money options should never be exercised.

At-the-money option: an option where the exercise price is equal to the asset price

- Option trading

  OTC markets vs. organized exchanges

  Over-the-counter markets: tailor the needs of the traders, such as the exercise price, expiration date, and number of shares

  Organized exchanges: for example, the Chicago Board of Option Exchange (CBOE), standardized contracts

  Option clearing corporation (OCC): the clearinghouse between option traders to guarantees option contract performance

Other listed options
Index options: the underlying asset is a stock index
Futures options: the underlying asset is a futures contract
Foreign currency options: the underlying asset is a foreign currency
Interest rate options: the underlying assets are T-bonds, T-notes, or T-bills

- Values of options at expiration

  Two types of options: call options vs. put options
  Four positions: buy a call, sell (write) a call, buy a put, sell (write) a put

  Notations
  S_0: the current price of the underlying asset
  X: the exercise (strike) price
  T: the time to expiration of option
  S_T: the price of the underlying asset at time T
  C: the call price (premium) of an American option
  P: the put price (premium) of an American option
  r: the risk-free interest rate
  σ : the volatility (standard deviation) of the underlying asset price

  In general, the payoff at time T, the expiration date is

  (1) Payoff to a call option holder is = max (S_T - X, 0) or
  = S_T - X if $S_T > X$
  0 if $S_T \leq X$

  For example, if S_T = 100 and X = 95, then the payoff to the call option holder is 5;
  If S_T = 90 and X = 95, then the payoff to the call option holder is 0.

  (2) Payoff to a call option writer is = min (X - S_T, 0)
  = -max (S_T - X, 0) or
  = -(S_T - X) if $S_T > X$
  0 if $S_T \leq X$

  For example, if S_T = 100 and X = 95, then the payoff to the call writer is -5;
  If S_T = 90 and X = 95, then the payoff to the call option writer is 0.

  (1) is the mirror of (2) across of the x-axis

  (3) Payoff to a put option holder is = max (X - S_T, 0) or
  = X - S_T if $S_T < X$
  0 if $S_T \geq X$

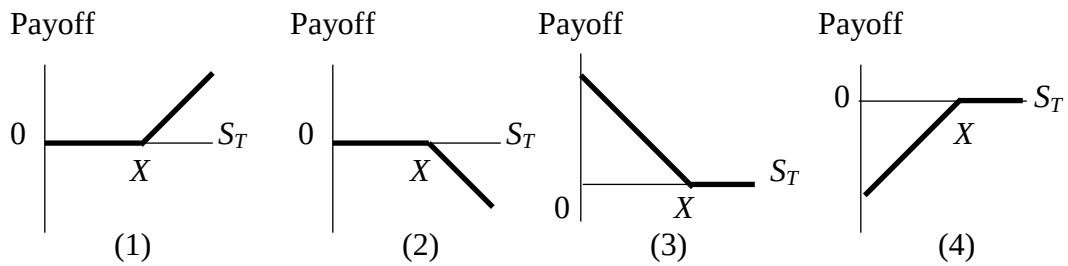
  For example, if S_T = 100 and X = 95, then the payoff to the put option holder is 0;
  If S_T = 90 and X = 95, then the payoff to the put option holder is 5.

(4) Payoff to a put option writer is = min (S_T - X, 0)

$$= -\max(X - S_T, 0) \text{ or}$$
$$= -(X - S_T) \text{ if } S_T < X$$
$$0 \text{ if } S_T \geq X$$

For example, if S_T = 100 and X = 95, then the payoff to the put option writer is 0;
If S_T = 90 and X = 95, then the payoff to the put option writer is -5.

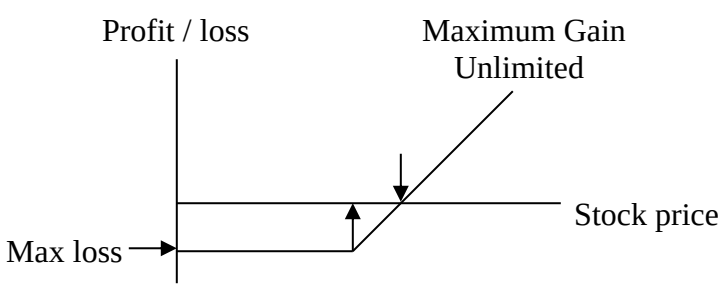
(3) is the mirror of (4) across of the x-axis



Profit/loss diagrams (including the premium) for four option positions
Buy a call
Sell (write) a call
Buy a put
Sell (write) a put

(1) Buy a call option: buy an October 90 call option at $2.50

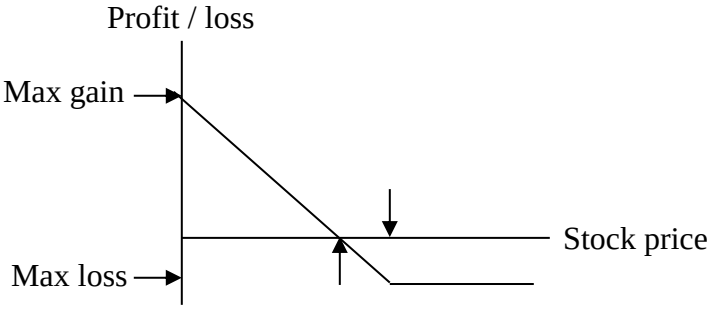
		Stock price at expiration			
		0	70	90	110
Buy October 90 call @ $2.50		-2.50	-2.50	-2.50	17.50
Net cost	$2.50	-2.50	-2.50	-2.50	17.50



(2) Write a call option: write an October 90 call at $2.50 (exercise for students, the mirror of (1) across of the x-axis)

(3) Buy a put option: buy an October 85 put at $2.00

		Stock price at expiration			
		0	65	85	105
Buy October 85 put @ $2.00		83.00	18.00	-2.00	-2.00
Net cost	$2.00	83.00	18.00	-2.00	-2.00



(4) Write a put option: write an October 85 put at $2.00 (exercise for students, the mirror of (3) across of the x-axis)

- Options vs. stock investments

  Suppose you have $9,000 to invest. You have three choices:

  (1) Invest entirely in stock by buying 100 shares, selling at $90 per share

  (2) Invest entirely in at-the-money call option by buying 900 calls, each selling for $10. (This would require buying 9 contracts, each would cost $1,000. Each contract covers 100 shares.) The exercise price is $90 and the options mature in 6 months.

  (3) Buy 1 call options for $1,000 and invest the rest of $8,000 in 6-month T-bill to earn a semiannual interest rate of 2%.

Outcome: it depends on the underlying stock price on the expiration date

Untab1504 – excel outcome when the underlying stock price on the expiration data is $85, $90, $95, $100, $105, and $110 respectively

Risk-return tradeoff: option investing is considered very risky since an investor may lose the entire premium. However, the potential return is high if the investor is right in betting the movements of the underlying stock price.

Stock investing is less risky compared with option investing.

- Option strategies

  A variety of payoff patterns can be achieved by combining stocks and puts or calls

  Protective put: buy a share of stock and buy a put option written on the same stock to protect a potential drop in the stock price

  Example: buy a stock at $86 and buy a December 85 put on the stock at $2.00

		Stock price at expiration			
		0	45	85	125
Buy stock @	86	-86	-41	-1	39
Buy Dec. 85 put @	2	83	38	-2	-2
Net	-88	-3	-3	-3	37

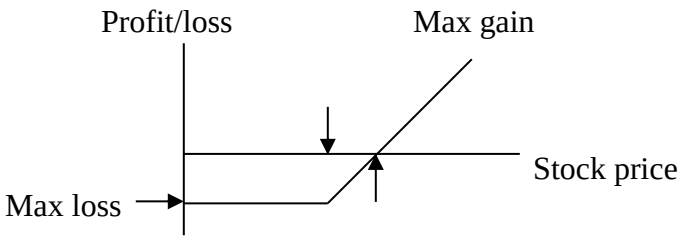


Figure 15.6: buy stock + buy a put = buy a call

Covered call: buy a share of stock and sell (write) a call on the stock

Example: buy a stock at $86 and write a December 90 call on the stock at $2.00

		Stock price at expiration			
		0	45	90	135
Buy stock @	86	-86	-41	4	49
Write Dec. 90 call @	2	2	2	2	-43
Net	-84	-84	-39	6	6

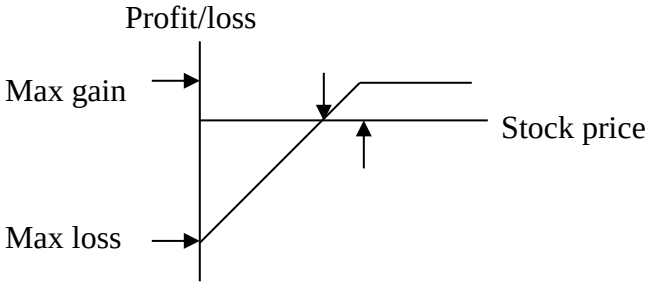


Figure 15.8: buy stock + sell (write) a call = sell (write) a put

Other combinations: an unlimited variety of payoff patterns can be achieved by combining puts and calls with different exercise prices

Straddle: a combination of a call and a put written on the same stock, each with the same exercise price and expiration date

Figure 15.9 – buy a straddle, you believe that the stock will be volatile

What if you sell (write) a straddle? You believe that the stock is less volatile

Spread: a combination of two or more call options or put options written on the same stock with different exercise prices or times to expiration dates

Figure 15.10 – buy a spread, you are bullish about the stock

What if you sell (write) a spread? You must be bearish about the stock

Collar: a strategy that brackets the value of a portfolio between two bounds

- Option-like securities

  Callable bonds: give the bond issuer the right to call the bond before the bond matures at the call price, which is equivalent to day that it gives the bond issuer a call option to buy the bond with an exercise price that is equal to the call price.

  Convertible bonds: give the bond holder the right to convert the bond into a fixed amount of common stocks, which is equivalent to day that it gives the bond holder a put option to sell the bond back to the issuing firm in exchange for a number of shares of common stock.

  Value of a convertible bond: Figure 15.12

  Convertible preferred stock: works similar as convertible bonds

  Warrants: issued by the firm to purchase shares of its stock; it is different from a call option in that it requires the firm to issue new shares to satisfy the obligation.

  Collateralized loans and other option-like securities

- ASSIGNMENTS

1. Concept Checks and Summary
2. Key Terms
3. Basic: 4 and 5
4. Intermediate: 9-12

Chapter 17 - Futures Markets and Risk Management

- Futures contract
- Trading mechanics
- Futures market strategies
- Futures prices
- Financial futures
- Swaps

- Futures contract

  Forward contract vs. futures contract

  A forward contract is an agreement between two parties to either buy or sell an asset at a certain time in the future for a certain price. A forward contract, usually, is less formal, traded only in OTC markets, and contract size is not standardized.

  A futures contract is an agreement between two parties to either buy or sell an asset at a certain time in the future for a certain price. It is more formal, traded in organized exchanges, and contract size is standardized (focus).

  Comparison of futures and forward contracts

	Exchange trading	Standardized contract size	Marking to market	Delivery	Delivery time	Default risk
Forward	No	No	No	Yes or cash settlement	One date	Some credit risk
Futures	Yes	Yes	Yes	Usually closed out	Range of dates	Virtually no risk

  Characteristics of futures contracts

  Opening a futures position vs. closing a futures position

  Opening a futures position can be either a long (buy) position or a short (sell) position (i.e., the opening position can be either to buy or to sell a futures contract)

  Closing a futures position involves entering an opposite trade to the original one

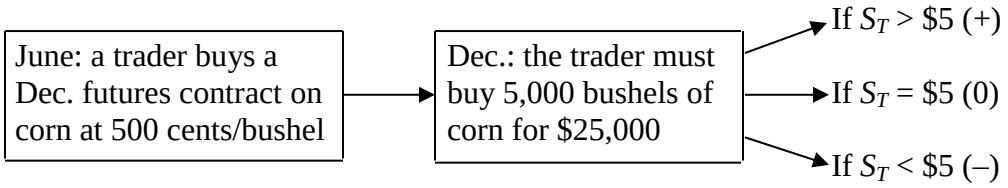
  The underlying asset or commodity: must be clearly specified

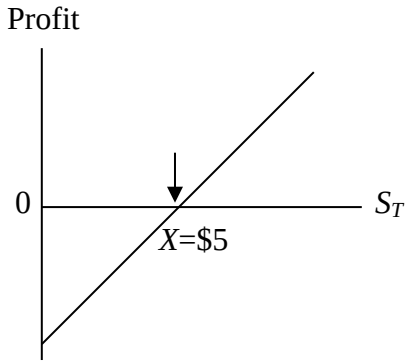
The contract size: standardized
Corn and wheat: 5,000 bushels per contract
Live cattle: 40,000 pounds per contract
Cotton: 50,000 pounds per contract
Gold: 100 troy ounces per contract
DJIA: $10*index
Mini DJIA: $5*index
S&P 500: $250*index
Mini S&P 500: $50*index

Delivery month: set by the exchange
Delivery place: specified by the exchange

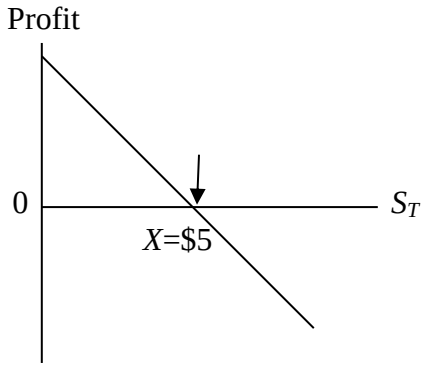
For example, a trader in June buys a December futures contract on corn at 500 cents (or $5) per bushel

Corn: underlying asset - commodity (commodity futures contract)
Buy a futures contract: long position (promise to buy)
500 cents/bushel: futures price/delivery price
5,000 bushels: contract size - standardized
December: delivery month
Spot price: actual price in the market for immediate delivery





Long position (buy futures)



Short position (sell futures)

X = delivery price = $5/bushel and S_T = the spot price at maturity (can be greater than, equal to, or less than $5/bushel)

If S_T is greater than X, the person with a long position gains (S_T - X) and the person with a short position loses (X - S_T) since it is a zero sum game (someone's gain is someone else's loss)

If S_T is less than X, the person with a long position loses (S_T - X) and the person with a short position gains (X - S_T) since it is a zero sum game (someone's gain is someone else's loss)

If S_T is equal to X, there is no gain or loss on both sides - zero sum game

What will happen if a trader in June sells a December futures contract on corn at 500 cents (or $5) per bushel? This is an exercise for students.

Futures prices – Figure 17.1

- Trading mechanics

  The clearinghouse and open interest

  A clearinghouse is an agency or a separate corporation of a futures exchange responsible for settling trading accounts, clearing trades, collecting and maintaining margin money, regulating delivery and reporting trading data. A clearinghouse acts as a third party to all futures and options contracts - as a buyer to every clearing member seller and a seller to every clearing member buyer.

  Figure 17.3

  Open interest: the total number of futures contracts outstanding for a particular asset/commodity at a particular time

  Open interest: an example
  Given the following trading activities, what is the open interest at the end of each day?

Time	Actions	Open Interest
t = 0	Trading opens for gold contract	0
t = 1	Trader A buys 2 and trader B sells 2 gold contracts	2
t = 2	Trader A sells 1 and trader C buys 1 gold contract	2
t = 3	Trader D sells 2 and trader C buys 2 gold contracts	4

Marking to market and margin account

Marking to market: the procedure that the margin account is adjusted to reflect the gain or loss at the end of each trading day

Example: suppose an investor buys two gold futures contracts. The initial margin is $2,000 per contract (or $4,000 for two contracts) and the maintenance margin is $1,500 per contract (or $3,000 for two contracts). The contract was entered into on June 5 at $850 and closed out on June 18 at $840.50. (Gold is trading around $1,300 per ounce now.)

Day	Futures price (settlement)	Daily gain (loss)	Cumulative gain (loss)	Margin balance	Margin call (variation margin)
	850.00			4,000	
June 5	848.00	(400)	(400)	3,600	
June 6	847.50	(100)	(500)	3,500	
June 9	848.50	200	(300)	3,700	
June 10	846.00	(500)	(800)	3,200	
June 11	844.50	(300)	(1,100)	2,900	Yes (1,100)
June 12	845.00	100	(1,000)	4,100	
June 13	846.50	300	(700)	4,400	
June 16	842.50	(800)	(1,500)	3,600	
June 17	838.00	(900)	(2,400)	2,700	Yes (1,300)
June 18	840.50	500	(1,900)	4,500	

Note: the investor earns interest on the balance in the margin account. The investor can also use other assets, such as T-bills to serve as collateral (at a discount)

Margin account: an account maintained by an investor with a brokerage firm in which borrowing is allowed

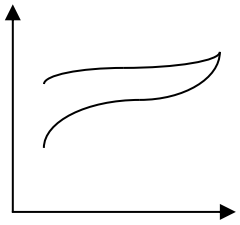
Initial margin: minimum initial deposit

Maintenance margin: the minimum actual margin that a brokerage firm will permit investors to keep their margin accounts

Margin call: a demand on an investor by a brokerage firm to increase the equity in the margin account

Variation margin: the extra fund needs to be deposited by an investor

Convergence of futures price to spot price
As the delivery period approaches, the futures price converges to the spot price of the underlying asset. Why? Because the arbitrage opportunity exists if it doesn't happen



If the futures price is above the spot price as the delivery period is reached
(1) Short a futures contract
(2) Buy the asset at the spot price
(3) Make the delivery

If the futures price is below the spot price as the delivery period is reached
(1) Buy a futures contract
(2) Short sell the asset and deposit the proceeds
(3) Take the delivery and return the asset

Cash settlement vs. actual delivery
Some futures contracts are settled in cash – cash settlement, for example, most financial futures contracts
Most commodity futures contracts are offset before the delivery month arrives
For agricultural commodities, where the quality of the delivered good may vary, the exchange sets the standard as part of the futures contract. In some cases, contracts

Regulations: federal Commodity Futures Trading Commission (CFTC) regulates futures markets

The futures exchanges may set position limits and price limits.

Taxation: because of the marking-to-market procedure, investors do not have control over tax year in which they realize gains or losses. Therefore, taxes are paid at year-end on cumulated gains or losses. In general, 60% of futures gains or losses are treated as long term while 40% as short term.

- Futures market strategies

  Hedging and speculation

  Hedging: an investment strategy used to protect against price movements

  Short hedges: use short positions in futures contracts to reduce or eliminate risk
  For example, an oil producer can sell oil futures contracts to reduce oil price uncertainty in the future

  Long hedge: use long positions in futures contracts to reduce or eliminate risk
  For example, a brewer buys wheat futures contracts to reduce future price uncertainty of wheat

  Example: a refinery buys crude oil futures to lock in the price. This is a hedging behavior since the purpose of doing so is to reduce future price uncertainty (movements) - long hedging

  Speculation: an investment strategy used to profit from price movements

  Example: if you believe that crude oil prices are going to rise and you purchase crude oil futures. You are speculating crude oil price movements - long speculation (you don't need crude oil). If you believe that crude oil prices are going to drop and you sell crude oil futures. You are speculating crude oil price movements - short speculation (you don't have crude oil).

  Why not buy the underlying asset directly? Because trading futures contracts saves you transaction costs. Another important reason is the leverage (you use a limited amount of capital to play a bigger game).

  Basis: the difference between the futures price and the spot price
  Basis (b) = futures price (F) – spot price (P)
  At maturity, T: $F_T - P_T = 0$ due to convergence property

  Basis risk: risk attributable to uncertain movements in the spread between a futures price and a spot price

  Let $P_1, F_1,$ and b_1 be the spot price, futures price, and basis at time t_1 and $P_2, F_2,$ and b_2 be the spot price, futures price, and basis at time t_2, then $b_1 = F_1 - P_1$ at time t_1 and $b_2 = F_2 - P_2$ at time t_2.

  Consider a hedger who knows that the asset will be sold at time t_2 and takes a short position at time t_1. The spot price at time t_2 is P_2 and the payoff on the futures position is $(F_1 - F_2)$ at time t_2. The effective price is

  $P_2 + F_1 - F_2 = F_1 - (F_2 - P_2) = F_1 - b_2$, where b_2 refers to the basis risk

  Example 17.6 on page 574

Spread: taking a long position in a futures contract of one maturity and a short position in a contract of a different maturity, both on the same commodity

- Futures prices

  Spot-futures parity

  Let us consider two investment strategies:

  (1) Buy gold now, paying the current or spot price, S_0, and hold the gold until time T, when its spot price will be S_T

  (2) Initiate a long futures position on gold and invest enough money at the risk-free rate, r_f, now in order to pay the futures price, F_0, when the contract matures

	Action	Initial cash flow	Cash flow at time T
Strategy (1)	Buy gold	$-S_0$	S_T
Strategy (2)	Enter a long position	0	$S_T - F_0$
	Invest $F_0 / (1 + r_f)^T$	$- F_0 / (1 + r_f)^T$	F_0
	Total for Strategy (2)	$- F_0 / (1 + r_f)^T$	S_T

Since the payoff for both strategies at maturity (time T) is the same (S_T), the cost, or the initial cash outflow must be the same. Therefore,

General solution: $F_0 = S_0*(1 + r_f)^T$ or $F_0 / (1 + r_f)^T = S_0$

Example: gold currently sells for $1,300 an ounce. If the risk free rate is 0.1% per month, then a six-month maturity futures contract should have a futures price of

$F_0 = S_0*(1 + r_f)^T = 1{,}300*(1 + 0.001)^6 = \$1{,}307.82$

For a 12-month maturity, the futures price should be
7
$F_0 = S_0*(1 + r_f)^T = 1{,}300*(1 + 0.001)^{12} = \$1{,}315.69$

If the spot-futures parity doesn't hold, investors can earn arbitrage profit.

In the above example, if the 12-month maturity gold futures price is not $1,315.69, instead, it is $1,320 an investor can borrow $1,300 at 0.1% per month for 12 months and use the money to buy one ounce of gold and sell a 12-month gold futures contract at $1,320. After 12 months, the investor delivers the gold and corrects $1,320. The investor repays the loan of $1,315.69 (principal plus interest) and pockets $4.31 in risk free profit.

If the 12-month futures price is $1,310, an investor can also make risk-free profit by reversing the steps above. That is an exercise for students.

The arbitrage strategy can be represented in general on page 577

Spot-futures parity theorem or cost-of-carry relationship

$F_0 = S_0*(1 + r_f - d)^T$, where $(r_f - d)$ is the cost of carry and d can be positive or negative

Example: buying a stock index futures contract, d will be the dividend yield

- Financial futures

  Stock index futures: a futures contract written on a stock index (the underlying asset is a stock index)

  Index arbitrage: an investment strategy that explores divergences between actual futures price on a stock index and its theoretically correct parity value.

  Program trading: a coordinated buy or sell order of the entire portfolio, often to achieve index arbitrage objectives

  Foreign exchange futures: futures contracts written on a foreign currency (exchange rate) and mature in March, June, September, and December

  Interest rate futures: futures contracts written on an interest-bearing instrument, such as Eurodollars, T-bonds, T-notes, and T-bills, etc.

  Price value of a basis point: the change in price due to the change in 1 basis point (or 0.01% change in yield)

  Cross hedging: hedging a position in one asset by establishing an offsetting position in a related but different asset

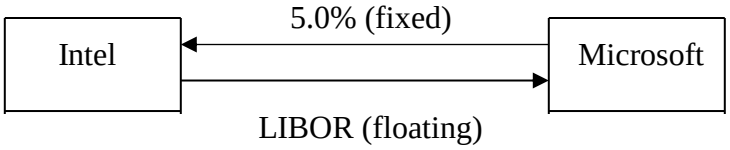
  Example: a good example is cross hedging a crude oil futures contract with a short position in natural gas. Even though these two products are not identical, their price movements are similar enough to use for hedging purposes

- Swaps

  Interest rate swap and foreign exchange swap

  Interest rate swap: an instrument in which two parties agree to exchange interest rate cash flows, based on a specified notional amount from a fixed rate to a floating rate (or vice versa). Interest rate swaps are commonly used for both hedging and speculating

For example, Intel and Microsoft agreed a swap in interest payments on a notional principal of $100 million. Microsoft agreed to pay Intel a fixed rate of 5% per year while Intel agreed to pay Microsoft the 6-month LIBOR.



Cash flows to Microsoft in a $100 million 3-year interest rate swap when a fixed rate of 5% is paid and LIBOR is received:

Date	6-month LIBOR	Floating cash flow	Fixed cash flow	Net cash flow
3-5-2010	4.20%			
9-5-2010	4.80%	+2.10 million	-2.50 million	-0.40 million
3-5-2011	5.30%	+2.40 million	-2.50 million	-0.10million
9-5-2011	5.50%	+2.65 million	-2.50 million	+0.15 million
3-5-2012	5.60%	+2.75 million	-2.50 million	+0.25 million
9-5-2012	5.90%	+2.80 million	-2.50 million	+0.30 million
3-5-2013		+2.95 million	-2.50 million	+0.45 million

Cash flows to Intel will be the same in amounts but opposite in signs.

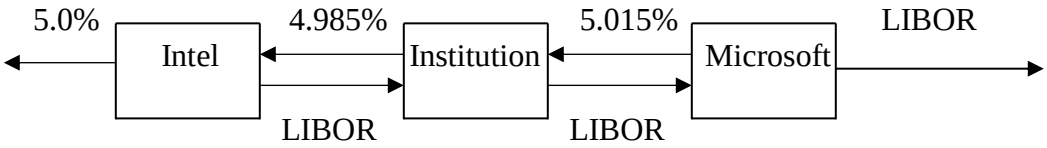
The floating rate in most interest rate swaps is the London Interbank Offered Rate (LIBOR). It is the rate of interest for deposits between large international banks.

Why swaps? Comparative advantages

What if the swap is arranged by a swap dealer (for example, a bank)?

Arranging a swap to earn about 3-4 basis points (0.03-0.04%)

Refer to the swap between Microsoft and Intel again when a financial institution is involved to earn 0.03% (the cost is shared evenly by both companies)



After swap, Intel pays LIBOR + 0.015%, Microsoft pays 5.015%, and the financial institution earns 0.03% by arranging the swap.

Foreign exchange swap: an agreement to exchange a sequence of payments denominated in one currency for payments in another currency at an exchange rate agreed to today

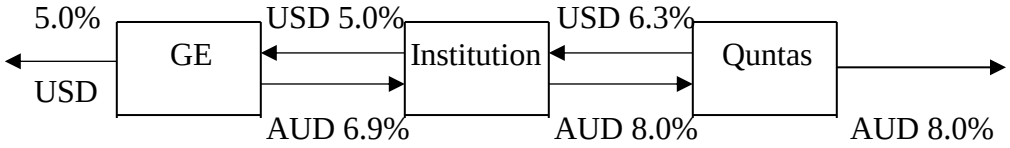
Example: let us consider two corporations, GM and Qantas Airway. Both companies are going to borrow money and are facing the following rates. Assume GM wants to borrow AUD and Qantas Airway wants to borrow USD.

	USD	AUD
GE	5.00%	7.60%
Qantas	7.00%	8.00%

How can a swap benefit both companies?
Answer: GE borrows USD and Qantas borrows AUD and then two companies engage in a swap

Since in the USD market, GM has a comparative advantage of 2.00% and in the AUD market it has 0.4% in comparative advantage, the net gain from the swap will be 1.6% (the total benefit will be shared by all the parties involved).

Assuming a financial institution arranges the swap and earns 0.2% (by taking the exchange rate risk)



Net outcome (assuming the net benefit is evenly shared by GM and Quntas):
GE borrows AUD at 6.9% (0.7% better than it would be if it went directly to the AUD market)
Quntas borrows USD at 6.3% (0.7% better than it would be if it went directly to the USD market)
Financial institution receives 1.3% USD and pays 1.1% AUD and has a net gain of 0.2%

- ASSIGNMENTS

1. Concept Checks and Summary
2. Key Terms
3. Basic: 2-4
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Chapter 18 - Portfolio Performance and Evaluation

- Risk-adjusted returns
- M^2 measure
- T^2 measure
- Style analysis
- Morningstar's risk-adjusted rating
- Active and passive portfolio management
- Market timing

- Risk-adjusted returns

  Comparison groups: portfolios are classified into similar risk groups

  Basic performance-evaluation statistics
  Starting from the single index model

$$R_{Pt} = \beta_P R_{Mt} + \alpha_P + \varepsilon_{Pt}$$

Where R_{Pt} is the portfolio P's excess return over the risk-free rate, R_{Mt} is the excess return on the market portfolio over the risk-free rate, β_P is the portfolio beta (sensitivity), $\alpha_P + \varepsilon_{Pt}$ is the nonsystematic component, which includes the portfolio's alpha α_P and the residual term ε_{Pt} (the residual term ε_{Pt} has a mean of zero)

The expected return and the standard deviation of the returns on portfolio P

$$E(R_{Pt}) = \beta_P E(R_{Mt}) + \alpha_P \qquad \text{and} \qquad \sigma_P^2 = \beta_P^2 \sigma_M^2 + \sigma_\varepsilon^2$$

Estimation procedure

(1) Obtain the time series of R_{Pt} and R_{Mt} (enough observations)

(2) Calculate the average of R_{Pt} and R_{Mt} ($\bar{R}_P$ and $\bar{R}_M$)

(3) Calculate the standard deviation of returns for P and M (σ_P and σ_M)

(4) Run a linear regression to estimate β_P

(5) Compute portfolio P's alpha: $\alpha_P = E(R_{Pt}) - \beta_P E(R_{Mt}) = \bar{R}_P - \beta_P \bar{R}_M$

(6) Calculate the standard deviation of the residual: $\sigma_\varepsilon = \sqrt{\sigma_P^2 - \beta_P^2 \sigma_M^2}$

Risk-adjusted portfolio performance measurement (Table 18.1)

(1) The Sharpe measure: measures the risk premium of a portfolio per unit of total risk, reward-to-volatility ratio

$$\text{Sharpe measure} = S = \frac{\bar{R}}{\sigma}$$

(2) The Jensen measure (alpha): uses the portfolio's beta and CAPM to calculate its excess return, which may be positive, zero, or negative. It is the difference between actual return and required return

$$\alpha_P = E(R_{Pt}) - \beta_P E(R_{Mt}) = \bar{R}_P - \beta_P \bar{R}_M$$

(3) The Treynor measure: measures the risk premium of a portfolio per unit of systematic risk

$$\text{Treynor measure} = T = \frac{\bar{R}}{\beta}$$

- M^2 measure

  M^2 measure: is to adjust portfolio P such that its risk (volatility) matches the risk (volatility) of a benchmark index, then calculate the difference in returns between the adjusted portfolio and the market

$$M^2 = (S_P - S_M)\sigma_M$$

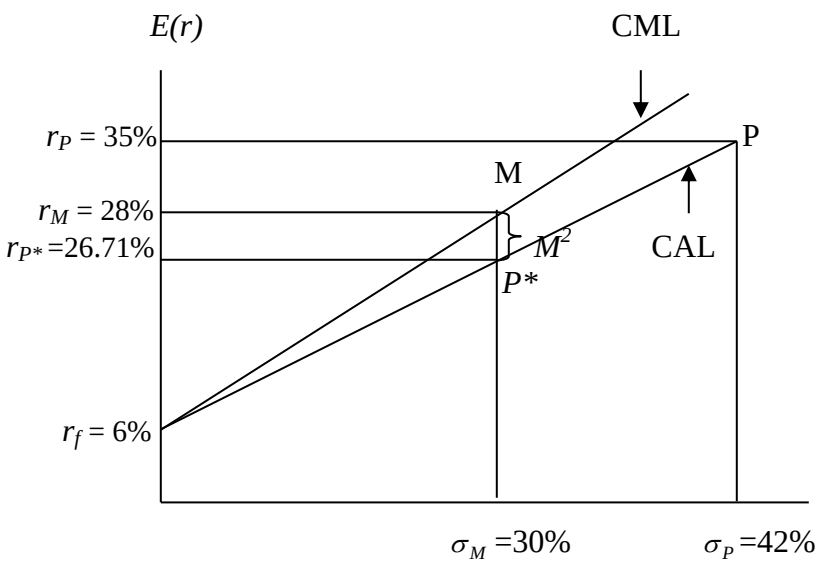
Example: Given the flowing information of a portfolio and the market, calculate M^2, assuming the risk-free rate is 6%.

	Portfolio (P)	Market (M)
Average return	35%	28%
Beta	1.2	1.0
Standard deviation	42%	30%

S for P = (0.35 - 0.06) / 0.42 = 0.69

S for M = (0.28 - 0.06) / 0.30 = 0.73

M^2 = (0.69 - 0.73)*0.30 = -0.0129 = -1.29%



Alternative way: adjust P to P* (to match the risk of the market)

Determining the weights to match the risk of the market portfolio
30/42 = 0.7143 in portfolio
1-0.7143 = 0.2857 in risk-free asset
Adjusted portfolio risk = 30%
Adjusted portfolio return = 0.7143*35% + 0.2857*6% = 26.71% < 28%

M^2 = 26.7% – 28% = -1.29%

The portfolio underperforms the market (refer to Figure 18.2 for another example)

- T^2 measure

  T^2 measure: is similar to M^2 measure but by adjusting the market risk - beta

  $$T^2 = r_{p*} - r_M$$

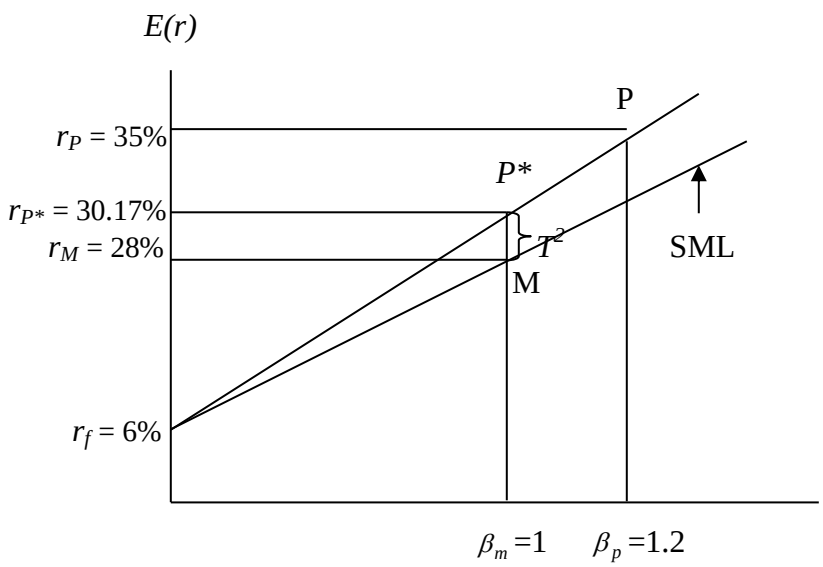
  Example (continued)

  Weights: 1/1.2 = 0.8333 in P and 1 – 0.8333 = 0.1667 in risk-free asset

  The adjusted portfolio has a beta of 1: 1.2*0.8333 + 0*0.1667 = 1

  Adjusted portfolio return = 0.8333*35% + 0.1667*6% = 30.17% > 28%

  T^2 = 30.17% – 28% = 2.17%



The portfolio outperforms the market

Why M^2 and T^2 are different?

Because P is not fully diversified and the standard deviation is too high

- Style analysis

  Style analysis: the process of determining what type of investment behavior an investor or money manager employs when making investment decisions

  Table 18.3

- Morningstar's risk-adjusted rating

  Morningstar computes fund returns (adjusted for loads, risk measures and other characteristics) and rank the funds with 1 to 5 stars, with one star being the worst and 5 stars being the best.

- Active and passive portfolio management

  Active: attempt to improve portfolio performance either by identifying mispriced securities or by timing the market; it is an aggressive portfolio management technique

  Passive: attempt of holding diversified portfolios; it is a buy and hold strategy

- Market timing

  A strategy that moves funds between the risky portfolio and cash, based on forecasts of relative performance

  Assume an investor had $1 to invest on December 1, 1926. The investor had three choices by then:

  (1) Invested $1 in a money market security or cash equivalent
  (2) Invested in stocks (the S&P 500 portfolio) and reinvested all dividends
  (3) Used market timing strategy and switched funds every month between stocks and cash, based on its forecast of which sector would do better next month

  (Table 18.8)

  If you can time the market perfectly you will be a billionaire.

  Can we time the market?

  Revisit the efficient market hypothesis

  When can we time the market?

  Forecast the market conditions, if $r_M > r_f$, move funds to stocks; if $r_M < r_f$, move funds to the risk-free asset

- ASSIGNMENTS

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Example: Intermediate 6 (Figure - Digital Image)

We first distinguish between timing ability and selection ability. The intercept of the scatter diagram is a measure of stock selection ability. If the manager tends to have a positive excess return even when the market's performance is merely "neutral" (i.e., the market has zero excess return) then we conclude that the manager has, on average, made good stock picks. In other words, stock selection must be the source of the positive excess returns.

Timing ability is indicated by the curvature of the plotted line. Lines that become steeper as you move to the right of the graph show good timing ability. The steeper slope shows that the manager maintained higher portfolio sensitivity to market swings (i.e., a higher beta) in periods when the market performed well. This ability to choose more market-sensitive securities in anticipation of market upturns is the essence of good timing. In contrast, a declining slope as you move to the right indicates that the portfolio was more sensitive to the market when the market performed poorly and less sensitive to the market when the market performed well. This indicates poor timing.

We can therefore classify performance ability for the four managers as follows:

	Selection Ability	Timing Ability
A	Bad	Good
B	Good	Good
C	Good	Bad
D	Bad	Bad

Chapter 19 - International Investing

- Global equity markets
- Risk factors in international investing
- International diversification
- Exchange rate risk and political risk

- Global equity markets
  Developed markets vs. emerging markets

  (Tables 19.1 and 19.2)

  Market capitalization and GDP: positive relationship, the slope is 0.64 and R^2 is 0.52, using 2000 data, suggesting that an increase of 1% in the ratio of market capitalization to GDP is associated with an increase in per capita GDP by 0.64%. However, the relationship is getting weaker, using 2010 data. The slope fell to 0.35 and R^2 drops to 0.10

  Figures 19.1 and 19.2

  Home-country bias: investors prefer to invest in home-country stocks

- Risk factors in international investing
  Exchange rate risk: the risk form exchange rate fluctuations

  Direct quote vs. indirect quote

  Direct quote: $ for one unit of foreign currency, for example, $1.5 for one pound

  Indirect quote: foreign currency for $1, for example, 0.67 pound for $1

  Example: 19.1

  Given: you have $20,000 to invest, r_{Uk} = 10%, current exchange rate E_0 = $2 per pound, the exchange rate after one year is E_1 = $1.80 per pound, what is your rate of return in $?

  The dollar-dominated return is $1 + r_f(US) = [1 + r_f(UK)] * \frac{E_1}{E_0}$

  $20,000 = 10,000 pounds, invested at 10% for one year, to get 11,000 pounds
  Exchange 11,000 pounds at $1.80 per pound, to get $19800, a loss of $200
  So your rate of return for the year in $ is = (19,800 - 20,000) / 20,000 = -1%

If E_1 = \$2.00 per pound, what is your return? Answer: 10%

How about E_1 = \$2.20 per pound? Answer: 21%

Interest rate parity: $\frac{F_0}{E_0} = \frac{1 + r_f(US)}{1 + r_f(UK)}$

Where E_0 is the spot exchange rate and F_0 is the futures exchange rate now

If F_0 = \$1.93 (futures exchange rate for one year delivery) per pound, what should be the risk-free rate in the U.S.?

Answer: r_{US} = 6.15%, using the interest rate parity

If F_0 = \$1.90 per pound and r_{US} = 6.15%, how can you arbitrage?

Step 1: borrow 100 pounds at 10% for one year and convert it to \$200 and invest it in U.S. at 6.15% for one year (will receive 200*(1 + 0.0615) = \$212.3)

Step 2: enter a contract (one year delivery) to sell \$212.3 at F_0

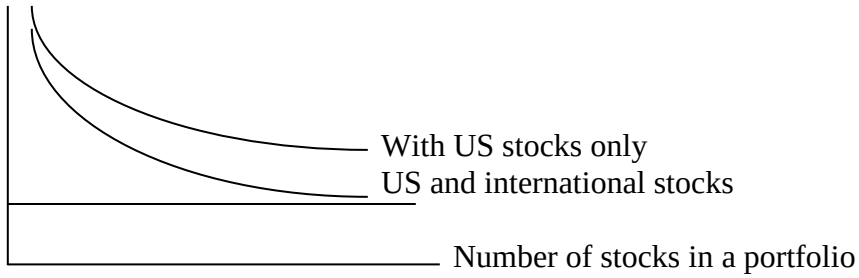
Step 3: in one year, you collect \$212.3 and make the delivery to get 111.74 pounds

Step 4: repay the loan plus interest of 110 pounds and count for risk-free profit of 1.74 pounds

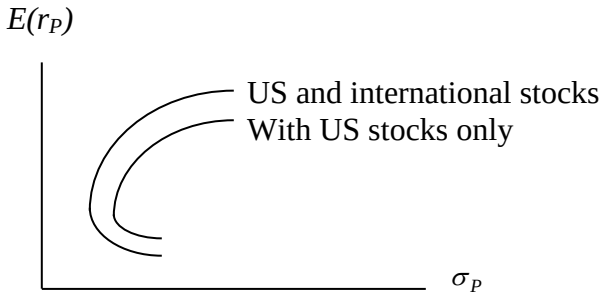
Country-specific risk (political risk) – Table 19.4

- International diversification
  Adding international equities in domestic portfolios can further diversify domestic portfolios' risk (Figure 19.11)

Portfolio Risk



Adding international stocks expands the opportunity set which enhances portfolio performance (Figure 19.12)



(Way? Because investors with more options (choices) will not be worse off)

World CML

World CAMP

Choice of an international diversified portfolio

More in Fin 430 – International Financial Management

- ASSIGNMENTS

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