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2003 Review for Level I  
Economics  
Debt Investments  
Derivatives

By  
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Debt Investments  
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## **EXECUTIVE SUMMARY**

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## **ECONOMICS**

### **Modern Macroeconomics: Fiscal Policy**

Fiscal policy is the policy with regard to government expenditures. When government revenues from all sources are equal to government expenditures, the government is running a balanced budget. When government expenditure exceeds revenues, the government is experiencing a budget deficit. Budget deficits are financed by issuing interest-bearing bonds that become part of the national debt. Budget surpluses exist when government revenues exceed government expenditures. The federal budget is the primary tool of fiscal policy.

- 1) Discretionary fiscal policy results when policymakers institute deliberate changes in tax laws or spending on government programs. Governments influence the level of aggregate demand by increasing government purchases of goods and services while holding taxes constant. Changes in tax policy will also influence aggregate demand. The Keynesian model suggests that when an economy is operating below its potential the government should institute an expansionary fiscal policy. The government should increase its purchases of goods and services and/or cut taxes. The increased deficit would be financed with borrowing. During periods of inflation the Keynesian model would require a restrictive fiscal policy. Increased taxes, reduced government spending or a combination of the two would work to reduce aggregate demand.
  - a) Deficits arising from these deliberate actions are called.”
  - b) Deficits arising from recessionary conditions are often termed “passive budget deficits.”
- 2) Prior to Keynes it was believed a responsible government would constrain spending within the bounds of revenues. According to Keynes general economic conditions rather than the concept of an annually balanced budget should drive budgetary policy. Keynesians stress the importance of counter-cyclical policy meaning the government should shift toward a deficit when recession looms and a surplus when inflation threatens. To determine whether fiscal policy is expansionary or restrictive focus on changes in the size of the budget deficit. An expansionary policy will increase the size of a deficit while a restrictive policy will lower it.
- 3) If the money supply is held constant, when the government runs a deficit, it must borrow by issuing bonds. The increase in the demand for loanable funds will increase real interest rates. Consumers will reduce the purchase of interest sensitive goods such as consumer durables. Higher real rates will increase the opportunity cost of investment and business will postpone the purchase of heavy equipment and capital goods. Higher real interest rates will retard private spending. This is called the “Crowding-Out Effect.” Budget deficits will exert less impact on aggregate demand than the Keynesian model suggests since the crowding-out effect will offset the increase in aggregate expenditures by government. The crowding-out effect implies that the budget deficit will change the composition of aggregate demand. As real interest rates increase, investment in capital goods will decline and the future stock of capital will be less than it otherwise would have been. The reduction in the supply of capital will reduce the productivity and income of future workers. If applied during a recession an active budget deficit may not crowd out significant private investment.
- 3) The price equalization principle also applies to the market for loanable funds. The real interest rate in one country will be approximately the same as the real interest rate in other countries. If the U.S. reduces taxes and runs a larger budget deficit, the demand for loanable funds will increase and real interest rates will rise. The higher real interest rate will attract funds from abroad moderating the rise in real rates in the U.S. The higher real interest rates will attract loanable funds and also will increase

the demand for dollars in foreign exchange markets and the dollar will appreciate relative to other currencies. The demand for imports will increase since they are cheaper than before the rise in the value of the dollar and the level of exports will decline since they are now more expensive. Net exports will decline retarding aggregate demand. In summary, the inflow of capital from abroad changes the form of the crowding out effect but not its magnitude. Budget deficits and trade deficits are linked. When budget deficits increase real interest rates and attract foreign capital, they simultaneously cause an appreciation in the value of a nation's currency and cause its imports to rise relative to its exports.

- 4) New Classical economists argue that when the government runs a budget deficit and increases its outstanding debt, higher future taxes will have to be levied to service the debt. Some economists argue that taxpayers will reduce current consumption and increase savings to pay the higher future taxes.
- 5) In the Keynesian model, a reduction in current taxes financed by borrowing, will increase the disposable income of households and hence current consumption. This position may be incorrect because it ignores the higher future taxes necessary to service the debt. Debt financing affects the timing of taxes, not the magnitude. It substitutes higher future taxes for lower current taxes. New classical economists do not believe the substitution of debt for taxes will stimulate either private consumption or aggregate demand. Taxes and debt financing are essentially equivalent. A summary of the New Classical position is that higher current taxes and an equivalent increase in government debt reduce the wealth and permanent income of taxpayers by identical amounts. Taxpayers will recognize the higher future taxes implied by the debt and reduce their current expenditures accordingly. Thus, budget deficits do not stimulate aggregate demand. The real rate of interest is unaffected by the deficits since people will save more to pay future taxes. Fiscal policy is impotent.
- 6) If fiscal policy is to reduce economic instability, changes must provide a stimulus during a recession and restraint during booms. The timing of fiscal policy is a difficult if impossible task because of the lags that exist. There is a lag between the time when the need for a fiscal policy change is recognized and the time it is implemented. After a policy is implemented, it may take six months to a year for its major impact to be felt. These long lags make it extremely difficult to use fiscal policy to impact economic activity.
- 7) Automatic stabilizers are programs which automatically apply a demand stimulus during recessions and demand restraint during booms. The advantage of stabilizers is that they apply counter cyclical fiscal policy without the delays that accompany legislation. They minimize the problem of proper timing.

Three major automatic stabilizers:

- a) Unemployment compensation consists of benefits paid to laid off and unemployed workers. As layoffs increase during recessions, unemployment compensation will rise and unemployment taxes will decline. During a boom unemployment taxes will increase and unemployment benefits will decline. This program will run deficits during recessions and surpluses during booms.
- b) Corporate profits tax is the most counter-cyclical of all stabilizers. Corporate profits are highly sensitive to economic activity. During recessions corporate profits and taxes will decline significantly widening the deficit and during booms profits and taxes will increase rapidly shrinking the deficit.
- c) Progressive income tax insures that as income grows taxes will increase rapidly and as income declines taxes will decline. This behavior will automatically enlarge the size of the deficit during a recession and reduce during a boom.

- 8) The following consensus exists with respect to Fiscal Policy:
  - a) When substantial unused capacity is present during a recession, expansionary fiscal policy is able to stimulate aggregate demand and real output.
  - b) During more normal times, the ability of fiscal policy to influence real output is far more limited than the early Keynesian view implied.
  - c) Proper timing of discretionary fiscal policy is difficult to achieve and of crucial importance. Rather than smoothing economic cycles, an ill-timed fiscal policy can contribute to economic instability.
- 9) Supply-side effects of fiscal policy may also impact aggregate supply. Supply-side tax cuts are those that change marginal tax rates. Marginal tax rates determine the breakdown of one's additional income between tax payments and personal disposable income. A reduction in marginal tax rates increases the reward for added work, savings, and investment. If the return to income producing activities is increased, the opportunity cost of leisure will be increased and work will become more rewarding. People will shift from leisure to work and devote less time to tax sheltering activities. Supply-side economists believe these substitutions enlarge the effective resource base and improve the allocations of resources. Supply-side economics is not a short run counter cyclical tool. Supply-side economics is a long-run growth-oriented strategy.
- 10) Supply-side economists argue high taxes tend to retard output for three major reasons:
  - a) High marginal tax rates discourage work effort and reduce the productive efficiency of labor.
  - b) High tax rates will adversely affect the rate of capital formation and the efficiency of its use. High tax rates will discourage foreign investment and direct domestic investment into projects and activities where taxes are lower or sheltered.
  - c) High marginal tax rates encourage individuals to substitute less desired tax-deductible goods for more desired nondeductible goods.
- 11) Review of the data indicates the general counter-cyclical pattern of fiscal policy is primarily the result of automatic stabilizers rather than active discretionary changes in fiscal policy. There is little evidence to support the assertion that budget deficits cause higher interest rates and if a relationship exists it is weak at best. Evidence exists which supports the relationship between budget deficits, capital inflows, and net exports. Large budget deficits will increase real interest rates, increase the value of the currency in foreign exchange markets, and increase net imports. Macroeconomic analysis provides little support for the thesis that budget deficits cause inflation.

### **Money and the Banking System**

- 1) Money is an asset that performs three basic functions. It serves as;
  - a) a medium of exchange,
  - b) measure of value,
  - c) store of value.

As a medium of exchange money simplifies and reduces the costs of transactions. This reduction in transactions cost permits us to realize the gains from specialization, division of labor and mass production techniques. Without money exchange would be complicated, time consuming and costly. Money is a unit of measure that can be used to compare the value and cost of things. Money serves as a common denominator into which the current value of all goods and services can be expressed. Money is a financial asset which may be used to store value and purchase power from one time

period to another. During inflation the purchasing power of money will decline imposing a cost on those holding wealth in the form of money.

- 2) Modern nations use “fiat money” as currency. Fiat money has no intrinsic value and its value is based upon the confidence of the people who use it. Fiat money is money because the government designates it as legal tender. Money’s main source of value is determined by demand relative to supply. People demand money because it reduces the cost of exchange. When the supply of money is limited relative to the demand, money will be valuable. Money is worth what it will buy.
- 3) If the purchasing power of money is to remain stable over time, the supply of money must be controlled.
  - a) If the supply of money grows more rapidly than the real output of goods and services, prices will rise. There is “Too much money chasing too few goods.” When government authorities rapidly expand the supply of money, it becomes less valuable in exchange and is worthless as a store of value. Examples of hyperinflation are numerous: Germany after WWI, Soviet Union, Yugoslavia, etc.
- 4) Definitions of money:
  - a) M1 is the narrowest definition of money. M1 includes (1) currency in circulation, (2) demand deposits, (3) other (interest-earning) check able deposits, and (4) traveler’s checks.
  - b) M2 includes M1 plus:
    - i) savings and small denomination time deposits at all depository institutions,
    - ii) money market mutual fund shares,
    - iii) money market deposit accounts,
    - iv) overnight loans from customers to commercial banks (repurchase agreements),
    - v) overnight Eurodollar deposits of U.S. residents.Many economists, particularly those that stress the store of value function of money, prefer the M2 definition of the money supply to M1.
  - c) M3 includes (1) large denomination (over \$100,000) time deposits at all depository institutions, (2) longer-term (more than overnight) loans from customers to commercial banks and savings and loan associations.
- 5) Money is a financial asset that provides the holder with future purchasing power. Credit is a liability acquired when one borrows funds. Credit Cards are not money but represent an extension of credit from the institution issuing the card.
- 6) The banking industry in the U.S. operates under the jurisdiction of the Federal Reserve System that is the nations central bank.
  - a) Banks provide services and pay interest in order to attract depositors. Depositor’s funds are then used to extend loans and make investments that are the primary source of income for banks. Banking brings together people who want to save for the future with those who want to borrow to make investments. The major liabilities of banks are demand deposits, savings deposits and time deposits. These deposits represent the obligations of a bank to its depositors. Interest earning loans are the major class of assets. Banks maintain only a fraction of their customer’s deposits in the form of reserves (vault cash + deposits with the federal reserve system) to meet the cash requirements of customers.
  - b) Fractional Reserve banking is a system that permits banks to hold reserves of less than 100% against customer deposits. Required reserves are the minimum amount of reserves that a bank is required by law to keep on hand to back up its deposits. Individual banks are regulated by a central bank. In the U.S. the central bank is the Federal Reserve. The central bank will act as a

- lender of last resort and supply the necessary funds to a specific bank if all of its depositors demanded their funds at once.
- c) The Federal Deposit Insurance Corporation insures the deposits held by commercial banks and thrift institutions. Deposit insurance reduces the level of risk for depositors by helping to avoid runs and increasing depositor confidence.
  - d) Banks create money by extending loans. The amount of money the banking system can create is determined by its level of excess reserves. Excess reserves (actual reserves minus legal reserves) are those reserves over and above the amount banks are required to maintain. Required reserve ratio is the percentage of a liability category banking institutions are required to hold as reserves against that type of liability.
  - e) The Deposit Expansion Multiplier is the multiple by which new reserves will increase the stock of money. The deposit expansion multiplier is simply the reciprocal of the reserve requirement. When new currency reserves enter the banking system they will not have the effect of the full deposit multiplier because some currency will be held as cash and banks will maintain positive excess reserves. Currency leakages and idle excess reserves will result in a deposit expansion multiplier that is less than its potential maximum.
- 8) Central banks are charged with the responsibility of carrying out monetary policy. The major function of the Federal Reserve Bank and other central banks is to regulate the money supply and create a monetary climate that is in the best interest of the rest of the economy. There are 12 Federal Reserve Banks and 25 branches in the Federal Reserve System. The Board of Governors consists of 7 members, each appointed to a staggered 14 year term by the president and confirmed by the senate. One member is designated "Chairman" by the president. New members are appointed every other year enhancing the political independence of the Fed. The Board of Governors and the Fed are responsible for monitoring the health of the banking industry, supervising its procedures and enforcing Fed regulations. Federal Advisory Council provides the Board of Governors with input from the banking community. Twelve members are selected from each Federal Reserve district. The council is purely advisory. Federal Open Market Committee (FOMC) exerts a powerful influence on monetary policy. The FOMC is composed of the seven members of the Board of Governors plus the president of the Federal Reserve Bank of New York plus four revolving district bank presidents. The FOMC determines Fed policy with respect to the purchase and sale of U.S. Government bonds. This is the Fed's most important monetary policy tool.
- 9) Federal Reserve District banks differ from commercial banks in the following ways:
- a) Federal Reserve banks are not profit making institutions - profit is transferred to the Treasury,
  - b) Federal Reserve banks can actually issue money,
  - c) Federal Reserve banks are banks for bankers. The federal government and commercial banks are their only customers.
- 10) The primary function of the Fed is to conduct monetary policy and regulate the banking system in a manner that will promote full employment, steady economic growth, and stable prices. The Fed controls the money supply using three tools:
- a) Open Market Operations - When the Fed buys U.S. Government securities in the market it pays with a check. This check is deposited in a commercial bank and new excess reserves enter the financial system. If \$1,000,000 of securities are purchased by the Fed and the reserve requirement for commercial bank demand deposits is ten percent then new loans of \$10,000,000 may be made by the banking system. When the Fed sell securities it removes excess reserves from the banking system and reduces the monetary base. The monetary base is equal to reserves of commercial

banks (vault cash + deposits with the Fed) plus currency in circulation. When the Fed injects or withdraws funds from the banking system the money supply will change by the change in the size of the monetary base multiplied by the actual deposit expansion multiplier. Empirical evidence suggests that for each dollar of securities the Fed purchases or sells the money supply will change by \$3.

- b) When banks borrow from the Fed the interest rate they pay is called the discount rate. Borrowing from the Fed is a privilege not a right. Banks borrow from the Fed to meet temporary shortages of reserves. They will only borrow for a short period and not continuously. An increase in the discount rate will make it more expensive for banks to borrow and a reduction will lower the borrowing expense. The importance of the discount rate is overrated. If a bank must borrow to meet its reserve requirement it can borrow in the Federal Funds market. Federal funds are excess reserves that banks lend among one another. If the Federal Funds rate is significantly above the discount rate banks will attempt to borrow from the Fed. The Fed will usually raise the discount rate to remove the incentive for banks to borrow from the discount window.
- c) Reserve Requirements are established by the Fed against demand deposits. Legal reserves consist of:
  - i) vault cash,
  - ii) deposits with the Federal Reserve.

Banks are required to maintain these reserves to restrain bankers from overlending and facing sudden withdrawals. When the Fed lowers the reserve requirement, excess reserves are created and the monetary expansion process can begin. Increasing reserve requirements reduces excess reserves and the money supply. Changing reserve requirements is a blunt tool and is seldom used by the Fed.

- 11) The Treasury is a budgetary agency and its responsibility is to finance government operations. The Fed is concerned with supplying money and credit for the entire economy. The Fed can create money by writing checks while the treasury cannot. The Treasury cannot alter the size of the money supply while the Fed can.

### **Modern Macroeconomics: Monetary Policy**

- 1) The demand for money reflects the desire of households and businesses to hold money balances. When economists say people want to hold more or less money they mean that they will restructure their wealth balances toward larger or smaller money balances. There are three major reasons people hold money balances:
  - a) Transaction demand reflects the need to maintain money balances to purchase and sell goods and services.
  - b) Precautionary demand refers to those balances held as protection against unforeseen events. Examples would include medical emergencies, loss of a job, etc.
  - c) Speculative balances are balances held to profit from unexpected opportunity.
- 2) The motive for holding money will increase with increases in income. Larger incomes will require larger money balances to effect transactions and to respond to unforeseen events. The opportunity cost of holding money will increase with increases in nominal rates. As the rates increase people will economize on the amount of money balances held. There is an inverse relationship between the nominal interest rate and the quantity of money demanded.

- 3) The supply of money is determined by the Federal Reserve. The supply of money is insensitive to the level of interest rates. The money supply is what the Fed thinks it should be. In equilibrium, the quantity of money demanded must equal the quantity supplied at the economy's money interest rate. The quantity theory of money states that an increase in the supply of money will lead to a proportional increase in the price level. This relationship is illustrated in the following equation:  
growth rate of money supply + growth rate of velocity = rate of inflation + growth rate of output  
or in absolute terms (equation of exchange);

$$MV=PY$$

The equation of exchange is an identity, it reflects both the real (PY) and the monetary side (MV) of final product exchange.

- 4) The Keynesian revolution emphasized the importance of aggregate demand. Early Keynesians had little faith in the ability of changes in the money supply to stimulate aggregate demand. Monetary policy was like a string. You could pull on it to hold the economy back and restrain inflation, however you could not push on a string.
- 5) The monetarists argued that changes in the stock of money exerted a powerful influence on nominal and real GDP as well as prices. Monetarists reject the use of discretionary monetary policy as an effective stabilization tool. There are lengthy and unpredictable lags between the implementation of a policy change and the observation of its primary effects. When policy-makers change the direction of monetary policy it may take between six and eighteen months before the change impacts output. The lag between a change in monetary policy and changes in prices can vary from twelve to thirty-six months. The modern view of monetary policy outlines two transmission mechanisms.
- a) Interest rate channel:
- i) Economy is in equilibrium
  - ii) Fed changes to an expansionary monetary policy.
  - iii) Public's supply of money now exceeds the demand for money
  - iv) Public will invest excess money balances in savings accounts, etc., increases loanable funds
  - v) Real interest rates will decline
  - vi) At the lower real interest rate investment projects will be undertaken that would have been foregone, consumers will purchase consumer durables.
  - vii) Aggregate demand will increase
- b) Direct Channel:
- i) Unanticipated increase in money supply leaves public with excess balances
  - ii) Consumers will spend more on goods and services and business will invest excess balances in equipment and other fixed investments.
  - iii) Aggregate demand is closely linked to the money supply (M) and the velocity of money (V)

Modern analysis indicates an unanticipated increase in the money supply will increase the demand for goods and services either indirectly through reductions in the real rate of interest or directly through increased spending. The increase in spending will increase output and employment in the short run.

- 6) A full employment economy, subjected to an unanticipated increase in the money supply, will in the long-run arrive at a higher general level of prices with the same level of output. An unanticipated restrictive monetary policy will reduce the supply of money available, people will dissave, raising real interest rates, and aggregate demand will decrease. The price level will decline and output will be reduced and the unemployment rate will rise above the natural rate. Monetary policy must be properly timed if it is to help stabilize the economy. If it is timed improperly monetary policy can be

destabilizing. In a dynamic setting a change in the growth rate of the money supply is more indicative of monetary policy.

- 7) Assume monetary authority pursues a course of rapid monetary expansion.
    - a) Real interest rates are reduced
    - b) Aggregate demand is stimulated and rapid money growth continues
    - c) Price level will rise and a sustained inflation will result.
    - d) In product and resource market inflation is anticipated and built into contracts
    - e) When inflation is anticipated fully real wages and profits will stabilize. Unemployment will return to the natural rate.
    - f) Inflation will fail to reduce the real interest rate in the long run. In the long run the major result of rapid monetary growth is inflation with higher nominal interest rates.
  - 8) An anticipated monetary policy change will exert little impact on real economic activity.
  - 9) The Fed can control short-term rates. Their impact on long term rates is modest. Long term rates are influenced by real factors such as the demand for investment funds than by monetary factors. Second, monetary factors can influence nominal long term rates through the impact on inflation.
  - 10) Money is productive because it reduces transactions costs and enhances our ability to realize gains from specialization, production and exchange. The productive contribution of money is directly related to the stability of its value. There are three reasons inflation and monetary instability tend to retard economic progress:
    - a) Inflation distorts the information delivered by prices and changes the results of long term contracts from those that are intended in unpredictable ways;
    - b) People will respond to the inflation and monetary instability by spending less time producing and more time trying to protect their wealth;
    - c) Inflation and monetary instability undermine the credibility of government.
  - 11) There are several aspects of a changing monetary policy:
    - a) An unanticipated shift to a more expansionary (restrictive) monetary policy will temporarily stimulate (retard) output and employment.
    - b) The stabilizing effects of a change in monetary policy are dependent upon the state of the economy when the effects of the policy change are observed.
    - c) Persistent growth of the money supply at a rapid rate will cause inflation.
    - d) Money interest rates and the inflation rate will be directly related.
    - e) There will only be a loose year-to-year relationship between shifts in monetary policy and changes in output and prices.
    - f) Monetary and price level stability will reduce the uncertainty and thereby promote the realization of gains from production, investment and exchange.
- Economists agree that monetary and price stability will help promote economic growth.

### **Expectations, Inflation and Unemployment**

- 1) Adaptive expectations holds that people rely on the past to predict future trends. Under the adaptive-expectations hypothesis decision makers believe that the best indicator of the future is what has happened in the past. Under adaptive expectations forecasts of future inflation will exhibit systematic error. When inflation is accelerating decision makers will automatically tend to underestimate the future inflation rate.

- 2) Rational Expectations is the idea that decision makers form their expectations concerning what will happen in the future on the basis of all available information including information about how policy changes will affect the economy. The rational expectations hypothesis assumes forecasting errors will be random.
- 3) The Phillips curve depicts the relationship between the unemployment rate and the inflation rate. When expectations are considered any trade-off between unemployment and inflation is unstable.
- 4) Adaptive Expectations suggests that expansionary policies will lead to a short term trade-off between lower unemployment and higher inflation. As the higher inflation rate is anticipated, individuals will alter their behavior and this will cause unemployment to return to the natural rate.
- 5) Rational Expectations does not accommodate a consistent unemployment-inflation trade-off, not even in the short run. The impact of an expansionary policy is unpredictable. If decision makers accurately forecast the inflationary effects, inflation will increase while the unemployment rate will remain unchanged. If the actual inflation exceeds (is less than) the forecast inflation, unemployment will fall below (rise above) the natural rate.
- 6) There is no evidence that long run inflationary policies can reduce the unemployment rate. Adaptive-expectations and rational-expectations theories imply that the long run Phillips curve is vertical at the natural rate of unemployment.
- 7) The modern view of the Phillips curve integrates the effect of expectations. An inflation rate greater than anticipated will result in a short term unemployment rate below the natural rate. An inflation rate less than anticipated will lead to a short term unemployment rate above the natural rate.
- 8) In recent years, economists have paid more attention to incentives in determining the natural rate of unemployment. Unemployment compensation, minimum wages and inadequate training and education programs contribute to high unemployment rates.

### Demand and Consumer Choice

- 1) Demand is the willingness of individuals to pay for what is offered in the market. Choice is reflected in individual demand in the following ways:
  - a) Limited income necessitates choice.
  - b) Consumers make decision purposefully too upgrade their personal welfare.
  - c) One good can be substituted for another. Buyers want utility (satisfaction) from substitute goods not necessarily the same services.
  - d) Consumers must make decisions without perfect information, knowledge and experience help.
  - e) The law of diminishing marginal utility applies: as the rate of consumption increases, the utility derived from consuming additional units of a good will decline.
- 2) With a fixed income and prices which are given, consumers will maximize their total utility (satisfaction) by ensuring that the last dollar spent on **each** commodity purchased yields equal marginal utility per dollar spent. If consumers are to get the most from their incomes the last dollar spent on product **a** must offer the same utility as the last dollar spent on product **b**.
- 3) Demand schedule shows the amount of a product that consumers would be willing to purchase at alternative prices during a specified time period. The First Law of Demand states that the amount of a product purchased is inversely related to its price. As the price of a product declines its lower opportunity cost will encourage consumers to buy more of it and less of other high priced goods.

This tendency to substitute cheaper goods for more expensive goods is known as the substitution effect.

- 4) A reduction in the price of a product will increase real income C the amount of goods a services people can purchase. This is called the income effect. Since real incomes have increased consumers will increase their purchase of goods and services.
- 5) If the price of a good increases its opportunity cost increases and consumers will purchase less of the higher priced good as well as other goods since real income has declined. The monetary price of a good does not always reflect its total cost. The cost of time spent in acquiring a good is also a component of its total cost.
- 6) The market demand curve for a product is the sum of the individual demand curves existing in the market at a specific time. Consumer surplus reflects the law of diminishing marginal utility. Consumers will purchase additional units of a good as long as the marginal utility of a good is greater than its market price. Up until the point where marginal utility equals price, each unit of a product purchased will generate additional consumer surplus. The height of the demand curve measures how much consumers value each additional unit of a good. Consumer surplus is the difference between the maximum amount a consumer would be willing to pay for a unit of a good and the payment actually made. The size of the consumer surplus is affected by the market price.
- 7) The willingness to pay for additional units depends upon ones valuation of the marginal unit, not the value of all units taken together. When additional units are available at low cost they will be consumed until their marginal value is also low.
- 8) Demand curves shift because of :
  - a) Changes in market demographics such as the age distribution of the population
  - b) Changes in consumer income
  - c) Changes in the distribution of income
  - d) Prices of closely related goods: substitutes and complements
  - e) Changes in consumer preferences
  - f) Price expectations
- 9) Consumer preferences are influenced by:
  - a) The determining factors in consumer preferences are frequently complex.
  - b) Advertising is a strong influence on consumer preferences.
- 10) Elasticity of Demand is the percent change in the quantity of a product demanded divided by the percent change in price. If the quotient is greater than 1 it indicates that if the price of a product is increased the quantity demand will decrease by an amount greater than the increase in price. Total revenue will decline as a result of the increase in price. If the price of a product declines, quantity demanded will increase at a greater rate and total revenues will increase. If the elasticity of demand is less than 1, then demand is inelastic. Total revenues will vary directly with the change in price. If price increases total revenue will increase and if price declines total revenue will decline.
- 11) Arc Elasticity of Demand = percent change in quantity demanded / percent change in price. The Second Law of Demand states that the demand for most products will be more price elastic in the long run than in the short run.
- 12) Income elasticity of demand is the percent change in the quantity of a product demanded divided by the percent change in income. It measures the responsiveness of the demand for a good to a change in income.

- a) Inferior goods are those goods that have negative income elasticity. If income increases the demand for inferior goods will decline. Luxury goods have high income elasticities. If income increases the demand for these goods will increase.
- 13) Elasticity of supply measures the percent change in the quantity supplied divided by percent change in price causing the change in quantity supplied. Supply is more elastic when resources have alternative uses. Suppliers are less willing to reduce the price they receive in response to the imposition of a tax.
- 14) A “Deadweight Loss” is the value of transactions that are prevented from occurring because of the imposition of or increase in a tax.
- 15) The concept of elasticity explains the impact of a policy change such as the imposition of a sales tax. When demand is more elastic buyers bear less of a sales tax than the sellers. When supply is more elastic, sellers bear less of the burden. When either is inelastic, the excess burden, or the deadweight loss of the tax is smaller.
- 16) When a tax is imposed the supply curve will shift vertically by the amount of the tax. Because consumers will buy less of the product as the price rises sellers will not be able to pass all of the tax on to consumers. Consumers will pay some of the tax and sellers will pay a portion. If the demand curve is more elastic, consumers will reduce their purchases by a greater amount and the tax policy will fall more heavily on sellers. Supply is more elastic when resources have alternative uses. Suppliers are less willing to reduce the price they receive in response to a tax. Instead the quantity supplied is reduced by a greater amount. Greater supply elasticity causes less of the tax burden to be placed on suppliers.

### **Costs and the Supply of Goods**

- 1) The principal-agent problem arises when the purchaser of services (Principal) lacks full information about the circumstances faced by the seller (Agent) and cannot know how well the seller (agent) performs the purchased services. The agent may work toward objectives not shared by the principal paying for the service. Within firms it is difficult for employers to monitor the performance of individual employees and provide an incentive structure that will encourage high productivity.
- 2) A proprietorship is a business firm owned by an individual who possesses the ownership right to the firm’s profits and is personally liable for the firm’s debts.
- 3) A Partnership is a business firm owned by two or more individuals who possess ownership rights to the firm’s profits and are personally liable for the debts of the firm.
- 4) A Corporation is a business firm owned by shareholders who possess ownership rights to the firm’s profits but whose liability is limited to the amount of their investment in the firm.
- 5) Economies cannot produce as much of all goods as desired because the use of resources to make one commodity takes resources from the production of other desired goods. The desire for a given product must be balanced against the desire for other items that must be sacrificed to produce it. In a market economy consumer demand and the cost of production are central to the performance of the balancing function.
- 6) Explicit costs are payments by a firm to purchase the services of productive sources. Implicit costs are the opportunity costs associated with firm’s use of resources that it owns. These costs do not involve a direct money payment. Total costs include the explicit and implicit costs of all the resources used by the firm. It includes an imputed normal rate of return for the firm’s equity capital.

- 7) Economists use the normal return on financial capital as a basis for determining the implicit opportunity cost of equity capital. Economic profit is equal to total revenues minus total costs, including both explicit and implicit costs. Economic profits will be present only if the earnings of a business are in excess of the opportunity cost of using the assets owned by the firm.
- 8) Accounting profits are equal to sales revenue minus explicit costs. No allowance is made for implicit costs and the opportunity cost of the firm's equity capital. Accounting profits will overstate economic profits. High accounting profits suggest that a firm is earning an economic profit. Low accounting profits will imply economic losses.
- 9) The short run is a time period so short that a firm is unable to vary some of the factors of production. The firm's plant size typically cannot be altered in the short run. The long run is a time period long enough to allow the firm to vary all the factors of production.
- 10) Fixed costs are those costs that remain unchanged regardless of the level of output in the short run. Average fixed cost is equal to total fixed costs divided by the number of units produced.
- 11) Variable costs are those costs that vary with output. Average variable costs are equal to total variable costs divided the number of units produced. Average total cost (unit costs) is equal to total fixed cost plus total variable cost divided by the number of units produced or average fixed costs plus average variable costs.
- 12) Marginal cost is the change in total cost (TFC + TVC) to produce and additional unit.
- 13) In the short run marginal cost (MC) will decline if output is increased, then will increase reflecting that it becomes increasingly difficult to produce additional output from a facility operating at maximum capacity.
- 14) The Law of diminishing returns holds that as more and more units of a variable resource are combined with a fixed amount of other resources, employment of additional units of the variable source will eventually increase output only at a decreasing rate. Once diminishing returns are reached, it will take successively larger amounts of the variable factor to expand output by one unit.
- 15) Total product is the total output of a good that is associated with alternative utilization rates of a variable input.
- 16) Marginal product is the increase in the total product resulting from a unit increase in the employment of a variable input.
- 17) Average product is equal to the total product divided by the number of units of the variable input required to produce that output level.
- 18) Once a firm reaches diminishing returns larger and larger additions of the variable factor will be necessary to expand output by one unit.
- 19) Short run analysis relates costs to output for a specific size of plant.
- 20) The long run average total cost curve shows the minimum average cost of producing each output level when the firm is free to choose among all possible plant sizes.
- 21) Three major reasons why planning a larger volume reduces unit costs:
  - a) mass production,
  - b) specialization
  - c) improvements in production as a result of experience.
- 22) Economies of scale are reductions in the firm's per unit costs that are associated with the use of large plants to produce a large volume of output. Diseconomies of scale are opposite of economies of scale. The firm's per unit costs will increase. Constant returns to scale occur when unit costs are constant as the scale of the firm is altered.

- 23) There are three reasons cost curves shift:
  - a) Prices of resources
  - b) Taxes
  - c) Technology
- 24) The firm's short run MC curve measures the opportunity cost of expanding output given the firm's current plant size.
- 25) The firm's long run ATC represents the opportunity cost per unit of output associated with varying plant sizes and rates of output.
- 26) Sunk Costs are historical costs associated with past decisions that cannot be reversed. The information they provide is not relevant to current period decisions.

### **Price Takers and the Competitive Process**

- 1) Pure competition assumes the following conditions exist in a market:
  - a) All firms in the market produce a homogeneous product.
  - b) A large number of independent firms produce the product.
  - c) Each buyer and seller is small relative to the total market.
  - d) There are no artificial barriers to entry into or exit from the market.
- 2) In purely competitive markets firms are price takers. Each firm accepts the market price.
- 3) Marginal Revenue (MR) is the change in total revenue that results from the sale of an additional unit of the product.
- 4) In the short run a purely competitive firm will expand output to the point where MR equals MC.
- 5) Evidence tends to support the purely competitive market model. When a firm's costs exceed its revenues, losses result. Losses indicate that the resources used by the firm would be more valuable employed elsewhere. If a firm estimates that losses are temporary it may want to continue producing as long as it is able to cover its variable costs. If the market price drops below the firm's average variable cost curve a temporary shutdown is preferable to continuing to operate. It suffers an additional loss on each unit produced as well as on its variable cost. If the market price decline is permanent, the firm should consider going out of business.
- 6) The portion of the firm's short run MC curve which lies above the AVC curve is the short run supply curve. The market's short run supply curve is the summation of the short run supply curves (MC above AVC) of the firms.
- 7) In the long run when a purely competitive industry is in equilibrium:
  - a) The quantity supplied and the quantity demanded will be equal at the market price.
  - b) The firms in the industry will be earning normal (zero) economic profit.
- 8) The long run supply curve is the minimum price at which firms will supply differing market output levels given sufficient time to adjust plant and equipment.
- 9) Constant cost industries are those in which factor prices remain unchanged. The long run market supply curve is perfectly elastic. A constant cost industry is most likely to arise when the demand for resource inputs is small relative to total demand for the resources.
- 10) Increasing cost industries are those in which factor prices increase as output increases. The long run quantity supplied is directly related to market price.

- 11) Decreasing cost industries are those in which costs of production decline as the industry expands. Market supply is inversely related to price.
- 12) The market supply curve is more elastic in the long run than in the short run because the firm's short run response is limited by the "fixed" nature of some of the factors.
- 13) In the purely competitive model, profits and losses are signals sent to producers by consumers. Economic profits will be largest in areas where consumer's wants are greatest relative to the cost of production. Losses and bankruptcies are the markets way of halting wasteful activity.
- 14) Efficiency and the purely competitive model:
  - a) Production efficiency ( $P=ATC$ ) occurs because in the long run firms minimize their ATC and to charge a price sufficient to cover production costs. If firms are to survive they must use production methods which minimize production costs. Consumers will receive the largest quantity at the lowest possible price.
  - b) Allocative efficiency ( $P=MC$ ) refers to the allocation of available resources to the production of goods and services most desired by consumers given their incomes. The allocation is balanced so that resources could not benefit anyone without hurting someone else.

### **Price Searcher Markets with Low Entry Barriers**

- 1) Market structure is the classification of a market based upon :
  - a) The number of sellers;
  - b) Barriers to entry;
  - c) Firm's control over price and type of products (homogeneous or differentiated).
- 2) Monopolistic competition is present when there are a large number of independent sellers, each producing a differentiated product in a market with low barriers to entry. Examples include restaurants, retail establishments, service stations, etc.
- 3) Oligopoly is present when there are a small number of sellers in the entire industry. Oligopoly is competition among the few.
- 4) The closer a market to pure competition the more efficiently it will operate and the better off consumers will be. More substitutes are available for consumers, firms demand curves are more elastic, and firms are closer to producing and selling at marginal costs. Firms that aren't operating in purely competitive markets face downward-sloping demand curves. They are price searchers: and must search for prices most consistent with profit maximization.
- 5) Characteristics of Monopolistic competition:
  - a) Product differentiation
  - b) Low barriers to entry
  - c) Many independent firms
- 6) A monopolistic competitor maximizes profits by producing to the point where  $MR = MC$  and charging price  $P$ . The firm will make economic profits. Since entry and exit are free, competition will eventually drive prices down to the level of average total cost for the representative monopolistically competitive firm.
- 7) Since barriers to entry are low, neither pure nor monopolistic competitors will be able to earn long run economic profit. In the long run competition will drive the price of pure and monopolistic competitors down to the level of average total cost. When barriers to entry are low businesses must compete for the loyalty of consumers. Competition promotes economic progress in three ways:

- a) Competition places pressure on producers to operate efficiently and cater to the preferences of consumer;
- b) Competition provides firms with a strong incentive to develop improved products and discover lower costs of production;
- c) Competition causes firms to discover the type of business structure and size that can best keep the per unit costs of production low.

### **Price Searcher Markets with High Entry Barriers**

- 1) Monopoly is a market structure characterized by:
  - a) High barriers to entry
  - b) Single seller of a well-defined product for which there are no good substitutes
- 2) There are four types of barriers to entry make it difficult for potential competitors:
  - a) Economies of scale;
  - b) Government licensing;
  - c) Patents;
  - d) Control over an essential resource.
- 3) Monopolists will want to expand output as long as marginal revenue exceeds marginal cost. A monopolist will face a downward sloping demand curve. Since the monopolist is the only producer, the firm's demand curve is the same as the industry demand curve. When a firm faces a downward sloping demand curve, a price reduction that increases sales will have two conflicting influences on total revenue:
  - a) Total revenue will increase because of the increase in the number of units sold.
  - b) Revenue losses from the lower price will partially offset the additional revenues due to increased sales.
  - c) As a result of the above, the MR curve will fall inside the firm's demand curve.
- 4) At very high prices the demand curve for a monopolist is elastic.
  - a) As the price is reduced the marginal revenue goes from positive to negative as the elasticity of demand changes from elastic to inelastic.
  - b) A monopolist operating on the inelastic portion of its demand curve would be able to increase total revenue by raising prices. A monopolist would not operate in this range of the product demand curve.
  - c) A monopolist will expand output until  $MR = MC$ . At this point the monopolist will earn economic profits since MR is less than price. When  $MR = MC$ , MR is less than price. For the purely competitive firm:  $MR = P = MC$ .
- 5) High barriers to entry insulate monopolists from direct competition with rival firms producing similar products. A monopolist have little incentive to price gouge. Monopolists are profit maximizers and face an elastic demand curve. Therefore the highest price is not always the best price. The monopolist is a price searcher facing a downward sloping demand curve. A price searcher attempts to find the price that will maximize profit.
- 6) Four major reasons economists consider monopolies to be necessary evils.
  - a) A monopoly seriously limits the options available to consumers.
  - b) Monopoly results in allocative inefficiency. Allocative efficiency requires that product be produced when it generates additional benefits that exceed its added costs. This means the

monopolist should continue to produce as long as price exceeds MC. The monopolist would prefer to produce until  $MR = MC$ .

- c) Under monopoly, profits and losses do not properly induce firms to enter and to exit from industries. Inefficient firms may be protected from competition because of barriers to entry.
  - d) Government grants of monopoly will encourage rent seeking; resources will be wasted by firms attempting to secure and maintain grants of monopoly power.
- 7) Price discrimination is a practice in which a seller charges consumers different prices for the same product or service. When a seller can identify specific groups of customers and distinguish among them at a relatively low cost, profits can be increased if
- a) groups with the most inelastic demand are charged high prices
  - b) groups with a more elastic demand are charged low prices.
- Any firm that faces a downward-sloping demand curve can benefit from price discrimination. Buyers with inelastic demand curves pay higher prices when price discrimination exists than buyers with an elastic demand curve.
- 8) Output will be greater with price discrimination than with a single price. Price discrimination reduces allocative inefficiency that would exist with monopolistic pricing. Some marginal monopolists may be able to generate enough additional revenue to stay in business because of price discrimination.
- 9) When natural monopolies exist it is difficult and expensive to maintain a market structure. Natural monopolies occur because of economies of scale. As long as firms can merge and expand and continue to benefit from economies of scale (reduce per unit costs) there will be a natural tendency toward monopoly.
- 10) Policy alternatives to Natural Monopoly
- a) Monopolists could be permitted to operate freely;
  - b) Governments can regulate the monopolist;
  - c) Governments could provide the services through government owned firms.
- 11) Each of the alternatives mentioned above have shortcomings.
- a) Allowing monopolists to operate freely would lead to higher prices and lower output than desired (Marginal Cost Pricing).
  - b) Regulation will fail because of: (1) regulators will not have knowledge of monopolists cost and demand curves, (2) firms have an incentive to conceal actual cost conditions and take profits in other forms, (3) regulators are often influenced by the firm's they regulate.
  - c) Publicly owned firms have management which derives personal gain from policies that conflict with cost control and cater to the view of special interest groups.
- 12) Monopolists face competition from products which are substitutes.
- 13) Patents have conflicting influences on resource allocation:
- a) The monopoly granted by a patent restricts output and raises prices above marginal and average cost of production.
  - b) Possibility of monopoly rights provides incentives to developers and entrepreneurs to develop lower cost methods of production.
- 14) Oligopolies are characterized by the following conditions:
- a) Interdependence exists among the firms
  - b) Substantial economies of scale exist
  - c) Significant barriers to entry
  - d) Products may be either homogeneous or differentiated

- 15) Unlike a monopolist or a pure competitor, an oligopolist cannot determine the market price that will deliver maximum profit by estimating market demand and cost conditions. An oligopolist must also predict how rival firms will react to price and quality adjustments. When rival oligopolists compete on price they drive the market price down to the level of the cost of production. There is a strong incentive for oligopolists to collude, raise price, and restrict output. Collusion is an agreement among firms to avoid various competitive practices particularly price reductions. There are five obstacles to collusion:
  - a) When the number of oligopolists is larger, effective collusion is less likely;
  - b) When it is difficult to detect and eliminate price cuts, collusion is less attractive;
  - c) Low entry barriers are an obstacle to collusion;
  - d) Unstable demand conditions are an obstacle to collusion;
  - e) Vigorous antitrust action increases the cost of collusion.
- 16) Competition can come from potential as well as actual rivals. If entry and exit are not expensive and if there are no legal barriers to entry competitive results can occur even if only a few firms are active in the market.
- 17) There are four policy options in markets with high barriers to entry:
  - a) Restructure the industry to increase competition;
  - b) Reduce tariffs and other artificial variables that limit competition;
  - c) Regulate the price and output of firms in the market;
  - d) Supply the market with goods produced by government firms.
- 18) On balance there has been an increase in competitiveness in the U.S. economy. This conclusion is based upon an analysis of concentration ratios.

### **Gaining from International Trade**

- 1) Approximately 21 percent of the world's total output is now sold in a country other than the one in which it was produced. For industries in which economies of scale are important smaller countries may not be large enough to support cost efficient firms. Large firms in less-populated countries will export a larger share of their output and consumers in the country will be more likely to purchase imported goods.
- 2) Relative to total domestic output Singapore and Hong Kong have the largest international trade sectors in the world. These countries import raw materials and export finished products.
- 3) Comparative advantage is the ability to produce a good at a lower opportunity cost than others can produce it. Relative costs determine comparative advantage. A nation will have a comparative advantage in the production of a good when its production costs (other goods foregone) for the good are low relative to the production cost of other nations for the same good. Every country benefits if it specializes in the production of those goods for which it is a low opportunity cost producer and trades for those goods for which it is a high opportunity cost producer. With international trade, each country can gain by specializing in the production of goods it can produce economically and using the proceeds to import goods that would be expensive to produce domestically. As long as the relative production costs of two goods differ between two countries gains from trade are possible. Aggregate output is increased when each country uses more of its resources to produce those goods that it can produce at relatively low cost.

- 4) Trade permits nations to expand their joint output when each country specializes in the production of goods it can produce at a relatively low cost and uses the proceeds to buy goods that it could produce only at a high cost. Rising marginal costs, as the output of a good expands, will limit the degree to which a country will specialize in the production of goods. International trade benefits consumers particularly in smaller countries because it permits them to buy from large scale producers abroad. International trade promotes competition in domestic markets and allows consumers to purchase a wide diversity of goods at economical prices. Foreign competition improves domestic producers.
- 5) Exports and imports are closely linked. If a nation did not export goods it would not have the foreign currency necessary for the purchase of imports. Imports supply the foreign exchange necessary for a foreign country to purchase the importer's exports. Free trade results in lower prices and an expansion in domestic consumption and output.
- 6) A tariff is a tax levied on imported goods into a country. Tariff's benefit domestic producers and the government at the expense of consumers. The tariff is a subsidy to domestic producers. With tariffs a Country will end up producing less in areas where it has a comparative advantage and more in areas where it is a high cost producer.
- 7) Import Quotas place a ceiling on the amount of a product that can be imported during a period. Quotas are more harmful than tariffs. Foreign producers are limited to the amount of a product they can sell regardless of their costs relative to domestic producers. A quota brings in no revenue to the government. Quotas encourage political special interest groups.
- 8) Voluntary Export Restraints (VER) are voluntary agreements to limit exports to a particular country. The impact of VER's is similar to that of quotas.
- 9) There are three arguments for protecting domestic industries
  - a) National defense argument;
  - b) Infant-industries argument;
  - c) Anti-Dumping argument .
- 10) Empirical data indicate trade barriers are harmful to the economic health of a country.
- 11) GATT is an organization composed of 115 countries designed to set the rules for the conduct of international trade and reduce barriers to trade among nations. NAFTA is the North American Free Trade Agreement and includes the U.S. , Canada and Mexico.

### **International Finance and the Foreign Exchange Market**

- 1) The foreign exchange market is a widely dispersed, highly organized market in which the currencies of different countries are bought and sold. The exchange rate is the domestic price of one unit of a foreign currency. Appreciation is an increase in the value of a domestic currency relative to foreign currencies. Depreciation is a decline in the value of a domestic currency relative to foreign currencies.
- 2) Flexible exchange rates are determined by the market forces of supply and demand. Fixed exchange rates are set at a fixed rate relative to all other currencies. Government policies are used to maintain the fixed exchange rate. The following factors which cause changes in exchange rates:
  - a) Change in income will cause exchange rates to change. If domestic income increases the demand for imports will increase and the value of foreign currencies will rise relative to the domestic currency.

- b) Differences in rates of inflation will cause exchange rates to change. Domestic inflation will cause a depreciation in a country's currency whereas deflation will cause a currency appreciation. Domestic inflation will increase imports and exports will decline because of higher prices. Exchange-rate adjustments will permit nations with high inflation to engage in trade with countries experiencing little or no inflation.
- c) Changes in interest rates will impact exchange-rates. If real interest rates increase in a country the value of its currency will appreciate in currency markets.
- 3) Fixed exchange rates will lead to shortages and surpluses in exchange markets. Fixed exchange rates also lead to chronic balance of payment problems. A nation experiencing a chronic trade deficit has three options available to it:
  - a) The currency can be devalued.
  - b) A nation can heighten trade barriers, adopting tariffs and quotas in an effort to reduce imports and bring the value of its currency on the foreign exchange market into equilibrium.
  - c) A nation can follow restrictive macroeconomic policy designed to promote deflation and high interest rates.
- 4) The Balance of Payments Account is structured as follows:
  - a) Current Account is the record of all transactions with foreign nations that involve the exchange of merchandise goods and services, current income derived from investments, and unilateral gifts.
    - i) Balance of Merchandise Trade is the difference between the value of merchandise exports and the value of merchandise imports.
    - ii) Service exports and imports are composed of insurance, banking services, transportation, etc.
    - iii) Balance on goods and services is comprised of the exports of goods and services of a nation minus its imports of goods and services.
    - iv) Net Investment income is the income earned from investments in other countries less income earned on foreign investment in the U.S.
    - v) Unilateral transfers are monetary gifts to foreigners such as U.S. aid, private gifts, etc.
    - vi) 1.6 Balance on Current Account is equal to the Balance on Goods and Services, plus net investment income earned abroad, plus unilateral transfers.
  - b) Capital account transactions involve either
    - i) The exchange of ownership rights to real or financial assets
    - ii) the extension of loanable funds.
  - c) Official reserve account will be fairly stable under a system of flexible exchange rates. Changes in the exchange rates are relied on to balance the amount goods, services and assets purchased from foreigners and the amount sold to foreigners.
- 5) The Balance of Payments must balance:

$$\text{Current Account Balance} + \text{Capital Account Balance} + \text{Official Reserve Balance} = 0$$

The above identity implies that if any nation is experiencing a current account deficit it must be offset by a capital account surplus since the official reserve balance will tend to remain unchanged under a system of flexible exchange rates.

- 6) Monetary Policy and the Exchange Rate:
  - a) Assume an unanticipated increase in the rate of growth of the money supply.
  - b) Incomes will increase and imports will increase.
  - c) Prices will increase and exports will decline.

- d) Real interest rates will decline.
- e) All of the above factors will cause the currency to depreciate in value.
- 7) Fiscal Policy and the Exchange Rate: Fiscal policy generates conflicting influences on the exchange market. Assume a shift to a restrictive fiscal policy:
  - a) Incomes will decline and imports will decline.
  - b) Prices will decline and exports will increase.
  - c) Value of the currency will increase in exchange markets.
  - d) Real interest rate will decline because of reduced government borrowing.
  - e) Capital will flow out of the country because of reduced real rates.
  - f) Value of the currency will decline in exchange markets.
  - g) Since capital is mobile capital outflows will probably dominate pure economic effects.
- 8) Monetary Policy and the Current Account: Assume an unanticipated increase in money supply.
  - a) Incomes will increase and imports will increase.
  - b) Prices will increase and exports will decline.
  - c) Real interest rates will decline.
  - d) Current account will shift towards a larger deficit
  - f) Because of lower real interest rates capital will leave U.S.
  - g) Outflow of capital will increase the capital account deficit and depreciation in exchange value of the currency.
  - h) Dollar depreciation will encourage exports and discourage imports and offset the effects of higher income growth. Since capital is mobile the financial transactions will dominate.
  - i) In the short run the current account will move toward surplus and the capital account deficit will widen.
- 9) Fiscal Policy and the Current Account:
  - a) Expansionary fiscal policy will stimulate aggregate demand.
  - b) Incomes will increase and imports will increase.
  - c) Real interest rates will widen and deficits increase.
  - d) Current account will shift towards deficit because of increase in imports.
  - e) Higher real rates will attract foreign and domestic capital and capital account will shift towards surplus.
  - f) Large budget deficits will always result in large current account deficits.
- 10) The J - Curve effect is the tendency of a nation's current-account deficit to widen before it shrinks in response to an exchange-rate depreciation. This tendency results because the short-run demand for both imports and exports is often inelastic, even though the long-run demand curve is almost always elastic.

### **The Foreign Exchange Market**

- 1) Each country uses a different currency. An exchange rate must be set for trade in goods and assets to occur between countries. Gold served as an international means of payment during the era of the gold standard. Currencies could be exchanged for one another in exact proportion to their gold value. The domestic purchasing power of a currency (gold content) was set by the domestic monetary authority. An adjustment in exchange rates occurred only when the domestic monetary authority changed the gold content of its currency. Gold bullion was used to settle international transactions. The balance

of all monetary flows and the balance of payments, was linked to trade or capital flows. A deficit in the balance of payments resulted in an outflow of gold and a reduction in the money supply.

- 2) Hard currencies were introduced to soften the impact of BOP surpluses and deficits. These hard currencies were freely convertible into gold. In the early 1970's the system of fixed exchange rates collapsed. The current international exchange rate system is a floating rate system with constraints.
- 3) The foreign exchange market is a worldwide interbank market. It is organized like an institutional over-the-counter market. Spot exchange rates are quoted for immediate currency transactions. Forward rates are rates contracted today with settlement in the future. Forward rates are often quoted at a premium or discount. A premium exists if the forward rate is in excess of the spot rate and a discount exists when the forward rate is less than the spot rate.
- 4) Interest rate parity holds that the forward discount or premium is equal to the interest rate differential between two currencies:

$$F = S * ((1+r_f)/(1+r_d))$$

- 5) The use of different currencies allows each nation some independence in setting national interest rate and monetary policy. The **Spot Exchange Rate** is the rate of exchange between two currencies tells us the amount of foreign currency one unit of domestic currency will purchase. The **Forward Exchange Rate** is the rate of exchange of two currencies set on one date for delivery at a future specified date. The forward rate is quoted today for delivery at a future date. The **Interest Rate** for a given time period is a function of the length of time and the denomination of the currency. The **Interest Rate Differential** is the difference in interest rates between two countries. The **Inflation Rate** is equal to the rate of consumer price increase over the period specified. The **Inflation Rate Differential** is equal to the difference in inflation rates between two countries.
- 6) The **Purchasing Power Parity Relation** links spot exchange rates and inflation. The **International Fischer Relation** links interest rates and inflation. The **Foreign Exchange Expectations Relation** links foreign exchange rates and expected spot exchange rates. **Interest Rate Parity** links spot exchange rates, forward exchange rates, and interest rates. **Absolute Purchasing Power Parity** is inspired by the *Law of One Price* which states that the real price of a good in one country must be the same in all countries. Absolute PPP asserts that the exchange rate should equal the ratio of the average price levels in the two countries. **Relative Purchasing Power Parity** focuses on the general inflation rates in two countries and claims that the exchange rate movements should exactly offset any inflation differential between the two countries:

$$S_1/S_0 = (1 + I_F) / (1 + I_D)$$

$S_0$  is the spot exchange rate at the start of the period

$S_1$  is the spot exchange rate at the end of the period

$I_F$  is the inflation rate over the period in the foreign country

$I_D$  is the inflation rate over the period in the domestic country

- 7) Relative Purchasing Power Parity implies that the real return on an asset is identical for investors from any country.

- 8) The International Fischer Relation states that the interest rate differential between two countries should be equal to the expected inflation rate differential over the term of the interest rate. Fischer postulated that real interest rates are relatively stable over time and fluctuations in interest rates are caused by revisions in inflation expectations:

$$(1 + r_f)/(1 + r_D) = (1 + p_f)/(1 + p_D) * (1 + E(I_f))/(1 + E(I_D))$$

$r$  is the nominal interest rate

$p$  is the real interest rate

- 9) Purchasing Power Parity combined with the international Fischer relation implies that the interest differential between two countries is expected to be offset by the currency depreciation over the term of the interest rate. Movements in exchange rates should offset, on the average, any interest rate differential that may exist. Differences in real interest rates between countries will cause capital flows which will eliminate the interest rate differential and equalize real interest rates across countries.
- 10) The Foreign Exchange Expectations states that the forward exchange rate is equal to the expected value of the spot rate at the future specified time. The foreign exchange rate should be an unbiased estimator of the future spot exchange rate in the presence of uncertainty.
- 11) Interest Rate Parity states that the interest rate differential must equal the forward discount or premium.

$$F/S^0 = (1 + r_f) / (1 + r_D)$$

- 12) Interest rate parity combined with the foreign exchange expectation relation implies that the difference in interest rates is equal to the expected exchange rate movement.
- 13) There are practical implications of relationships between exchange rates, interest rates and inflation rates
- Interest rate differentials reflect expectations about currency movements. The expected return on default-free bills should be equal across countries.
  - Exchange risk reduces to inflation uncertainty. An investor caring about real returns would not be affected by exchange rate uncertainty.
- 14) Empirical Evidence:
- Purchasing Power Parity is a poor explanation for short-term exchange rate movements. Tests performed on longer time periods or involving high-inflation countries provide stronger support for PPP. Reasons for the above include:
    - definition of inflation is questionable,
    - transfer costs, import taxes and restrictions, as well as export subsidies might prevent arbitrage in goods markets. In the longer term industries in countries with overvalued currencies will make direct investments in countries with undervalued currencies.
  - International Fisher Relation tends to be supported when applied to the major currencies.
  - Foreign Exchange Expectations is not supported by empirical evidence. Exchange rates are unpredictable and the statistical power of the test is low. A risk premium should be included in tests because of uncertainty in exchange rates.
  - Interest Rate Parity tends to hold in major countries where markets are free and unregulated. There are large deviations from parity in lesser developed countries.

- 15) Empirical evidence shows that exchange rates do not neutralize inflation differentials in real terms. Furthermore, movements do not generally correct interest rate differences between two currencies.

## **DEBT INVESTMENTS**

### **Time Value of Money**

- Each time value concept can be thought of as answering a question. These questions will be presented in terms of \$1 amounts, if the amount is \$X, simply multiply the \$1 factor by X.
- FUTURE VALUE:** If I put away \$1 today at rate  $i$ , how much will I have at the end of  $N$  periods? The rule can be generated by considering consecutively greater numbers of periods:

| Pds. | Amount  | Amount if $i = 6\%$                          |
|------|---|--|
| 1    | $1 + 1(i) = (1+i)$                            | $1(1.06) = 1.06$                             |
| 2    | $(1+i) + i(1+i) = (1+i)(1+i) = (1+i)^2$       | $(1.06)^2 = 1.1236$                          |
| 3    | $(1+i)^2 + i(1+i)^2 = (1+i)(1+i)^2 = (1+i)^3$ | $(1.06)^3 = 1.191016$                        |
| .    | .   |  |
| .    | .   |  |
| N    | $(1+i)^N$                                     | If $N = 40$ , $FV = (1.06)^{40} = 10.285718$ |

- a) The future value factor for \$1 is given in future value tables. Alternately, on a Texas Instruments BA-35 calculator, you can find the \$1 factor by entering (for 40 periods at 6%):  $40 = N$ ,  $6 = \%i$ ,  $1 = PV$ ,  $0 = PMT$ ,  $CPT = FV$ .

**EXAMPLE:**

If I put away \$9.52 for 14 periods at 9%, at the end of the 14<sup>th</sup> period I will have:  
 $\$9.52 \times (1.09)^{14} = \$9.52 \times 3.341727 = \$31.81324$ .

OR:

Find the present value factor for 14 periods at 9% = 3.341727, and multiply by 9.52,

OR:

On a Texas Instruments BA-35 calculator, enter:  $14 = N$ ,  $9 = \%i$ ,  $9.52 = PV$ ,  $0 = PMT$ ,  $CPT = FV$ .

**NOTE:** There are only five calculator buttons necessary to do all time value calculations:

N: The number of periods .

%i: The yield per period.

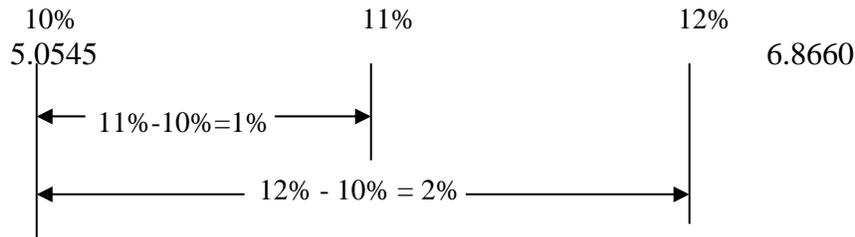
PV: The price at time 0.

PMT: The annuity cash flow per period (an annuity - see below).

FV: The value after the last annuity cash flow (maturity value or ending value).

- INTERPOLATION:** Time value tables are limited because they cannot contain factors all possible interest rates. In order to find a close approximation for the factor at a rate not given in a table, it is necessary to use a process called interpolation. This is easily demonstrated by an example:

EXAMPLE: What is the future value factor for 17 periods at 11%? The Future Value Table in Reilly & Brown gives values for 10% (5.0545) and for 12% (6.8660), but not for 11%. In this case the answer is easy to see - take the FV factor at 10% and go half way to 12%:



$$\text{Approximate 11\% factor} = 5.0545 + (6.8660 - 5.0545) \times \frac{11 - 10}{12 - 10}$$

This is an approximate solution because it assumes that the change between 10% and 12% is linear, while the true relationship is curved. Interpolation should not be applied over wide ranges of interest rates, or it will rapidly lose its accuracy - say at most a 2% difference between rates..

4. **ANNUITIES:** An annuity is a series of equal payments received at the end of each period. An annuity due is a series of equal payments received at the start of each period. I.e., for an N-period annuity and annuity due of \$X:

|             |     |     |     |     |     |     |     |
|-------------|-----|-----|-----|-----|-----|-----|-----|
| Time        | 0   | 1   | 2   | 3   | ... | N   |     |
| Annuity     |     | 0   | \$X | \$X | \$X | ... | \$X |
| Annuity Due | \$X | \$X | \$X | \$X | ... | 0   |     |

a) **NOTE:** The "PMT" on the calculator is an annuity

5. **FUTURE VALUE ANNUITY:** If I put away \$1 at the end of each of the next N periods at rate i, how much will I have at the end of the N<sup>th</sup> period? Again, we consider consecutively greater numbers of periods:

| Pds. | Amount                         | Amount if i = 6%   |
|------|--------------------------------|--|
| 1    | 1                              | 1  |
| 2    | 1 + 1(1+i)                     | 1 + 1.06 = 2.06  |
| 3    | 1 + (1+i) + (1+i) <sup>2</sup> | 1 + 1.06 + 1.12366 = 3.1836  |
| ...  | ...                            | ...  |
| N    | $\sum(1+i)^{N-1}$              | If N = 40, FVA = (1.06) <sup>39</sup> + (1.06) <sup>38</sup> + ... + (1.06) <sup>1</sup> + (1.06) <sup>0</sup> = 154.762 |

- a) The \$1 future value annuity factors are given in a future value table or, on a Texas Instruments BA-35 calculator, you can find the \$1 factor by entering (for 40 periods at 6%): 40 = N, 6 = %i, 0 = PV, 1 = PMT, CPT = FV.
- b) **NOTE:** The calculator will give you a value of -154.762. The negative is simply a convention of the calculator, it assumed outflows (payments) and called them negatives. Different calculators treat this differently, and you must understand your calculator's conventions. The negatives will be ignored from here forward.

EXAMPLE: If I put away \$9.52 at the end of each of the next 14 periods at 9%, at the end of the 14<sup>th</sup> period I will have:  $\$9.52 \times [(1.09)^{14} + (1.09)^{13} + \dots + (1.09) + 1] = \$9.52 \times 26.019 = \$247.70$ .

OR:

Find the future value annuity factor = 26.019 in a future value annuity table, and multiply by 9.52.

OR:

On a Texas Instruments BA-35 calculator, you could enter: 14 = N, 9 = %i, 0 = PV, 9.52 = PMT, CPT = FV = 247.703.

6. **PRESENT VALUE:** How much do I have to put away today at i% so as to have \$1 at the end of N periods? Again considering consecutively greater numbers of periods:

| Pds. | Amount                             | Amount if i = 6%                         |
|------|------------------------------------|--|
| 1    | $1 = PV(1+i)$ ; $PV = 1/(1+i)$     | $1/(1.06) = 0.9434$                      |
| 2    | $1 = PV(1+i)^2$ ; $PV = 1/(1+i)^2$ | $1/(1.06)^2 = 0.89$                      |
| 3    | $1 = PV(1+i)^3$ ; $PV = 1/(1+i)^3$ | $1/(1.06)^3 = 0.8396$                    |
| ·    | ·                                  | ·  |
| N    | $1 = PV(1+i)^N$ ; $PV = 1/(1+i)^N$ | If N = 40, $PV = 1/(1.06)^{40} = 0.0972$ |

- a) The \$1 present value factor is given in present value tables or, on a Texas Instruments BA-35 calculator, you can find the \$1 factor by entering (for 40 periods at 6%): 40 = N, 6 = %i, 0 = PMT, 1 = FV, CPT = PV.

Example: If I want to have \$9.52 at the end of 14 periods at 9%, I must put away  $\$9.52 \times [1/(1.09)^{14}] = \$9.52 \times 0.2992 = \$2.85$ .

OR:

Find the \$1 present value factor = 0.2992 in the table and multiply by 9.52,

OR:

On a Texas Instruments BA-35 calculator, you could enter: 14 = N, 9 = %i, 0 = PMT, 9.52 = FV, CPT = PV.

- b) **NOTE:**  $PV = 1 / FV$ , i.e., PV and FV are inverse.

7. **PRESENT VALUE ANNUITY:** How much must I put away today at i% so as to be able to withdraw \$1 at the end of each of the next N periods? Again considering consecutively greater numbers of periods:

| Pds. | Amount                               | Amount if i = 6%   |
|------|--------------------------------------|--|
| 1    | $1/(1.06)$                           | $1/(1.06) = 0.9434$  |
| 2    | $1/(1.06) + 1/(1.06)^2$              | $1/(1.06) + 1/(1.06)^2 = 1.8334$                                       |
| 3    | $1/(1.06) + 1/(1.06)^2 + 1/(1.06)^3$ | $1/(1.06) + 1/(1.06)^2 + 1/(1.06)^3 = 2.6730$                          |
| ·    | ·                                    | ·  |
| ·    | ·                                    | ·  |
| N    | $\Sigma[1/(1.06)^N]$                 | If N = 40, $PVA = 1/(1.06) + 1/(1.06)^2 + \dots + 1/(1.06)^N = 15.046$ |

- a) The \$1 present value annuity is given in present value annuity tables or, on a Texas Instruments BA-35 calculator, you can find the \$1 factor by entering (for 40 periods at 6%): 40 = N, 6 = %i, 1 = PMT, 0 = FV, CPT = PV.

EXAMPLE: If I want to withdraw \$9.52 at the end of each of the next 14 periods at 9%, I must put away  $\$9.52 \times [1/(1/09) + 1/(1.09)^2 + \dots + 1/(1.09)^{14}] = \$9.52 \times 7.7861 = \$74.1242$ .

OR:

Find the \$1 present value annuity factor and multiply by 9.52.

OR:

On a Texas Instruments BA-35 calculator, you could enter: 14 = N, 9 = %i, 9.52 = PMT, 0 = FV, CPT = PV.

b) **NOTE**: Although PV is the inverse of FV, PVA is **NOT** the inverse of FVA!

### Applications of Time Value of Money

1. If you know the required rate, cash flows, and ending value, what is the value of the asset? Time value of money is the basis of valuation. I.e., since the present value is the amount which must be put away today, at the required rate of return, to exactly create the cash flows and ending value, you would
  - a) consider an asset priced above the present value would be considered overpriced.
  - b) consider an asset priced below the present value to be underpriced. Thus, the present value is often used to estimate the correct price or intrinsic value of an asset.
  - c) It is an estimate because there is uncertainty about the exact cash flows, the exact required rate of return and the exact ending value.
2. Often the question is reversed: given the price, cash flows and ending value, what is the rate of return?
  - a) This version of the question is very useful, since it puts different size assets on a common basis and allows direct comparison.

### Bond Prices

1. From our discussion of present value, we see that given the required yield on a bond, the price is simply the present value of the cash flows:

$$\text{Price} = \sum_{t=1}^n C_t \frac{1}{(1+i)^t}$$

- a) Remember, this is the amount which, at the required rate of return, can exactly recreate the cash flows from the bond.

EXAMPLE:

What is the value of a 20 year, 10%, semiannual pay bond, if the yield to similar bonds is 10.6%? Using the calculator, we can find the present value of the cash flows at a rate of 10.88%. There is a slight problem in that this is a semiannual pay bond, while the required rate is given as an annual rate. We solve this by converting to a semiannual rate of return. Each coupon payment represents interest for half a year, so that we divide the annual rate by 2 ( $10.6 / 2 = 5.3$ ), and multiply the number of

periods by 2 ( $2 \times 20$ ) = 40. On a Texas Instruments BA-35 calculator, you would enter:  $40 = N$ ,  $5.3 = \%i$ ,  $50 = PMT$ ,  $1000 = FV$ ,  $CPT = PV$ . This gives the value of the bond as \$950.57.

### Bond Yield Measures

1. Given the price, what is the rate of return or yield on the bond? Going from price to yield is more complicated than going from required yield to price, since several measures are commonly used. The measures must be thoroughly understood.
2. **NOMINAL YIELD**: This is simply the coupon rate on the bond.
  - a) Nominal yield is the actual yield received on the bond only if the bond is priced at par. Otherwise, it is useful only in that it is part of the specification of cash flow to be received.
3. **CURRENT YIELD**: This is simply the annual cash flow divided by the price of the bond.
  - a) Current yield is only useful as a description of the immediate cash return on the bond, since it ignores any capital gains or losses.
4. **(PROMISED) YIELD TO MATURITY**: The yield to maturity (ytm) of the bond would be found by finding the discount rate which sets the present value of the cash flows equal to the price of the bond.
  - a) This is usually referred to simply as "yield to maturity" (YTM). This may be described as the "promised" yield to maturity because it is based on two assumptions:
    - The bond will be held to maturity.
    - All cash flows from the bond can be reinvested at the promised yield to maturity.
  - b) There is actually a third assumption which is sometimes overlooked - that all of the cash flows will be exactly as promised, without default, delay, or exercise of any embedded options such as a call.
  - c) Unfortunately, there is no closed form expression to find the yield to maturity. One solution is to use an approximation.
    - A rough approximation of the yield can be found by taking the average annual cash flow (interest plus amortization of premium or discount) divided by the average amount invested (average of present price and maturity value):

$$ytm = \frac{\text{coupon} + \frac{\text{par} - \text{price}}{n}}{\frac{\text{par} + \text{price}}{2}}$$

- Note: This is sometimes called the "approximate" yield, or more often "simple yield."
  - **NOTE**: The simple yield approximation tends to understate YTM for discount issues, and overstate YTM for premium issues.
  - This approximation can be refined through the process of interpolation.
- d) Very few analysts would use either of the above techniques, or the antiquated yield books. Most financial calculators are set up to calculate the YTM on a bond using the present value method.
    - The present value method simply uses the formula for the present value of the cash flows and the observed price to infer the yield, rather than using the formula and the required yield to infer the price. I.e., solve for  $i$  in the formula:

$$\text{Observed Price} = \sum_{t=1}^n C_t \frac{1}{(1+i)^t}$$

- Again note that there is no closed form expression.

Example: What is the yield of a 20 year, 10%, semi-annual pay bond, callable in 15 yrs. at 105, which is priced at 950.57?

- The nominal yield is 10%.
- The current yield is  $100 / 950.57 = 0.1052 = 10.52\%$ . Note again that current yield ignores capital gain or loss, as well as time value.
- The yield to maturity can be approximated using the simple yield formula. Since the bond is a semiannual pay bond, it is applied to semiannual periods:

$$\text{Approximate semiannual yield} = \frac{50 + \frac{1000 - 950}{40}}{\frac{1000 + 950}{2}} = 0.0526 \text{ or } 5.26\%$$

This semiannual yield is then converted to an annual yield. This is usually annualized by ignoring compounding and using "bond equivalent basis" or "bond equivalent yield," simply multiplying by the number of periods in a year:

$$\text{Approximate annual yield, bond equivalent basis: } 2 \times 5.26 = 10.52\%$$

- The correct yield to maturity is easily found using a calculator. On a Texas Instruments BA-35 calculator, you would enter:  $40 = N$ ,  $950.57 = PV$ ,  $50 = PMT$ ,  $1000 = FV$ ,  $CPT = \%i$ . The result is  $ytm = 5.30\%$ . You may note that the calculator takes several seconds to compute the ytm - this is because it is again using an iterative approximation algorithm, not a closed solution. The resulting semiannual yield is then annualized on a bond equivalent basis to 10.6%
6. **YIELD TO CALL:** The yield to call can be computed by applying the same methods used to compute YTM, but modifying them so that the term to maturity is the term to the call, and the maturity amount is the principal plus the call premium.
- Example: The bond in the previous example is callable in 15 years at 105 (i.e., 105% of face value or \$1050.00). The semiannual yield to call is calculated on a calculator by entering:  $30 = N$ ,  $950.57 = PV$ ,  $50 = PMT$ ,  $1050 = FV$ ,  $CPT = \%i$ . This gives a semiannual yield to call of  $\%i = 5.407$ , doubling gives an annual bond equivalent yield of 10.814%.
- NOTE:** Although this is a higher yield than the yield to maturity, it does not imply that you would like the bond to be called.
    - The yield to maturity was over the next twenty years, while the yield to first call is only over the next ten years.
    - There is the problem of what to do with the funds at the time of the call. The bonds would not be called unless yields were low.
    - Further, the firm will not call the bonds unless the call is favorable to the firm, which implies that the call is not favorable to the investor!
7. **REALIZED YIELD:** The yield actually obtained by the purchaser of a bond is called the realized yield or horizon yield. It may differ from the promised yield if the assumptions underlying promised yield to maturity are violated.
- Assuming that only the holding period assumption is violated and interest rates do not change, the yield is found by using the horizon as the maturity date and the bond price at the horizon date as the maturity value.
    - The value of the bond at the horizon date is found as the present value of the remaining flows at that time.

b) If the realized yield is computed using an expected bond price at the horizon date, the result is called the expected realized yield.

Example: Assume that the bond in the previous example will only be held for ten years, and that the required rate of return remains at 10.52%.

- a) At that time the bond has ten years until maturity, and is priced at:  $20 = N$ ,  $5.26 = \%i$ ,  $50 = PMT$ ,  $1000 = FV$ ,  $PV = CPT$ . This gives a price of \$968.30.
- b) The semiannual horizon yield is then computed as:  $N = 20$ ,  $PMT = 50$ ,  $PV = 950.57$ ,  $FV = 968.30$ ,  $\%i = CPT$ . This gives a semiannual yield of 5.29%, doubling gives a bond-equivalent annual yield of 10.6%
- c) Note that the procedure is exactly like that of computing yield to call except that the price of the bond is used instead of the call price.

8. The yield to maturity is an internal rate of return. The internal rate of return implicitly assumes that all interim cash flows can be reinvested at the internal rate of return. If this implicit assumption is incorrect, the realized yield (sometimes horizon yield) will be different than the computed yield to maturity. This is easily demonstrated:

- a) If the underlying assumption of reinvestment at the ytm is correct, at maturity the investor will have the compounded value of the coupon payments (FVA) plus the maturity value:

|                           |                |
|---------------------------|----------------|
| FVA of coupon payments* : | 6500.99        |
| Maturity value:           | <u>1000.00</u> |
| Total                     | 7500.99        |

$$\text{Total (realized) return (semiannual)} = (7500.99 / 950.57)^{1/40} = 1.053 = 5.30\%$$

\*  $N = 40$ ,  $\%i = 5.30$ ,  $PMT = 50$ ,  $PV = 0$ ,  $FV = CPT$ . The addition to the interest payments is sometime referred to as "interest on interest."

- b) If, on the other hand, interest rates drop immediately after purchase, and the actual reinvestment rate is only 5%, at maturity the investor will have:

|                            |                |
|----------------------------|----------------|
| FVA of coupon payments** : | 6039.99        |
| Maturity value:            | <u>1000.00</u> |
| Total:                     | 7039.99        |

$$\text{Total (realized) return (semiannual)} = (7039.99 / 950.57)^{1/40} = 1.0513 = 5.13\%$$

\*\*  $N = 40$ ,  $\%i = 5.00$ ,  $PMT = 50$ ,  $PV = 0$ ,  $FV = CPT$ .

Thus, if the rate at which cash flows are reinvested is not the ytm, the realized return will be different than the ytm. The possibility that this will occur is called "reinvestment rate risk."

**NOTE:** The realized rate of return or horizon yield will always lie between the yield to maturity and the reinvestment rate.

## HPR vs. HPY

- 1 There are two widely used measures of return over a period.

$$\text{HPR} = \text{Holding Period Return} = \frac{\text{Ending Value}}{\text{Beginning Value}}$$

$$\text{HPY} = \text{Holding Period Yield} = \frac{\text{Ending Value} - \text{Beginning Value}}{\text{Beginning Value}}$$

2. Note that  $\text{HPY} = \text{HPR} - 1$ :

$$\text{HPY} = \frac{\text{Ending Value} - \text{Beginning Value}}{\text{Beginning Value}} = \frac{\text{Ending Value}}{\text{Beginning Value}} - \frac{\text{Beginning Value}}{\text{Beginning Value}} = \text{HPR} - 1$$

Note that for multiple period returns, HPR is compounded (not HPY!). I.e.,

$$\text{Multiple Period Return} = \left[ \prod_{t=1}^T (1 + \text{HPY}) \right]^{\frac{1}{N}} - 1.0$$

EXAMPLE: Suppose that an investor earns 10% in year one, 11% in year two, and 5% in year three. The return over the three-year period is:

$$\text{Three-year return} = [(1 + 0.10)(1 + 0.11)(1 + 0.05)]^{1/3} - 1 = 0.282 \Rightarrow 28\%$$

## Term Structure of Interest Rates:

- 1 The term structure is the relationship between the maturity of a bond and the yield of the bond.
  - a) Some authors make a distinction between "term structure," which applies only to the implied relationship between maturity and yield for zero coupon Treasuries and the "yield curve," which applies to the observed relationship between maturity and yield for any given class of bonds.
2. The Pure Expectations theory: If an investor wishes to hold bonds for N periods, there are many ways to do this. The investor could hold an N-period bond, a series of N one-period bonds, a one-period and then an N-1 period bond, and so on.
  - a) In order for the market to be indifferent, the yield on all of these possible combinations must be the same.

$$(1 + R_{0,N})^N = (1 + R_{0,1}) \times (1 + R_{1,2}) \times \dots \times (1 + R_{N-1,N})$$

- b) Consider the choice between a series of N one-period bonds and an N-period bond, we must have:

$$R_{0,N} = [(1 + R_{0,1}) \times (1 + R_{1,2}) \times \dots \times (1 + R_{N-1,N})]^{1/N} - 1.0$$

where  $R_{j,k}$  is the yield on a bond purchased at time j and maturing at time k. Solving for  $R_{1,N}$ ,

$$R_{1,N} = \left[ \prod_{n=0}^{N-1} (1 + R_{n,n+1}) \right]^{1/N} - 1.0$$

- This equation essentially says that the yield on an n-period security is the Geometric Mean of the sequence of expected one-period forward rates.
  - In practice, if the period is not too long (say, < 20 periods) and the interest rates do not vary much (say, less than 5%), The arithmetic average is a close approximation to the geometric mean.
- c) Note that the expectation theory is consistent with a number of yield curve shapes.

EXAMPLE:

Suppose that the anticipated semiannual rates over the next 18 months are:  
first six months = 6%, second six months = 7%, third six months = 8%

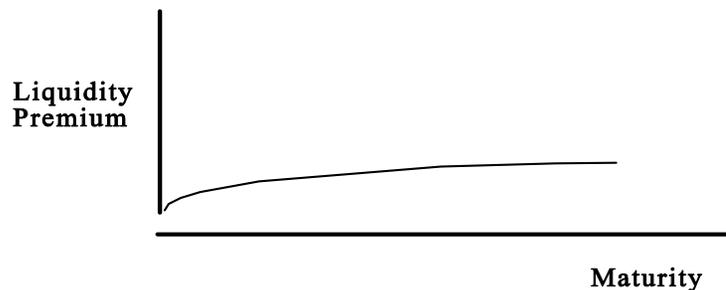
$$\left( \left( 1 + \frac{0.06}{2} \right) \left( 1 + \frac{0.07}{2} \right) \left( 1 + \frac{0.08}{2} \right) \right)^{\frac{1}{3}} - 1 \times 2 \times 100 = 6.998\%$$

According to the “expectations” theory, the return on an eighteen-month bond should be:

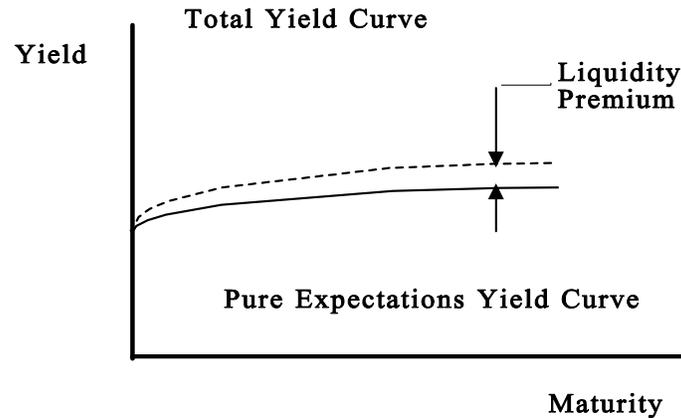
3. The Liquidity Premium hypothesis: Expectations theory ignores the differences in risk among bonds of differing maturity. Liquidity theory considers this risk differential.
- a) Investors in short-term bonds have greater liquidity, since the bonds will have a predictable cash value at a closer date and can be sold for that cash value at that date (remember, liquidity is quickness of sale at a known price). Investors in long-term bonds have less liquidity and thus higher risk.
  - b) This risk difference leads long-term investors to require some liquidity premium as an inducement to accept the added risk.

$$R_{1,N} = \left[ \prod_{n=1}^N (1 + R_n + L_n) \right]^{1/N} - 1.0$$

- c) Liquidity theory can be combined with expectations:  
where  $L_n$  is the liquidity premium required to attract investment in bonds of maturity n.
- d) The liquidity premium is an increasing function of maturity, although at a decreasing rate:

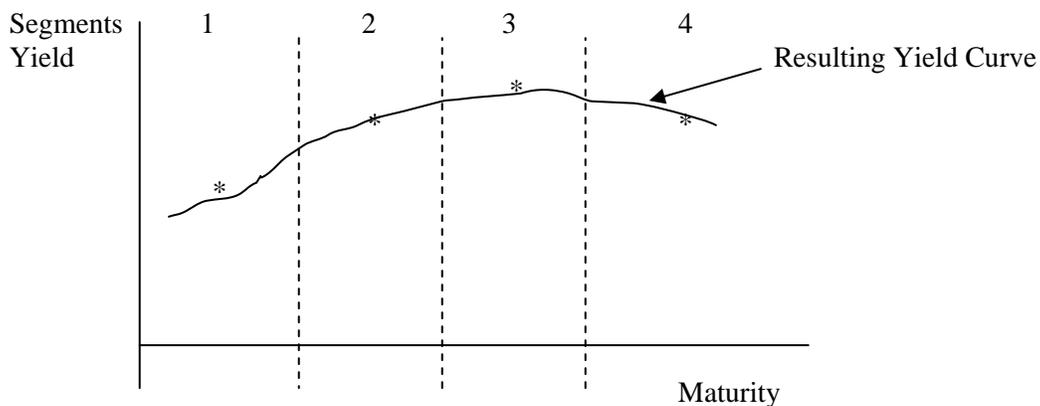


- e) The liquidity premium hypothesis is sometimes combined with the expectations theory, and would be a premium over the yield curve indicated by the pure expectations theory:



**NOTE:** The presence of a liquidity premium would mean the forward rates implied from observed yields will be upwardly biased estimates of expected interest rates

4. The Preferred Habitat / Market Segmentation Theory: The expectations and liquidity theories assume that except for liquidity differences, investors are indifferent as to maturity. Market segmentation theory suggests that investors are not indifferent to maturity.
  - a) This theory notes that investors can reduce risk by matching the maturity schedule of their assets and liabilities. Thus, different classes of investors will prefer bonds of different maturities (will have a preferred habitat in the term structure).
  - b) Because of this difference in maturity preference, markets are segmented. The amount of segmentation depends on the strength of preference assumed.
  - c) The “Preferred Habitat” form of the theory indicates that investors do not adhere totally to their preferred habitat, but are willing to move to different maturities for a premium. In this case, the yield curve reflects expectations plus a (positive or negative) premium.
  - d) The “Market Segmentation” form of the theory indicates that investors adhere strictly to their preferred habitat. In this case the segmentation is absolute, and the yield curve is determined by the supply and demand for loanable funds within the various market segments. I.e., suppose there were four segments with supply/demand conditions indicating a yield represented by \* in the diagram. The resulting yield curve would be the (smoothed) line connecting the yields:



- d) The market segmentation theory is also referred to as the preferred habitat, or institutional, or hedging pressure theory.

## Spot and Forward Rates

1. The spot rate for a given maturity is the yield on a zero coupon Treasury of that maturity, the spot rate curve is the relationship between spot rates and maturities. Unfortunately, the only zero coupon Treasuries available are T-bills, which have a maximum maturity of one year, and it is necessary to impute the spot rates for longer maturities through a sequential process called "bootstrapping."
2. The basic concept behind bootstrapping is that any coupon Treasury security can be decomposed into a package of zero coupon Treasury coupons of appropriate maturities. I.e., a two-year coupon Treasury can be thought of as a six-month zero coupon Treasury with maturity value equal to the coupon payment, plus a similar one-year zero, plus a similar eighteen-month zero, plus a two-year zero with value equal to the last coupon plus the maturity value of the original Treasury.
  - a) With this concept, it is possible to impute the spot rate for an eighteen-month Treasury from the observed six-month and one-year spot rates.
    - The price of the bond is the present value of the payments:

$$\text{Price} = \frac{\text{Coupon}}{(1 + y_1)} + \frac{\text{Coupon}}{(1 + y_2)^2} + \frac{\text{Coupon} + \text{Maturity Value}}{(1 + y_3)^3}$$

where  $y_1$  is the six-month spot rate,  $y_2$  the one-year spot rate, and  $y_3$  the eighteen-month spot rate.

- Since the price, coupon, maturity value, and the first two spot rates are known, the equation can be

$$y_3 = \left[ \frac{\text{Coupon} + \text{Maturity Value}}{\text{Price} - \frac{\text{Coupon}}{(1 + y_1)} - \frac{\text{Coupon}}{(1 + y_2)^2}} \right]^{\frac{1}{3}} - 1.0$$

solved for the eighteen-month spot rate:

The process is then repeated for the two-year Treasury, and so on.

- Note that it ain't that simple. There may be multiple treasuries of the same maturity but different yields (due to other factors such as coupon), and some maturities may not be available. In practice, points are plotted and a "smoothed" curve is fitted.
  - Note that the spot rate curve is based on the equivalence of a Treasury to a decomposed portfolio of zero coupon Treasuries. If a Treasury security is off the spot rate curve, i.e., is not priced based on the theoretic spot rates, it may be profitable to create a synthetic series of zero coupon Treasuries by stripping the coupons.
3. We can use the spot rate curve to infer the market expectation of future interest rates.
    - a) Given similar securities of different yields, we can infer that the difference between the two yields is due to the forward rate which will apply to securities held over the difference in maturities. I.e.,

if the yield on a one-year bond is different than that on an eighteen-month bond, we can imply the required yield on a bond purchased at the end of year one and maturing at the end of eighteen months - the forward rate.

- b) The rate of return on the eighteen-month security is  $(1 + ytm_3)^3$ , where  $ytm_3$  is the semiannual yield on the eighteen-month security. The rate of return on the one-year security is  $(1 + ytm_2)^2$ , where  $ytm_2$  is the semiannual yield on the one-year security. Since the market is indifferent between the two securities (or else the prices will change), the market must expect some forward rate  $f$  over the

$$(1 + ytm_2)^2 \times (1 + f_{2,3}) = (1 + ytm_3)^3$$

last six months which will provide the same return. I.e.,  
Since we know all the variables except  $f$ , we can solve to obtain the implied forward rate:

$$f_{2,3} = \frac{(1 + ytm_3)^3}{(1 + ytm_2)^2} - 1.0$$

Using the spot rate curve, expected interest rates over various future periods can be determined. While any yield curve can be used to infer spot and forward rates, the “par bond yield curve” is often used. This is a yield curve that gives the yield for par bonds - i.e., the yields of the bonds of different maturities differ in such a way that all of the bonds are priced at par.

**EXAMPLE:**

Suppose we observe the following “par” bond yield curve:

|        |       |        |        |        |
|--------|-------|--------|--------|--------|
| Mat’y  | 6 mo. | 12 mo. | 18 mo. | 24 mo. |
| Ytm, % | 6     | 7      | 7.8    | 8.5    |

Solve for the spot and forward rates.

The 6 month spot rate is, by definition, the rate on a six-month bond starting at time 0, or in this case 6%.

The 12 month spot rate is imputed by:

- a) subtracting the PV of the interim cash flows (the 6 month interest payment) from the price of

$$100 - \frac{3.5}{1.03} = 96.601942$$

the 12 month par bond to find the implied price of a 12 month zero:

- b) solving for the 12-month implied spot rate:

$$\frac{103.5}{(1 + y_{0,1})^2} = 96.601942$$

$$y_{0,1} = \left[ \left( \frac{103.5}{96.601942} \right)^{\frac{1}{2}} - 1 \right] \times 2 = 0.0701758 = 7.02\%$$

The 18 month spot rate is imputed by:

a) subtracting the PV of the interim cash flows (the 6 month and 12 month interest payments) from the price of the 18 month par bond to find the implied price of an 18 month zero:

$$100 - \frac{3.9}{1.03} - \frac{3.9}{\left(1 + \frac{0.0701758}{2}\right)^2} = 92.573159$$

Note that the payment is \$3.90, and the discount rate over the first 6 months is 3%.

b) solving for the implied 18-month spot rate:

$$\frac{103.9}{(1 + y_{0,1.5})^3} = 92.573519$$

$$y_{0,1.5} = 0.07845 = 7.845\%$$

The 24 month spot rate is imputed by:

a) subtracting the PV of the interim cash flows (the 6 month, 18 month, and 24 month interest payments) from the price of the 24 month par bond to find the implied price of a 24 month zero:

$$100 - \frac{4.25}{1.03} - \frac{4.25}{\left(1 + \frac{0.0701758}{2}\right)^2} - \frac{4.25}{\left(1 + \frac{0.07845}{2}\right)^3} = 88.120346$$

b) solving for the implied 24-month spot rate:

$$y_{0,2} = \left( \frac{104.25}{88.120346} \right)^{\frac{1}{4}} - 1 = 0.0429175 = 4.29175\%$$

Forward Rates:

The six month forward rate starting at time zero is, by definition, 6%

The six month forward rate starting at six months is implied from the 6 and 12 month spot rates:

$$\left(1 + \frac{y_{0,1}}{2}\right)^2 = (1 + f_{0,0.5})(1 + f_{0.5,1})$$

$$f_{0.5,1} = \left[ \frac{\left(1 + \frac{y_{0,1}}{2}\right)^2}{1 + f_{0,0.5}} \right]^2 = \left[ \frac{1.071407}{1.03} \right]^2 = 8.0402\%$$

The six month forward rate starting in one year is implied from the 12 and 18 month spot rates:

$$\left(1 + \frac{y_{0,1}}{2}\right)^2 \left(1 + \frac{f_{1,1.5}}{2}\right) = \left(1 + \frac{y_{0,1.5}}{2}\right)^3$$

$$f_{1,1.5} = \left[ \frac{\left(1 + \frac{y_{0,1.5}}{2}\right)^3}{\left(1 + \frac{y_{0,1}}{2}\right)^2} - 1 \right] \times 2 = \left[ \frac{\left(1 + 0.078\right)^3}{\left(1 + 0.07\right)^2} - 1 \right] \times 2 = 0.090409 = 9.0409\%$$

### Bond Price Volatility

- Bond price "volatility" refers to the per cent changes in the price of a bond as yield changes - i.e., volatility with respect to yield changes. *The rules should be understood and committed to memory.*

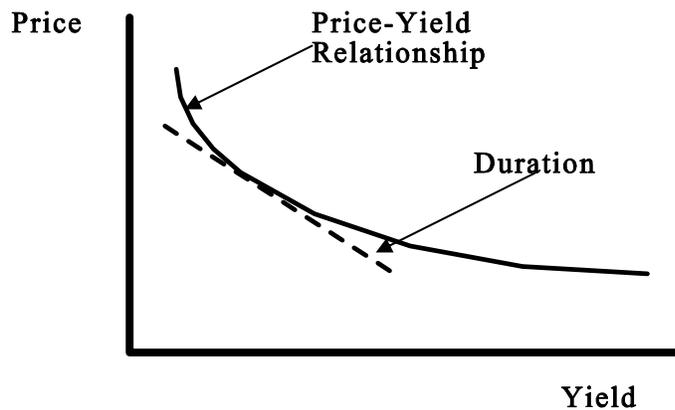
| Coupon | Maturity | YTM | Price         |  | Δ Price | % Δ     |
|--------|----------|-----|---------------|--|---------|---------|
| 6%     | 20 yrs   | 8%  | 804 -----A    |  | - 196   | - 19.60 |
| 6      | 3        | 8   | 949 -----C    |  | - 51    | - 5.10  |
| 6      | 20       | 6   | 1000          |  |         |         |
| 6      | 3        | 6   | 1000          |  |         |         |
| 6      | 20       | 4   | 1271 -----B   |  | + 271   | 27.10   |
| 6      | 3        | 4   | 1056 -----D   |  | + 56    | + 5.60  |
| 6      | 30       | 20% | 320.95        |  |         |         |
| 6      | 30       | 18  | 337.98 -----E |  | + 17.03 | + 5.31  |
| 6      | 20       | 20  | 318.26        |  |         |         |
| 6      | 20       | 18  | 357.67 -----F |  | + 39.41 | + 12.38 |
| 15     | 20       | 8   | 1687 -----G   |  | - 345   | - 16.98 |
| 15     | 20       | 6   | 2032          |  |         |         |
| 15     | 20       | 4   | 2495 -----H   |  | + 463   | + 22.79 |

- a) Bond prices move inversely to yield. Compare price changes A to B, C to D.
- b) Longer bonds will have larger price changes. Compare price changes A and B to C and D.
- c) As maturity increases, volatility (per cent price changes) tends to increase at a decreasing rate. Compare per cent changes A and B to C and D.
  - **NOTE:** this rule is not always true - under some conditions, volatility may actually decrease with maturity. Compare per cent changes E and F. This is not explicitly recognized in Reilly!
- d) For a given absolute change in the ytm, the price increase due to a decrease in yield is larger than the price decrease due to an increase in yield - i.e., price and volatility is not symmetrical. Compare price and per cent changes A and C to B and D.
- e) For a given absolute change in ytm, bonds of higher coupon have less volatility. Compare per cent changes G to A and B, and H to C and D.
- f) Note the implications for trading strategies:
  - a) If yields are expected to increase, price change will be downward and investors should seek the lowest volatility - i.e., short maturities and high coupon.
  - b) If yields are expected to decrease, price change will be upward, and investors should seek the highest volatility - i.e., long maturities and low coupons.
- g) The various above effects will cause differences in yields, or yield spreads, between bonds:
  - There will be a spread among different segments of the bond markets - i.e., governments vs. agencies vs. corporates.
  - There will be a spread among different sectors within market segments - i.e., AAA corporates vs. BBB corporates, etc.
  - There will be a spread among different coupons within a segment or sector - i.e., high coupon bonds are less volatile and will have (ceteris paribus) lower yield.
  - From the term structure, there will be a spread among different maturities.It is important to understand that these relationships and the resulting yield spreads will vary over time.

## Duration

1. This is an extremely important concept, with important applications. This material should be thoroughly understood!
2. The basic definition of duration is: "Duration is the percent change in price when yield changes by 100 basis points."
3. Basically, duration is calculated by:
  - computing the price for a small increase in yield, and for an equal decrease in yield,
  - computing the percent change in price
  - adjusting the percentage to reflect a +/- 50 basis point change in yield.
4. Computing the price of a bond after a yield change requires a valuation model. This leads to several versions of duration, depending on the model used:
  - Modified duration – assumes that the cash flows are not affected by the yield change (i.e., that the bond is a "straight" or "option-free" bond.
  - Effective duration – the effects of embedded options are included in the duration calculation.
  - Empirical duration and Implied duration is estimated statistically using historical observations.

5. Why is duration important?
- It is a handy risk measure – the higher the duration, the higher the sensitivity to changes in yield.
  - It is a handy way to compute the % change in the price of a bond, given a change in yield:  
$$\% \text{ change in price} = \text{duration} \times \text{change in yield in basis points.}$$
6. OTHER INTERPRETATIONS:
- The definition of duration is readily understood, but there are other ways of visualizing duration:
  - Duration is sometimes viewed as the slope of the price-yield relationship at the given yield (for those who speak calculus, it is  $dP/Pdy$ ):

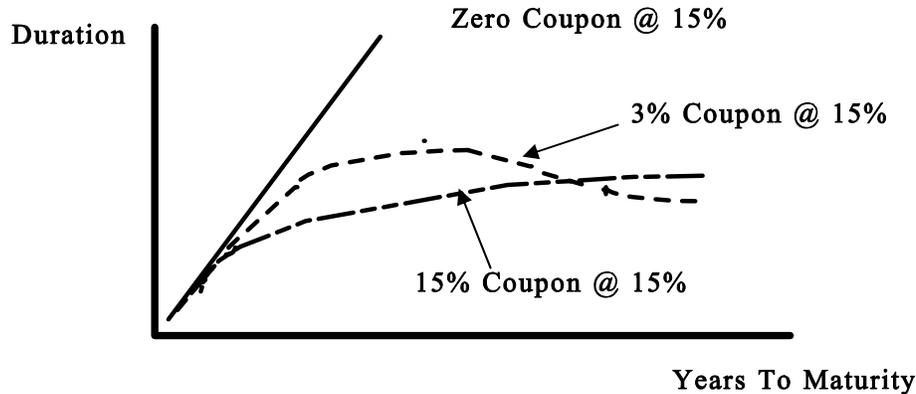


This interpretation is not exactly correct, since duration is based on a % change in price, rather than an absolute change in price, but it is close.

- Another interpretation of duration is that it is the point in time at which interest rate risk cancels out reinvestment rate risk, so that you have the same amount of \$, and hence the same return, no matter what happens to interest rates.
- Duration factoids:
  - The duration of a zero is equal to its maturity/ $(1 + y/2)$ .
  - The duration of a coupon bond is always less than its maturity.
  - Duration tends to increase with maturity, but at a declining rate.
  - **NOTE:** this is not always true - under some conditions, duration may decline with increasing maturity:

Figure 16.6 in Reilly demonstrates that duration (and hence the volatility) of coupon bonds generally increases at a decreasing rate. However, the curve for the 3% coupon, selling to yield 15%, shows that in some cases intermediate-term bonds will have longer duration (and so higher volatility) than long-term bonds!

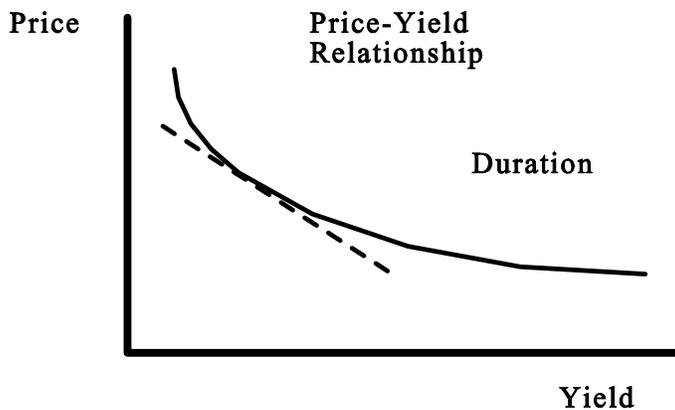
Macauley Duration vs. Maturity (from Figure 16.6 in Reilly & Brown)



- There is an inverse relationship between duration and yield. This can readily be seen by considering the slope of the price-yield relationship as yield increases.
- Events which accelerate the receipt of cash flows will reduce duration, sometimes dramatically.
- If yields are expected to decrease, the correct strategy is to increase volatility by increasing duration. If yields are expected to increase, the correct strategy is to reduce volatility by reducing duration.

### Convexity

1. The price - yield relationship is not linear. Convexity takes account of this nonlinearity.
2. The nature of convexity is revealed by examining the price - yield relationship:



- a) The relationship is not linear, but curvilinear. While the exact shape of the curve will vary, The general shape remains valid for all bonds and for portfolios (in fact, for any stream of payments):
  - The relationship is steeper at low yields than at high yields.
  - The rate of change of the relationship (amount of curvature) decreases as yields increase.

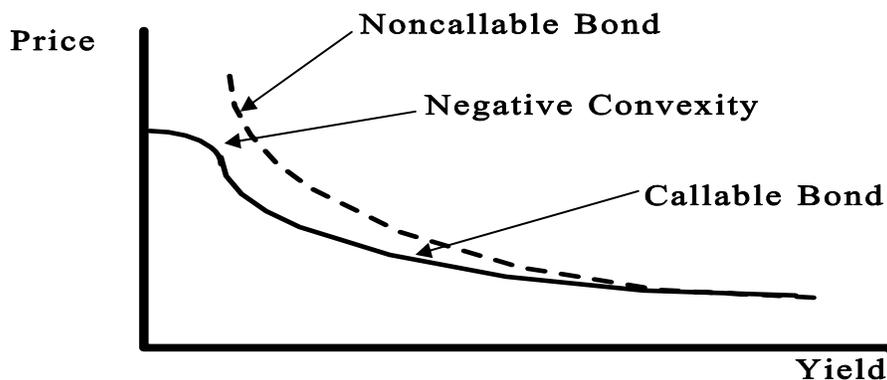
- b) The measure used to describe the curvature of the relationship is convexity. It is the rate of change of the slope of the curve (again, for those who speak calculus it is  $(1/P)(d^2P/dy^2)$  ).
- c) Duration is the slope of the curve at the given yield. It is only valid at that specific yield, however, since the curvature means that it changes as yield changes. This is not important for small changes in yield, since the error introduced is small.
- For larger changes in yield, however, the error can become significant, as shown in the diagram.
  - Convexity is used to correct for the error by adding the Price Change Due to convexity:

$$\text{Per Cent Price Change Due to Convexity} = 1/2 \times \text{Convexity} \times (\Delta \text{ yield})^2$$

so that the corrected per cent change in the price of the bond is:

$$\text{Corrected } \% \Delta \text{ Price} = (\% \Delta \text{ Price Due to Duration}) + (\% \Delta \text{ Price Due to Convexity})$$

- d) Note that the correction term "% Δ Price Due to Convexity" is always positive. I.e., the larger the convexity, the larger the price increase due to a decrease in interest rates and the smaller the price decrease due to an increase in interest rates.
- This means that higher convexity is preferred.
- e) Three convexity relationships:
- Holding yield and maturity constant, convexity is inversely related to coupon.
  - Holding yield and coupon constant, convexity is positively related to maturity.
  - Holding coupon and maturity constant, convexity is inversely related to yield.
- f) Convexity for callable bonds. For a callable bond, the call price becomes an upper bound on the price of the bond, so that the price-yield relationship is distorted as shown:



Note that at some point the curvature will change direction, so that the bond in this range of yields will actually exhibit negative convexity.

## **DERIVATIVE SECURITIES**

### **Derivatives**

1. The emphasis here is on the basic nature and procedures of options, futures and swaps and their markets. A thorough understanding of this material is essential to an understanding of applications covered at levels II and III. While the material is not difficult, it is easy to confuse the instruments and their outcomes under different conditions. Also, much of the material is expressed in the form of equations, which can become easily confused. Each equation, however, has an intuitive explanation, and it is through this intuitive understanding that the equations make sense. The candidate is strongly urged to understand the reasoning behind the analysis, rather than attempting to rely on memory.

### **Arbitrage**

1. The concept of arbitrage stands behind the “law of one price.” This “law” simply states that equivalent assets should be equivalently priced. I.e., if an asset is priced at ¥4,000 in market A, it should also be priced at ¥4,000, or the equivalent of ¥4,000, in market B. If this were not true, an arbitrage opportunity would exist - i.e., a trader could simultaneously sell the asset in the market in which it is priced higher, and purchase the asset in the market in which it priced lower. This would provide a costless, riskless return to the trader, and this type of arbitrage trading would rapidly bring the prices in the two markets. For this reason, the “law of one price” is also called the “no arbitrage condition.”
  - a) Note that this does not necessarily mean the same monetary price. For instance, two equivalent bonds might trade at different prices, but should have the same rate of return. In this case the equivalent price is not the same monetary price, but the monetary price which would imply the same rate of return.
    - In its pure or academic form, the law of one price assumes perfect market - costless trading and full information available to all traders. In actual markets, the size of the price difference must be larger than the costs of trading. In markets which function efficiently, however, the law of one price indicates close limits on price differences for equivalent assets.
    - Practitioners sometimes refer to arbitrage in a looser form, indicating a trade among similar assets which has low risk and low cost. The arbitrage referred to here is the academic arbitrage.While less use is made of the arbitrage concept at Level I, the concept underlies the valuation of derivative which will arise at Level II. It is therefore considered extremely important for the candidate to understand this concept.

### **Futures and Forward Contracts**

1. Futures and forward contracts are both agreements to exchange assets at some future point in time - usually cash for some physical asset - e.g., you and I agree that in six months I will give you ¥4,000 and you will give me one bushel of wheat.
2. The heart of the difference between futures and forward contracts lies in the formalized nature of futures trading vs. the informal nature of forwards trading. Specifically:

- a) Futures contracts always trade on an organized exchange; forward contracts are agreements between individuals..
  - b) Futures contracts are standardized as to the asset, the quantity, the date, and the mechanism of delivery; the terms of a forward contract are determined by the parties to the contract..
  - c) Performance of the futures contracts is guaranteed by the a clearinghouse; performance of a forward contract depends on the parties to the contract.
  - d) Futures trading requires a “good faith deposit,” or margin; forward contracts may not require any such arrangement.
  - e) Futures markets are regulated by an identifiable government agency; forward contracts trade in unregulated fashion.
3. Margin is expressed as a fraction of the futures price, or amount to be exchanged in the future.
- a) The amount which must be deposited at the start of the contract is known as the initial margin.
  - b) At the end of each trading day, the accounts are “marked to market” by adding profits to or subtracting losses from the traders margin account. This means that gains and losses on futures positions are immediately realized.
  - c) The trader is required to keep the amount in the margin account above a certain fraction of the futures price. This fraction is smaller than the initial margin fraction (typically equal to three-fourths of the initial margin fraction) and is called the maintenance margin. If the amount in the margin account falls below the maintenance margin, the trader is required to make a deposit, called variation margin (typically equal to one days trading limit), to bring the margin account back above the maintenance margin.
  - d) If the trader has multiple positions, the margin requirements are netted.
  - e) Since forward contracts are individual customized contracts which do not typically require margin or “mark to market,” gains and losses on forward contracts are not realized until expiration.
4. Speculators are traders who take a futures position in the hope of making a profit from changes in the futures price - but who accept the risk of a loss from changes in the futures price. The motivation of a hedger, on the other hand, is to avoid risk.
- a) An example of a speculator is a trader who has no use for wheat, but assumes a long position on the belief that the futures price will increase because predicted weather conditions will cause a small harvest.
  - b) An example of a hedger is a baker (farmer) who will need to buy (sell) wheat at the time of the futures maturity - by holding a long (short) position the baker (farmer) locks in a certain price for the purchase (sale), avoiding risk that the price will change.
    - This is an example of anticipatory hedging, in that the assets are not presently held but are anticipated to be held in the future. The same hedging technique could be used to avoid the risk of price fluctuations in an asset presently held by locking in the future price.
5. Futures trading provides social benefits.
- a) By providing risk reduction through hedging, futures contribute to market stability and reduce the required rate of return.
  - b) The futures price contributes to market efficiency by providing price discovery - information about the expected future price of wheat. The result is a general social benefit which spreads beyond the immediate participants in the market.
4. Only a small percentage of futures contracts result in actual delivery of the goods.

- a) The speculator does not wish to take delivery, having no use for the underlying asset. The hedger may desire the underlying asset but find the delivery arrangement called for in the future inconvenient.
- b) Rather than take the inconvenient delivery at expiration, the long position holder can simply offset the long position by going short the same future.
- The short position will cancel the long position, and leave the holder of the long position with the gain or loss on the future up to that point. The speculator simply accepts the gain or loss as the payoff to the strategy. The hedger buys or sells the asset at the market price, and the combination of market price plus gain or loss equals the original futures price.

**EXAMPLE:**

Trader S, a speculator, goes long a future on August wheat at futures price of ¥400 per bushel. At the same time trader H, a miller who will need wheat in August and so is a hedger, also goes long the same future. Other than the margin deposit, there is no exchange of assets at this time. In August, when the future is about to expire, the price of wheat is ¥600 per bushel, and both traders have profit of ¥200 in their margin accounts. The speculator offsets the long position by shorting the future at ¥600, which cancels his long position, and receives the original margin amount plus the ¥200 profit. The hedger, while actually needing to acquire the wheat, may find the delivery terms of the future inconvenient (possibly due to a delivery point far from the mill). The hedger's solution is to also offset the long position through shorting, and buy the wheat at a convenient location for ¥600. The effective price for the hedger is the original futures price of ¥400: the ¥600 local purchase price minus the ¥200 profit.

**CASH FLOWS OF SPECULATOR:**

|                                  |              |
|----------------------------------|--------------|
| Time 0: initial margin           | - Margin     |
| August: return of initial margin | + Margin     |
| increase in margin               | <u>+¥200</u> |
| NET (profit)                     | +¥200        |

**CASH FLOWS OF HEDGER:**

|                          |              |
|--------------------------|--------------|
| Time 0: initial margin   | - Margin     |
| August: return of margin | + Margin     |
| profit                   | +¥200        |
| purchase wheat           | <u>-¥600</u> |
| NET (cost of wheat)      | -¥400        |

The result for the hedger would be the same if the price of wheat should decrease. If the price of wheat at expiration were ¥200 per bushel, the hedger would still enter into an offsetting position and purchase locally at ¥200. Because the hedger would in this case have a ¥200 loss, the effective price would be ¥400: the ¥200 local price plus the ¥200 loss.

- c) Exchange-for-physicals (EFP) is an alternative to offset. Rather than entering into an offsetting position, the long position holder finds a short position holder who is hedging a long position in the underlying asset. The two traders tell the exchange to cancel the two futures positions, and exchange the underlying assets and cash. Note that this arrangement does not pass through the open outcry of the exchange and is said to occur ex-pit.

7. The candidate should be remember that there are four general types of futures contracts, which are defined by the underlying asset:
  - a) Agricultural and Metallurgical Contracts - these include agricultural products (grains, oil and meal, livestock, forest products, textiles, and foodstuffs), metals, and petroleum products.
  - b) Interest rate futures - Treasury bills, notes, and bonds, Eurodollar deposits, and municipal bonds.
  - c) Foreign Currencies - there is also an active forward contract market in foreign currencies.
  - d) Indexes - such as the S&P 500, the New York Stock Exchange index, the Nikkei index, the Nikkei 225, and others. Note that for index futures delivery is in cash, since actual delivery is impossible.

## Options and Option Markets

1. There are two different types of options.
  - a) Call options give the holder the right (but not the obligation) to purchase the underlying asset at a specific price for a specified time
  - b) Put options give the holder the right (but not the obligation) to sell the underlying asset for a specified price for a specified time.
  - c) Both puts and calls may be either American options or European options.
    - **NOTE:** This distinction is not connected with location of trading - the difference is simply that American options may be exercised at any time, while European options can only be exercised at expiration.

2. A typical option price quotation is:

| XYZ    | Strike | Calls |       |       | Puts  |       |       |
|--------|--------|-------|-------|-------|-------|-------|-------|
|        | Price  | FEB   | MAR   | APR   | FEB   | MAR   | APR   |
| 96 7/8 | \$ 90  | 6 5/8 | s     | 9 1/8 | 5/8   | s     | 1 3/8 |
|        | 95     | 2 7/8 | 4 3/8 | 5 1/2 | 1 5/8 | 2 5/8 | 3 1/8 |
|        | 100    | 7/8   | 1 7/8 | 3 1/8 | 4 5/8 | r     | 6 1/4 |
|        | 105    | 1/4   | 13/16 | 1 5/8 | 9 1/2 | r     | 11    |

- a) The underlying asset is common shares with symbol XYZ, presently priced at 96 7/8 per share.
- b) The per-share option premiums, or per-share cost of an option are given by month of expiration and strike price. E.g., the per-share premium for a call expiring in March and having a strike price of \$100 is 1 7/8.
- c) Exchange-traded options are for 100 shares, so that the actual amount to be paid for a standard option is 100 X per-share quoted premium.
- d) “s” indicates that the option is not traded (does not exist).
- e) “r” indicates that the option is traded (does exist), but was not traded on the day of the quote.
- f) There are several option pricing rules which are demonstrated in the quote table:
  - Option premiums are a positive function of time to expiration.
  - Call option premiums are negatively related to the strike price of the underlying asset.
  - Put option premiums are positively related to the strike price of the underlying asset.
3. Crucial to analyzing the outcome of any option position is the fact that the option holder (buyer, owner) of the option is the one who will decide if the purchase or sale will take place.
  - a) The option seller (writer) is obligated to comply with the decision of the option holder.

- b) The outcome of any position will be the result of the decision which maximizes the gain (or minimizes the loss) of the option holder.
4. The payoff to an option is immediate result of exercising the option. The “moneyness” of an option at any point in time is determined by the payoff to the holder of the option if exercised at that time - without regard to whether exercise will actually occur.
- If the payoff is positive, the option is said to be “in the money.”
  - If the payoff is zero, the option is said to be “at the money.”
  - If the payoff is negative, the option is said to be “out of the money.”

**EXAMPLE:**

If  $X$  is the exercise or strike price of the option.  $S_t$  is the price of the stock, and  $P_t$  is the payoff,

|                  | Call                         | Put                          |
|------------------|------------------------------|------------------------------|
| In the money     | $S_t > X, P_t = S_t - X > 0$ | $S_t < X, P_t = S_t + X < 0$ |
| At the money     | $S_t = X, P_t = S_t - X = 0$ | $S_t = X, P_t = S_t + X = 0$ |
| Out of the money | $S_t < X, P_t = S_t - X < 0$ | $S_t > X, P_t = S_t + X > 0$ |

**NOTE:** It is necessary to keep in mind the difference between “payoff,” which is the cash flow at exercise / maturity, and the profit or loss, which includes the premium paid by the buyer.

- At expiration, the holder would only exercise an in the money option, would be indifferent as to the exercise of an at the money option, and would not exercise an out of the money option.
  - The payoffs to the holder and writer are equal in size and opposite in sign.
5. The concept of the intrinsic value of an option takes into account the option nature of the instrument - i.e., whether the option will be exercised.
- Since exercise is the option of the holder, intrinsic value is the value of immediate exercise to the holder of the option.
  - Since the holder will avoid exercising if the payoff is negative (or zero), the intrinsic value of the option will be the larger of zero (no exercise - at the money and out of the money options) or the payoff (exercise - in the money options).
6. The profit or loss of the option holder or writer will include both the result of exercise or non-exercise and the option premium paid or received:

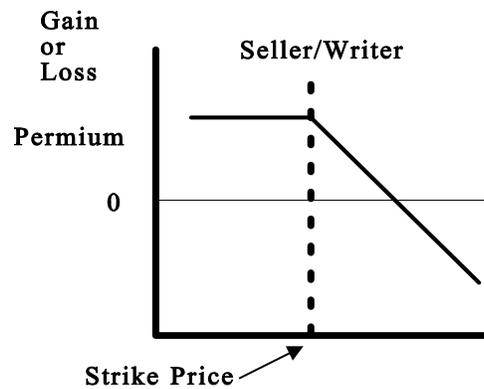
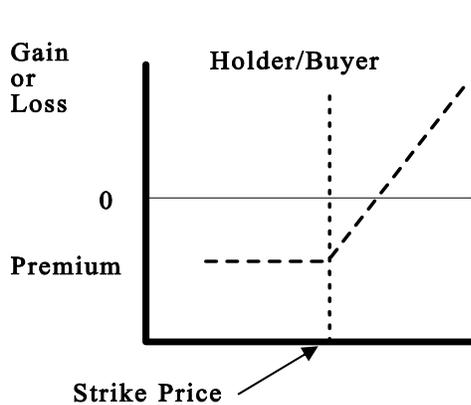
| Gain or loss of               | Holder           | Writer             |
|-------------------------------|------------------|--------------------|
| In the money, exercise        | payoff - premium | - payoff + premium |
| At the money, no exercise     | zero - premium   | zero + premium     |
| Out of the money, no exercise | zero - premium   | zero + premium     |

- NOTE:**
- Even though the position leads to a loss, the holder of a call (put) will exercise the option at expiration if the price of the stock is above (below) the strike price to minimize the loss!
  - As with the payoffs, the profit and loss to the holder and writer are equal in size but opposite in sign.

**EXAMPLE:**

A standard call option with a strike price of \$30 and a premium of \$200:

| Writer of Call |            |      |      | Buyer of Call |            |      |  |
|----------------|------------|------|------|---------------|------------|------|--|
| Stock Price    | Loss       | Gain | Net  | Loss          | Gain       | Net  |  |
| \$29 (-)       | -0-        | 200  | 200  | 200           | -0-        | -200 |  |
| 30             | (30-30)100 | 200  | 200  | 200           | (30-30)100 | -200 |  |
| 31             | (30-31)100 | 200  | 100  | 200           | (31-30)100 | -100 |  |
| 32             | (30-32)100 | 200  | -0-  | 200           | (32-30)100 | -0-  |  |
| 33             | (30-33)100 | 200  | -100 | 200           | (33-30)100 | 100  |  |
| 34             | (30-34)100 | 200  | -200 | 200           | (34-30)100 | 200  |  |

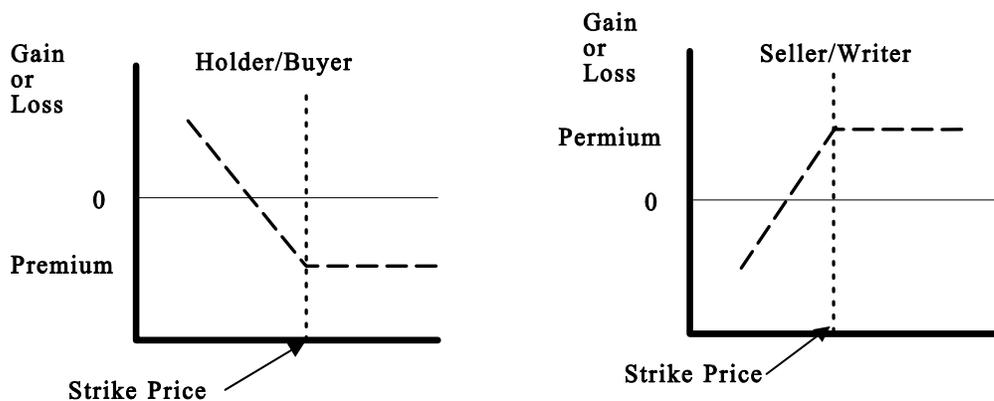


- NOTE:**
- the premium is the maximum loss to the buyer, and the maximum gain to the seller.
  - the maximum loss to the seller and the maximum gain to the buyer are theoretically unlimited.
  - the net to the seller and buyer are mirror images, so that the option contract is a zero-sum game.

**EXAMPLE:**

A standard put option with a strike price of \$30 and a premium of \$200:

| Writer of Put |            |      |      | Buyer of Put |            |      |  |
|---------------|------------|------|------|--------------|------------|------|--|
| Stock Price   | Loss       | Gain | Net  | Loss         | Gain       | Net  |  |
| \$26          | (26-30)100 | 200  | -200 | -200         | (30-26)100 | 200  |  |
| 27            | (27-30)100 | 200  | -100 | -200         | (30-27)100 | 100  |  |
| 28            | (28-30)100 | 200  | -0-  | -200         | (30-28)100 | -0-  |  |
| 29            | (29-30)100 | 200  | 100  | -200         | (30-29)100 | -100 |  |
| 30            | (30-30)100 | 200  | 200  | -200         | (30-30)100 | -200 |  |
| 31 (+)        | -0-        | 200  | 200  | -200         | -0-        | -200 |  |

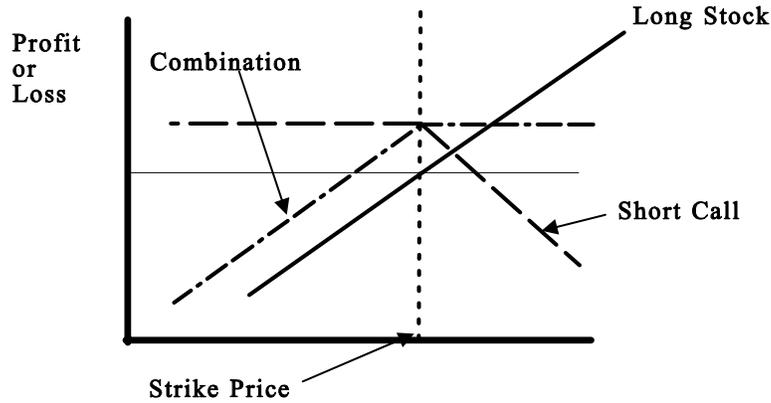


- NOTE:**
- the premium is the maximum loss to the buyer, and the maximum gain to the seller.
  - the maximum loss to the seller, and the maximum gain to the buyer happen when the stock becomes worthless. If that happens, the buyer makes a profit of  $(30-0)100 - 200 = 2800$ , while the seller loses 2800.
  - the net to the seller and buyer are mirror images - the option contract is a zero-sum game.
7. A covered call is a combination of a long position in the stock and a short position in the option.
- The motivation behind the sale of a covered call is often to generate income in the form of the option premium - i.e., the seller of the covered call receives the premium but hopes that the price of the stock will stay below the exercise price, so that the option will never be exercised.
  - The profit/loss diagram, however, shows that the seller of the covered call has really traded the chance of large capital gains for the premium.

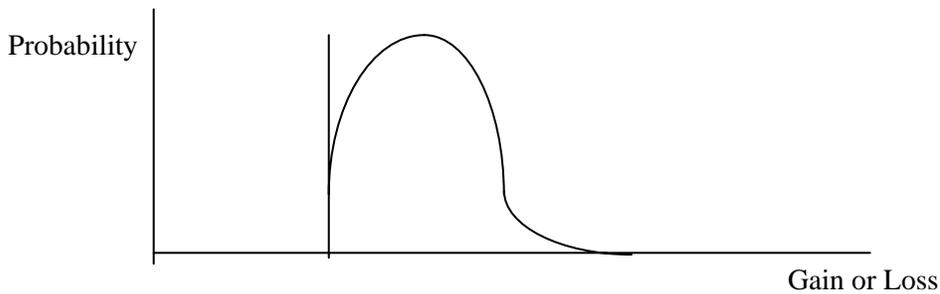
**EXAMPLE:**

Sale of a covered call on a stock selling at \$30, with a strike price of \$30 and a premium of \$200.

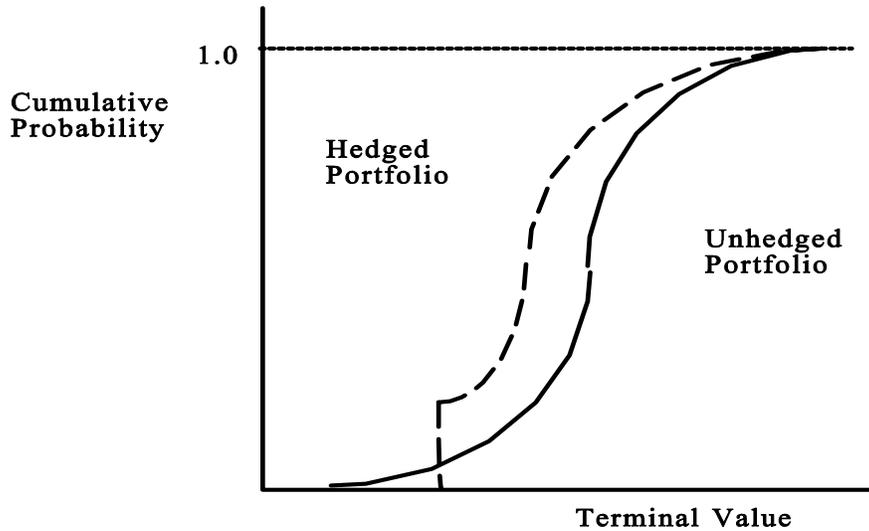
| Stock Price | Short Call Gain/Loss | Stock Gain/Loss | Net Gain/Loss | Terminal Value |
|-------------|----------------------|-----------------|---------------|----------------|
| \$26        | +200                 | -400            | -200          | \$2800         |
| 27          | +200                 | -300            | -100          | 2900           |
| 28          | +200                 | -200            | -0-           | 3000           |
| 29          | +200                 | -100            | +100          | 3100           |
| 30          | +200                 | -0-             | +200          | 3200           |
| 31          | +100                 | +100            | +200          | 3200           |
| 32          | -0-                  | +200            | +200          | 3200           |
| 33          | -100                 | +300            | +200          | 3200           |
| 34(+)       | 200                  | +400            | +200          | 3200           |



8. A protective put is the purchase of a put on an asset held long.
- a) The distribution of returns is truncated on the downside - in this example the most that can be lost is the premium.
- The effect of portfolio insurance can be shown using the probability distribution:



- The effect can also be shown using a cumulative probability distribution, which shows the probability that the terminal value of the portfolio will be equal to or less than a given value:



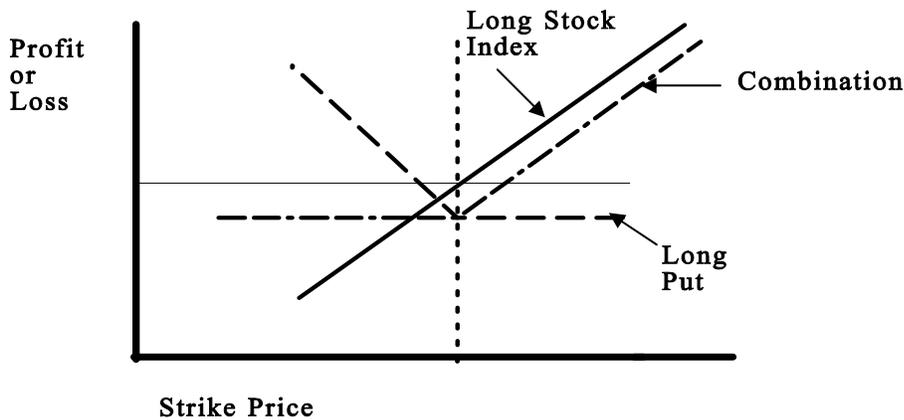
Note this is the terminal value without premium deducted.

- b) Protective puts are often used for portfolio insurance.
- To use portfolio insurance, the holder of the portfolio purchases a put on an index which will exhibit price movements similar to those of the portfolio.
  - The put on the index serves as a protective put, limiting the potential downside movement of portfolio value.
  - Note that this strategy works best when the index and the portfolio exhibit similar price movements, so that the strategy is best applied to well - diversified portfolios similar to the indexes on which options are traded.

**EXAMPLE:**

A protective put on a stock selling at \$30, with a strike price of \$30 and a premium of \$200:

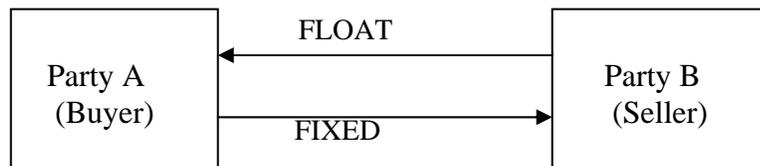
| Stock Price | Put Gain/Loss | Stock Gain/Loss | Net Gain/loss | Terminal Value |
|-------------|---------------|-----------------|---------------|----------------|
| \$26        | +200          | -400            | -200          | \$2800         |
| 27          | +100          | -300            | -200          | 2800           |
| 28          | -0-           | -200            | -200          | 2800           |
| 29          | -100          | -100            | -200          | 2800           |
| 30          | -200          | -0-             | -200          | 2800           |
| 31          | -200          | +100            | -100          | 2900           |
| 32          | -200          | +200            | -0-           | 3000           |
| 33          | -200          | +300            | +100          | 3100           |
| 34(+)       | -200          | +400            | +200          | 3200           |



**Swaps Markets**

1. A swap is an agreement between two parties, called counterparties, to exchange sets of cash flows over some future period.
  - a) A plain vanilla swap is the simplest type of swap, with no special arrangements beyond the exchange of cash flows.

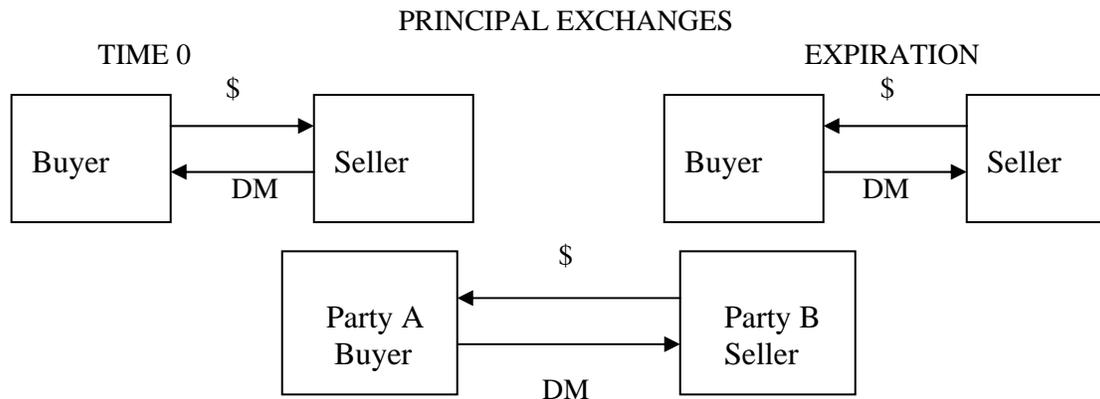
- b) The swap is often arranged by a third party called a swap facilitator, who helps the counterparties find each other and complete the transactions.
- When acting strictly as an agent, without taking any actual part in the swap, the facilitator is acting as a swap broker.
  - If the facilitator transacts for its own account to help complete the swap, the facilitator is acting as a swap dealer.
  - A swap facilitator is also sometimes called a swap bank.
2. An interest rate swap is tied to the value of a debt instrument, with the cash flows to be swapped specified in terms of interest payments on some principal amount.
- a) One of the cash flows is based on a fixed rate, while the other is based on a variable or floating rate
- Both series of cash flows for an interest rate swap are based on a single principal amount based in the same currency.
  - The principal amount is called the notional principal because it is not exchanged.
- b) Cash flows for a plain vanilla interest rate swap can be diagrammed as:



- e) The cash flows in the diagram are described above in terms of the rate on which the cash flows are based. If the notional principal of the swap were ¥100 million:
- Party A would pay ¥12 million to Party B at the end of each payment.
  - The payment made by Party B to Party A would depend on the (floating) LIBOR rate. If LIBOR were at 10% at the end of a period, Party B would pay Party A ¥13 million.
  - Although conceptually the cash flows go both ways, in practice the flows are netted so that only the party with the higher required cash flow makes a payment, which is equal to the difference in the required cash flows.
3. A currency swap is tied to the value of a foreign currency.
- a) The cash flows that are swapped are based on debt instruments, but the debt instruments are denominated in different currencies.
- The cash flows are in the (different) currencies of the principal on which they are defined.
- b) Unlike an interest rate swap, the principal amounts are not notional and are exchanged at the start of the swap and re-exchanged (returned) at the end of the swap.
- Due to exchange rates, the absolute size of the principal will be different in the different currencies.

**NOTE:** Identical amounts are exchanged at the start and end of the swap - i.e., the principal amounts are not affected by changes in the exchange rates.

- c) In order to express the principal flows at the start and end of the swap, the cash flows for a plain vanilla currency swap requires three diagrams:



- The diagrams assume that Party C and Party D swap principal amounts of DM 25 million and \$ 10 million (exchange rate = 2.5 marks per dollar), a German interest rate of 8 percent, and a US interest rate of 10 percent.
  - The first diagram shows the cash flows at the start of the swap, an exchange of the principal amounts, with Party C receiving dollars and Party D receiving marks.
  - The second diagram shows one of the periodic cash flows, with Party C paying dollars (“interest” on the \$ 10 million principal received) and Party D paying marks (“interest” on the DM 25 million principal received).
  - The third diagram show the re - exchange of the principal amounts at the end of the swap. **NOTE:** the re - exchange of principal is not affected by exchange rates, and the amounts returned are the same as the amounts received.
  - Unlike the plain vanilla interest rate swap, the periodic cash flows in the two currencies are not netted, and both parties pay and receive cash flows.
- d) The example used in the text uses fixed rates for both parties, but in practice the swap rates may be a mixture of fixed and floating or both floating.
- e) There are four differences between interest rate and currency swaps:
- In a currency swap the principals and cash flows are in different currencies, in an interest rate the principal and cash flows are in the same currency;
  - Periodic cash flows to interest rate swaps are netted, while the periodic cash flows of currency swaps are not netted
  - In an interest rate swap the principal is notional only and is not exchanged, in a currency swap the principal amount is exchanged at the start and end of the swap;
  - The essential feature of an interest rate swap is transformation between fixed and floating rate obligations, while the essential feature of a currency swap is access to a different currency

# **2003 Review for Level I**

**Economics  
Debt Investments  
Derivatives**

**ABSTRACTS  
PRACTICE QUESTIONS**

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## NEW MATERIAL

New material, or rewritten material, may indicate a high probability for questions drawn from the material.

**SS 4:** LOS 1. C. e, 1. D. a, 1. D. b, and 1. E. a are new. LOS 1. B. a, 1. B. e, and 1. C. c have been rewritten.

**SS 5:** LOS 1. A. b, 1. A. c, 1. B. b, 1. B. f, 1. C. d, 1. C. e, 1. E. d and all of section 1. F are new. LOS 1. C. b has been rewritten.

**SS 6:** LOS 2. f. is new. LOS 1. A. e and 2. j have been rewritten.

**SS 14:** LOS 1. A. b, 1. B. u, 1. B. V, 1. C. a, and all of section 2 are new. LOS 1. A. c, 1. B. j, 1. B. l, 1. B. q, 1. C. f, 1. C. h, 1. C. v, and 1. C. v have been rewritten.

**SS 15:** LOS 1. A. a, 1. B. c, 1. C. m, all of section 2, and 3. h are new. LOS 1. A. d and 1. B. r. are rewritten.

**SS 16:** LOS 1. D. h and I. D. n are new.

## HIGH PROBABILITY QUESTIONS

Note: In addition to the comments below, refer to the “New Material” section. New material indicates an item of interest that would have a higher probability of showing up on the exam.

### STUDY SESSION 4:

There is a large amount of material in this and the other economics sessions, but none of the material is of extreme difficulty. There is too much material to memorize – candidates are advised to reason through each argument, since most arguments are straightforward. In all of the economics sessions, the candidate will benefit by becoming familiar with the approach to questions, and the general tone of the conclusions. In general, there would be two types of questions:

a) Definition-type questions.

Example: Which of the following is an automatic stabilizer?

- i) unemployment compensation programs.
- ii) free public education
- iii) floating exchange rates.
- iv) none of the above.

b) “If – then” questions:

Example: The Phillips curve implies that:

- i) there is a tradeoff between employment and inflation.
- ii) as price increases, the quantity demanded will decrease.
- iii) as the rate of employment increases, the money supply will increase.
- iv) employment and inflation are inversely related.

There is little quantitative content – but where there is quantitative content, it is high probability for questions. You should, for instance, be quite familiar with the multiplier.

### STUDY SESSION 5:

The comments for Study Session 4 also apply here.

### STUDY SESSION 6:

The comments for Study Session 4 are pertinent, but this study session has more quantitative material than the other economics sessions – especially in the foreign exchange area. Triangular arbitrage and covered interest arbitrage are especially important. The candidate should be able to detect, set up, and compute the profit for both types of arbitrage. The no-arbitrage range is a bit long for item set, but remember that you might be asked for one side of the range!

#### STUDY SESSION 14:

This material is very basic to understanding of fixed income, and is a great source of questions! Questions drawn from study session 14 are likely to be of two types:

- a) market and asset characteristics.

Example: A call provision:

- i) allows a borrower to prepay
- ii) allows an issuer to prepay
- iii) requires that the borrower alert the lender to adverse events
- iv) none of the above.

- b) short quantitative questions:

Example: If interest rates increase by 50 basis points, a bond with a 7 year duration will have a price change of:

- i) 7 %
- ii) 350 basis points
- iii) \$35
- iv) 3.5%

Since there will be many multiple choice questions, the topics will be widespread. Most of the material is descriptive in nature, and you can expect qualitative questions on::

- a) basic bond types and features (i.e., par value, inverse floaters, municipals, etc.)
- b) embedded option features (i.e., callable, puttable, prepayment, etc.)
- c) risk (i.e., different types),
- d) spreads (nominal vs. OAS).

There is not much quantitative material, but you can expect quantitative questions that require computation and application of duration

#### STUDY SESSION 15:

The material in this study session is more quantitative in nature. Questions will be of two types:

- a) Perform a calculation given information:

Example: What is the value of a 20 year, \$1000, 10% semiannual pay bond if the yield to maturity is 9%?

- i) \$1180.00
- ii) \$910.00
- iii) \$1092.00
- iv) none of the above

- b) Describe a calculation or measure:

Example: Valuation of bond value using a single rate:

- i) should use the risk-free rate.
- ii) assumes reinvestment at the risk-free rate.
- iii) ignores the yield curve.
- iv) is correct if the bond has a fixed rate.

It is very important to understand a measure or concept, but it is perhaps even more important to know the shortcomings or problems (these are prime targets for questions!). Since multiple choice questions cannot require involved calculations, they are likely to involve some phase of a longer problem, or require the quick calculation of a measure given underlying data. Be aware that you may be given a

large scenario with data relevant to several questions – and some of the data will not be needed. Note, by the way, that often quantitative questions will not require any calculation at all:

Example: What is the value of a 20 year, \$1000, 10% semiannual pay bond if the yield to maturity is 9%?

- i) \$942.50
- ii) \$910.00
- iii) \$1092.00
- iv) \$900.00

Since the yield is below the coupon, the bond must be priced above par.

#### STUDY SESSION 16:

Options have three types of questions:

a) market and instrument characteristics. There are many possible questions here!

Example: Which of the following is not a typical feature of forwards?

- i) the contract is a private agreement.
- ii there is no exchange of assets at the beginning of the contract.
- iii) positions are “marked to market” daily.
- iv) the arrangement is not public knowledge.

b) diagrams.

- i) put and call buyer (holder) and seller.
- ii option strategies (covered call, protective put)
- iii) swaps (interest rate and currency)

c) quantitative. Topics:

- i) gain or loss or payoff on options (in or out of the money)
- ii) futures margin
- iv) swaps cash flows

## Study Session 4 Investment Tools Economics: Macroeconomic Analysis

### Reading Assignments

**1. *Economics: Private and Public Choice*, 9<sup>th</sup> edition, James D. Gwartney, Richard L. Stroup, and Russell S. Sobel (Dryden, 2000)**

#### A. “Fiscal Policy” (Ch. 12)

**SS 4. 1. A. a) Aggregate demand and fiscal policy:** *Discretionary fiscal policies influence the level of aggregate demand by; (1) increasing government purchases of goods and services while holding taxes constant, and (2) implementing changes in tax policy that will influence aggregate demand. Supply-Side effects of fiscal policy may also impact aggregate supply. Supply-Side tax cuts are those that change marginal tax rates. Marginal tax rates determine the breakdown of one’s additional income between tax payments and personal disposable*

*income. A reduction in marginal tax rates increases the reward for added work, savings, and investment. If the return to income producing activities is increased, the opportunity cost of leisure will be increased and work will become more rewarding. People will shift from leisure to work and devote less time to tax sheltering activities. Supply-side economists believe these substitutions enlarge the effective resource base and improve the allocations of resources.*

**SS 4. 1. A. b) Timing problems of fiscal policy:** *If fiscal policy is to reduce economic instability changes must provide a stimulus during a recession and restraint during booms. The timing of fiscal policy is a difficult if not impossible task because of the lags which exist. There is a lag between the time when the need for a fiscal policy change is recognized and the time it is implemented. After a policy is implemented it may take six months to a year for its major impact to be felt. These long lags make it extremely difficult to use fiscal policy to impact economic activity.*

**SS 4. 1. A. c) Expansionary and restrictive fiscal policy in the macroeconomic models:** *As follows:*

- a) *The Keynesian model suggests that when an economy is operating below its potential the government should institute an expansionary fiscal policy. The government should increase its purchases of goods and services and/or cut taxes. The increased deficit would be financed with borrowing. This increase in spending would lead to a multiple increase in output.*
- b) *The crowding out model holds that if the money supply is held constant when the government runs a deficit it must borrow by issuing bonds. The increase in the demand for loanable funds will increase real interest rates. Consumers will reduce the purchase of interest sensitive goods such as consumer durables. Higher real rates will increase the opportunity cost of investment and business will postpone the purchase of heavy equipment and capital goods. Higher real interest rates will retard private spending.*
- c) *New classical economists do not believe the substitution of debt for taxes will stimulate either private consumption or aggregate demand. Taxes and debt financing are essentially equivalent. A summary of the New Classical position is that higher current taxes and an equivalent increase in government debt reduce the wealth and permanent income of taxpayers by identical amounts. Taxpayers will recognize the higher future taxes implied by the debt and reduce their current expenditures accordingly. Thus,*

*budget deficits do not stimulate aggregate demand. The real rate of interest is unaffected by the deficits since people will save more to pay future taxes. Fiscal policy is impotent.*

- d) *Supply-side economics is not a short run counter cyclical tool. Supply-side economics is a long-run growth oriented strategy. High taxes tend to retard output for these major reasons:*
- i) *High marginal tax rates discourage work effort and reduce the productive efficiency of labor.*
  - ii) *High tax rates will adversely affect the rate of capital formation and the efficiency of its use.*
  - iii) *High tax rates will discourage foreign investment and direct domestic investment into projects and activities where taxes are lower or sheltered.*
  - iv) *High marginal tax rates encourage individuals to substitute less desired tax-deductible goods for more desired nondeductible goods.*

➔ *The Thumbnail Sketch on pg. 311 is helpful!*

**SS 4. 1. A. d) Linkages of budget deficits and trade deficits:** *Historically, large deficits and increasing interest rates attracted foreign capital inflows and increased the value of a dollar. This made foreign goods cheaper in the US, and US goods more expensive elsewhere. The increased imports and decreased exports, so that net exports declined sharply.*

**SS 4. 1. A. e) Automatic stabilizers:** *Automatic stabilizers are programs that automatically apply demand stimulus during recessions and demand restraint during booms. The advantage of stabilizers is that they apply counter cyclical fiscal policy without the delays that accompany legislation. They minimize the problem of proper timing. There are three major automatic stabilizers:*

- a) *Unemployment compensation consists of benefits paid to laid off and unemployed workers. As layoffs increase during a recession unemployment compensation will rise and unemployment taxes will decline. During a boom unemployment taxes will increase and unemployment benefits will decline. This program will run deficits during recessions and surpluses during booms.*
- b) *Corporate profits tax is the most counter cyclical of all stabilizers. Corporate profits are highly sensitive to economic activity. During recessions corporate profits and taxes will decline significantly widening the deficit and during booms profits and taxes will increase rapidly shrinking the deficit.*
- c) *Progressive income tax insures that as income grows taxes will increase rapidly and as income declines taxes will decline. This behavior will automatically enlarge the size of the deficit during a recession and reduce during a boom.*

**SS 4. 1. A. f) Supply-side effects of fiscal policy:** *Supply-Side effects of fiscal policy impact aggregate supply. Supply-Side tax cuts are those that change marginal tax rates. Marginal tax rates determine the breakdown of one's additional income between tax payments and personal disposable income. A reduction in marginal tax rates increases the reward for added work, savings, and investment. If the return to income producing activities is increased, the opportunity cost of leisure will be increased and work will become more rewarding. People will shift from leisure to work and devote less time to tax sheltering activities. Supply-side economists believe these substitutions enlarge the effective resource base and improve resource allocations.*

**SS 4. 1. A. g) Relationship of budget deficits, inflation, and real interest rates:** *Budget deficits do not cause inflation unless they are financed with an expansion in the money supply. Interest rates reflect the rate of inflation.*

## **B. "Money and the Banking System" (Ch. 13)**

**SS 4. 1. B. a) Basic functions of money:** *Money performs three basic functions:*

- a) *Money is a medium of exchange;*
- b) *Money is a measure of value;*
- c) *Money is a store of value.*

**SS 4. 1. B. b) Money supply:** *There are three measures of the money supply:*

- a) *M1 is the narrowest measure of the money supply. M1 includes (1) currency in circulation, (2) demand deposits, (3) other (interest-earning) checkable deposits, and (4) traveler's checks.*
- b) *M2 includes M1 plus (1) savings and small denomination time deposits at all depository institutions, (2) money market mutual fund shares, (3) money market deposit accounts, (4) overnight loans from customers to commercial banks (repurchase agreements), and (5) overnight Eurodollar deposits of U.S. residents. Many economists particularly those that stress the store of value function of money prefer the M2 definition of the money supply to M1.*
- c) *M3 includes (1) large denomination (over \$100,000) time deposits at all depository institutions, (2) longer-term (more than overnight) loans from customers to commercial banks and savings and loan associations.*

**SS 4. 1. B. c) Fractional reserve banking:** *Banks maintain only a fraction of their customers deposits in the form of reserves (vault cash + deposits with the federal reserve system) to meet the cash requirements of customers. Fractional Reserve banking is a system that permits banks to hold reserves of less than 100% against customer deposits. Required reserves are the minimum amount of reserves that a bank is required by law to keep on hand to back up its deposits. Required reserve ratio is the percentage of a liability category banking institutions are required to hold as reserves against that type of liability. The Deposit Expansion Multiplier is the multiple by which new reserves will increase the stock of money. The deposit expansion multiplier is simply the reciprocal of the reserve requirement. When new currency reserves enter the banking system they will not have the effect of the full deposit multiplier because some currency will be held as cash and banks will maintain positive excess reserves. Currency leakages and idle excess reserves will result in a deposit expansion multiplier that is less than its potential maximum.*

**SS 4. 1. B. d) Required reserve, potential deposit expansion, and the deposit multiplier:** *The reserve ratio is the percent of reserves that must be held against checkable demand deposits. The potential deposit expansion multiplier is the proportional increase in the supply of money that could be supported by an increase in reserves. It is the reciprocal of the required reserve. E.g., if the required reserve is 15%, then an increase in reserves of \$N could support an increase in the money supply of  $(1/0.15) \times N$  dollars. The actual increase, and so the actual deposit expansion multiplier, would be less because:*

- a) *The potential deposit expansion multiplier assumes that all newly created money (new loans) are redeposited in a bank. Some individuals, however, will hold all or part of the money as cash.*
- b) *Banks may fail to use all of the lending potential.*

**SS 4. 1. B. e) Monetary policy tools:** *The primary function of the Fed is to conduct monetary policy and regulate the banking system in a manner that will promote full employment, steady economic growth, and stable prices. The Fed controls the money supply using three tools:*

- a) *Open Market Operations - When the Fed buys U.S. Government securities in the market it pays with a check. This check is deposited in a commercial bank and new excess reserves enter the financial system. If \$1,000,000 of securities are purchased by the Fed and the reserve requirement for commercial bank demand deposits is ten percent then new loans of \$10,000,000 may be made by the banking system. When the Fed sells securities it removes excess reserves from the banking system and reduces the monetary base. The monetary base is equal to reserves of commercial banks (vault cash + deposits with the Fed) plus currency in circulation. When the Fed injects or withdraws funds from the banking system the money supply will change by the change in the size of the monetary base multiplied by the actual deposit expansion multiplier. Empirical evidence suggests that for each dollar of securities the Fed purchases or sells the money supply will change by \$3.*
- b) *When banks borrow from the Fed the interest rate they pay is called the discount rate. Borrowing from the Fed is a privilege not a right. Banks borrow from the Fed to meet temporary shortages of reserves. They will only borrow for a short period and not continuously. An increase in the discount rate will*

*make it more expensive for banks to borrow and a reduction will lower the borrowing expense. The importance of the discount rate is overrated. If a bank must borrow to meet its reserve requirement it can borrow in the Federal Funds market. Federal funds are excess reserves that banks lend among one another. If the Federal Funds rate is significantly above the discount rate banks will attempt to borrow from the Fed. The Fed will usually raise the discount rate to remove the incentive for banks to borrow from the discount window.*

- c) *Reserve Requirements are established by the Fed against demand deposits. Legal reserves consist of: (1) vault cash, and (2) deposits with the Federal Reserve. Banks are required to maintain these reserves to restrain bankers from overlending and facing sudden withdrawals. When the Fed lowers the reserve requirement, excess reserves are created and the monetary expansion process can begin. Increasing reserve requirements reduces excess reserves and the money supply. Changing reserve requirements is a blunt tool and is seldom used by the Fed.*

→ Exhibit 13-8 on pg. 339 is helpful! See also the Thumbnail Sketch on pg. 369!

**SS 4. 1. B. f) Measuring the money supply:** *There are a number of difficulties in exactly measuring the money supply, even abstracting from the uncertainty of the exact definition of "money." These include:*

- a) *Structural changes and financial innovations:*
- i) *In the past, the move to interest-bearing checking accounts and then to money-market accounts have affected the size of the M1 measure.*
  - ii) *The increasing use of low-fee stock and bond mutual funds, which are not included in any of the money measures, distorts the M2 measure.*
  - iii) *Debit cards and electronic transfers affect the amount of currency held and affect the measures.*
- b) *There is widespread use of the US dollar outside the US, and this is difficult to measure.*

### C. "Modern Macroeconomics: Monetary Policy" (Ch. 14)

**SS 4. 1. C. a) Supply of and demand for money:** *The demand for money reflects the desire of households and businesses to hold money balances. When economists say people want to hold more or less money they mean that they will restructure their wealth balances toward larger or smaller wealth balances. There are three major reasons people hold money balances:*

- a) *Transaction demand reflects the need to maintain money balances to purchase and sell.*
- b) *Precautionary demand refers to those balances held as protection against unforeseen events*
- c) *Speculative balances are balances held to profit from unexpected opportunity.*

*The motive for holding money will increase with increases in income. Larger incomes will require larger money balances to effect transactions and to respond to unforeseen events. The opportunity cost of holding money will increase with increases in nominal interest rates. As the rates increase people will economize on the amount of money balances held. There is an inverse relationship between the nominal interest rate and the quantity of money demanded. The supply of money is determined by the Federal Reserve. The supply of money is insensitive to the interest rate. The money supply is what the Fed thinks it should be. In equilibrium, the quantity of money demanded must equal the quantity supplied at the economy's money interest rate.*

**SS 4. 1. C. b) Monetary policy and output, interest rates, and employment:** *Modern analysis indicates an unanticipated increase in the money supply will increase the demand for goods and services either indirectly through reductions in the real rate of interest or directly through increased spending. The increase in spending will increase output and employment in the short run. A full employment economy, subjected to an unanticipated increase in the money supply, will in the long-run arrive at a higher general level of prices with the same level of output. An unanticipated restrictive monetary policy will reduce the supply of money available, people will dissave raising real interest rates, aggregate demand will decrease. The price level will*

*decline output will be reduced and the unemployment rate will rise above the natural rate. Monetary policy must be properly timed if it is to help stabilize the economy. If it is timed improperly monetary policy can be destabilizing. In a dynamic setting a change in the growth rate of the money supply is more indicative of monetary policy.*

→ The Thumbnail Sketch on pg. 358 is helpful!

**SS 4. 1. C. c) Policy anticipation and policy effectiveness:** *Essentially, if the effects of monetary policy are anticipated, the policy will have little or no impact on the economy in real terms. Anticipating inflation, borrowing demand goes up, but lenders are more reluctant to lend – interest rates will increase. Demand for goods goes up, but producers will be reluctant to sell at less than premium prices – prices will increase. The result will be that nominal interest rates and money income will increase, but real interest rates and real income will be relatively unchanged.*

→ The Thumbnail Sketch on pg. 369 is helpful!

**SS 4. 1. C. d) The exchange equation and monetary policy:** *The exchange rate equation is:*

$$MV = PY,$$

or:

$$\text{Money Stock} \times \text{Velocity of Money} = \text{Price} \times \text{Output}$$

*Note that this equation refers to the economy as a whole – i.e., Price is the price of goods produced in the economy, and output is the output of the economy (GDP). Velocity is the number of times a unit of currency is “turned over,” i.e., the number of times per period that the unit of currency is used in a transaction. This can also be written in terms of growth rates:*

*Inflation rate + growth rate of real output = growth rate of money supply + growth rate of velocity*  
*Since output (Y) and the velocity of money (V) are assumed to be fixed (not affected by monetary policy), the equation implies that changes in the money stock M will lead to proportional changes in the price level (P). I.e., increasing M will increase P (cause inflation), while decreasing M will decrease P (cause deflation).*

**SS 4. 1. C. e) Quantity theory of money:** *The quantity theory of money indicates that an increase in the money supply will cause a proportional increase in the price level. This is reflected in the previous LOS, where M is the Money Stock. If the velocity of money V and the level of output Y are constant, then an increase in M will lead to an increase in P, the price level. Classical economists thought that V and Y were relatively constant, at least in the short run.*

**SS 4. 1. C. f) Short and long term impacts of monetary policy:** *This is covered best in the thumbnail sketch on p. 369 of the text. Important: note effect of anticipation of the policy – If the policy is anticipated, the short-run and long-run effects become the same. That is because the only difference between short and long run is the realization that the rate of money supply growth has changed. The effects for an expansionary monetary policy are:*

| <i>Variable</i>                   | <i>Short-run Unanticipated</i> | <i>Short-run Anticipated &amp; Long-run</i> |
|-----------------------------------|--------------------------------|---|
| <i>Inflation</i>                  | <i>small increase</i>          | <i>increase</i>                             |
| <i>Real output and employment</i> | <i>increase</i>                | <i>no change</i>                            |
| <i>Nominal interest rate</i>      | <i>probable decline</i>        | <i>increase</i>                             |
| <i>Real interest rate</i>         | <i>decrease</i>                | <i>no change</i>                            |

*A restrictive monetary policy would have the opposite effects – i.e., substitute increase for decrease, and decrease for increase.*

## D. “Stabilization Policy, Output, and Employment” (Ch. 15, pp. 390-399)

**SS 4. 1. D. a) Index of leading economic indicators:** *The index of 10 leading indicators is based on ten variables that generally lead the turns in the economy. Individual variables have great variability in predictive power, and the index is used to reduce that variability through averaging. The index still has great variability in predictive power, however, and sometimes gives false signals. The index is also inconsistent as to the lead time between index turns and turns in the economy.*

→ The Index is described on pg. 386!

**SS 4. 1. D. b) Time lags and the performance of discretionary policy:** *Three lags have been identified*

a) *recognition lag – the time period required to recognize that there has been a change in economic conditions.*

b) *administrative lag – the time required to institute a policy change.*

c) *impact lag – the time required for a policy change to have an effect.*

**SS 4. 1. D. c) Expectations and effectiveness of policy:** *Going back to SS 4. 1. C. f), note again that*

a) *a difference between short-term and long-term only occurs if monetary policy is not anticipated,*

b) *in the long run, monetary policy has no real effects.*

*This implies that if monetary policy is anticipated, it will have no real effect. Note this relates to the next topic. Under adaptive expectations, policy is not anticipated because the past is simply extrapolated. Under rational expectations, however, expectations are future oriented and policy is anticipated. This last point is likely the important point.*

→ The Thumbnail Sketch on pg. 394 is helpful!

**SS 4. 1. D. d) Adaptive expectations and rational expectations:** *The two hypotheses are:*

a) *Adaptive expectations holds that people rely on the past to predict future trends. Under the adaptive-expectations hypothesis decision makers believe that the best indicator of the future is what has happened in the past. Forecasts of future inflation will exhibit systematic error. When inflation is accelerating decision makers will automatically tend to underestimate the future inflation rate (i.e., they will expect the previous rate of inflation).*

b) *Rational Expectations is the idea that decision makers form their expectations concerning what will happen in the future on the basis of all available information including information about how policy changes will affect the economy. The rational expectations hypothesis assumes forecasting errors will be random.*

**SS 4. 1. D. e) Non-activist economic policy:** *As the name implies, a non-activist policy is hands-off, i.e., the only policy is to maintain steady conditions without trying to manipulate the economy through changes in monetary and fiscal policy.*

## E. “The Phillips Curve: Is There a Trade-off Between Inflation and Unemployment?” (Application 3, pp. 765-776)

**SS 4. 1. E. a) Phillips curve:** *The Phillips curve depicts the relationship between the unemployment rate (horizontal axis) and the inflation rate (vertical axis). The curve is downward-sloping, indicating that a low unemployment rate is associated with higher inflation rates..*

**SS 4. 1. E. b) Unemployment vs. inflation.** *The Phillips curve depicts the relationship between the unemployment rate and the inflation rate. When expectations are considered, however, any trade-off between unemployment and inflation is unstable. Adaptive Expectations suggests that expansionary policies will lead to a short term trade-off between lower unemployment and higher inflation. As the higher inflation rate is*

*anticipated, individuals will alter their behavior and this will cause unemployment to return to the natural rate. Rational Expectations does not accommodate a consistent unemployment-inflation trade-off, not even in the short run. The impact of an expansionary policy is unpredictable. If decision makers accurately forecast the inflationary effects, inflation will increase while the unemployment rate will remain unchanged. If the actual inflation exceeds (is less than) the forecast inflation, unemployment will fall below (rise above) the natural rate.*

## Study Session 5 Investment Tools Economics: Microeconomic Analysis

### Reading Assignments

1. *Economics: Private and Public Choice*, 9<sup>th</sup> edition, James D. Gwartney, Richard L. Stroup, and Russell S. Sobel (Dryden, 2000)

#### A. “Demand and Consumer Choice” (Ch. 19, including addendum “Consumer Choice and Indifference Curves.”)

**SS 5. 1. A. a) Consumer choice:** Demand is the willingness of individuals to pay for what is offered in the market. Choice and individual demand are determined by the following factors:

- a) Limited income necessitates choice,
- b) consumers make decisions purposefully in an attempt to upgrade their personal welfare,
- c) One good can be substituted for another,
- d) buyers want utility (satisfaction) from substitute goods not necessarily the same services,
- e) consumers must make decisions without perfect information, knowledge and experience improve the quality of the decisions,
- f) The law of diminishing marginal utility applies: as the rate of consumption increases, the utility derived from consuming additional units of a good will decline.

With a fixed income and prices that are given, consumers will maximize their total utility (satisfaction) by ensuring that the last dollar spent on each commodity purchased yields equal marginal utility per dollar spent. If consumers are to get the most from their incomes the last dollar spent on product a must offer the same utility as the last dollar spent on product b.

**SS 5. 1. A. b) Price and income elasticity of demand:** Price Elasticity of Demand is the percent change in the quantity of a product demanded divided by the percent change in price:

$\text{Elasticity of Demand} = \text{percent change in quantity demanded} / \text{percent change in price}$

Note that the percent change is based on the midpoint – e.g., a change from 50 to 70 is computed as:

$$(70 - 50)/60 = 0.333 = 33.3\%$$

rather than as  $(70 - 50)/50 = 40\%$  or  $(70 - 50)/70 = 28.6\%$ .

Income Elasticity of demand is the percent change in the quantity of a product demanded divided by the percent change in income.

The text states in Ch 3 that: “When good substitutes are unavailable, even a larger price change may not cause much of a change in the quantity demanded. Economists would say that the demand for such goods is relatively inelastic.” Note that in the equation, if the quotient is greater than 1 it indicates that if the price of a product is increased the quantity demand will decrease by an amount greater than the increase in price. Total revenue will decline as a result of the increase in price. If the price of a product declines, quantity demanded will increase at a greater rate and total revenues will increase. If the elasticity of demand is less than 1, then demand is inelastic. Total revenues will vary directly with the change in price. If price increases total revenue will increase and if price declines total revenue will decline. The application to income is similar.

**SS 5. 1. A. c) Determinants of price and income elasticity of demand:**

*Determinants of price elasticity of demand include:*

- a) *first and most important: availability of substitutes.*
- b) *share of budget expended on product.*

*Goods that are considered as luxuries generally have a greater income elasticity of demand than staples (goods which are necessary) – i.e., you need staples to live, so that elasticity is small. Luxuries are not necessities, and will not be purchased when income is low, but will be purchased if incomes increase.*

**SS 5. 1. A. d) Total revenue, total expenditures, and price elasticity of demand:** *Price and total expenditures are related through the elasticity of demand. If demand is inelastic, price has little effect on quantity demanded, and a price change will cause a change in total expenditure in the same direction as the change in price. If elasticity is high, a price change will have a large effect on quantity demanded, and a price change will cause a change in total expenditures in the opposite direction as the price change. Unitary elasticity (elasticity = 1) will produce no change in total expenditures. The same rules hold true for the total revenue of a firm, but remember that the demand curve for the firm will be more elastic than the demand curve for the economy.*

**SS 5. 1. A. e) Price elasticity of demand in the long run:** *The text states in Ch 3 that: “The consumption response to a price change will usually be smaller in the short run than over a longer period of time.” The reasoning behind this statement is that in the short run consumers have little ability to adjust or find substitutes, while over the long run they are better able to adjust or seek out substitutes. This is repeated in Ch. 19 somewhat more forcefully.*

**SS 5. 1. A. f) Consumer indifference curves:** *Indifference curves, as the name suggests, demonstrate combinations of (two) goods which the consumer considers equally desirable. The curves have the following characteristics:*

- a) *More goods are preferable to fewer goods – this implies that if the quantity of good A is reduced ceteris paribus, the consumer is not indifferent.*
- b) *Goods are substitutable – if the amount of A is reduced, the reduction can be made up by increasing the amount of B. This implies that the indifference curve will be downward sloping to the right.*
- c) *The more of a good, the less satisfaction from increasing consumption (decreasing marginal utility). This implies that the indifference curve will be convex (from below).*
- d) *Indifference curves come in families – i.e., they can be drawn through any point.*
- e) *Indifference curves cannot cross.*

**SS 5. 1. A. g) Opportunity and budget constraints:** *A budget constraint is simply a consumption-opportunity constraint expressed in monetary terms. It is simply the limit of consumption, and defines the optimum indifference curve as the difference between attainable and unattainable consumption.*

**SS 5. 1. A. h) Income and substitution effects:** *The substitution effect is the change in the amount of a good consumed if the price of that good changes, holding attainable consumer utility constant. Unfortunately, if the price of a good changes attainable consumer consumption also changes, so that the substitution effect does not give the change in consumption. I.e., if the price of a good changes ceteris paribus, consumer income has effectively changed. The income effect reflects the change in consumption due to the effective change in income. See Exhibit 19A-6 p. 525.*

## B. “Costs and the Supply of Goods” (Ch. 20)

**SS 5. 1. B. a) Principal-agent problem:** *The principal-agent problem arises when the purchaser of services (Principal) lacks full information about the circumstances faced by the seller (Agent) and cannot know how well the seller (agent) performs the purchased services. The agent may work toward objectives not shared by the principal paying for the service. Within firms it is difficult for employers to monitor the performance of individual employees and provide an incentive structure that will encourage high productivity.*

**SS 5. 1. B. b) Types of firms:** *There are three types:*

- a) *(Sole) Proprietorship – owned by a single individual who is fully liable for the debts of the firm.*
- b) *Partnership – two or more individuals as co-owners, and sharing the risks and responsibilities in some prearranged manner.*
- c) *Corporation – ownership through shares, with risk limited to the individual owner’s investment.*

**SS 5. 1. B. c) Explicit and implicit costs; economic and accounting profit; production in the short and the long run:** *These are :*

- a) *Explicit costs are payments by a firm to purchase the services of productive sources. Implicit costs are the opportunity costs associated with firm’s use of resources that it owns. These costs do not involve a direct money payment.*
- b) *Economic profit is equal to total revenues minus total costs, including both explicit and implicit costs. Economic profits will be present only if the earnings of a business are in excess of the opportunity cost of using the assets owned by the firm. Accounting profits are equal to sales revenue minus explicit costs. No allowance is made for implicit costs and the opportunity cost of the firm’s equity capital. Accounting profits will overstate economic profits. High accounting profits suggest that a firm is earning an economic profit. Low accounting profits will imply economic losses.*
- c) *The short run is a time period so short that a firm is unable to vary some of the factors of production. The firm’s plant size typically cannot be altered in the short run. The long run is a time period long enough to allow the firm to vary all the factors of production.*

→ The thumbnail Sketch on pg. 538 is helpful!

**SS 5. 1. B. d) Costs:** *Various costs include:*

- a) *Fixed costs are those costs which remain unchanged regardless of the level of output in the short run.*
- b) *Average fixed cost is equal to total fixed costs divided by the number of units produced.*
- c) *Variable costs are those costs that vary with output. Average variable costs are equal to total variable costs divided the number of units produced*
- d) *Marginal cost is the change in total cost (TFC + TVC) to produce and additional unit. In the short run MC will decline if output is increased, then will increase reflecting that it becomes increasingly difficult to produce additional output from a facility operating at maximum capacity.*
- e) *Opportunity cost is the highest valued alternative that must be sacrificed as a result of choosing among alternatives.*
- f) *Sunk costs are costs that have already been incurred as a result of past decisions.*

**SS 5. 1. B. e) Law of diminishing returns:** *Law of diminishing returns holds that as more and more units of a variable resource are combined with a fixed amount of other resources, employment of additional units of the variable source will eventually increase output only at a decreasing rate. Once diminishing returns are reached, it will take successively larger amounts of the variable factor to expand output by one unit. Once a firm reaches diminishing returns larger and larger additions of the variable factor will be necessary to expand output by one unit.*

**SS 5. 1. B. f) Average fixed cost, short-run marginal cost, average variable cost, and average total cost:**

- a) *Since fixed costs do not vary with quantity, the average will decrease with quantity as fixed cost is spread over more units of production.*
- b) *Short-run marginal cost will at first decline, but as optimal production levels for the given plant size are exceeded marginal cost will increase.*
- c) *Average Variable Cost will at first decline, since marginal cost is declining. Marginal cost eventually increases, however, so that average variable cost will begin to increase.*
- d) *Average total cost will be the sum of average fixed cost and average variable cost. I will decrease at first, but eventually begin to increase as average variable cost increases faster than average fixed cost decreases.*

→ This is shown in Exhibit 20-6 on pg. 542.

**SS 5. 1. B. g) Economies and diseconomies of scale and the long-run average total cost:** *Economy of scale exists if unit costs decline as output increases; diseconomy of scale exists if unit costs increase as output increases. The long run average cost curve (LARTC) depends on the relative presence of economies or diseconomies of scale:*

- a) *If only economy of scale is present, the LARTC will be constantly declining (usually considered to be declining at a decreasing rate) – large plants or firms will evolve.*
- b) *If both economies and diseconomies are present, the LARTC:*
  - i) *may have a u-shape – same-size plants will evolve.*
  - ii) *may have a u-shape with a flat bottom – different plant sizes will evolve.*

**SS 5. 1. B. h) Cost curve shifts:** *Three reasons cost curves shift are changes in:*

- a) *Prices of resources*
- b) *Taxes*
- c) *Technology*

**C. “Price Takers and the Competitive Process” (Ch. 21)**

**SS 5. 1. C. a) Price takers and price searchers:** *In purely competitive markets firms are price takers. Each firm accepts the market price. When firms face a downward sloping demand curve they are price searchers. They can sell at a price they select but that price will affect the quantity of goods sold.*

**SS 5. 1. C. b) Purely competitive (price taker) markets:** *Pure competition assumes the following conditions exist in a market:*

- a) *All firms in the market produce a homogeneous product.*
- b) *A large number of independent firms produce the product.*
- c) *Each buyer and seller is small relative to the total market.*
- d) *There are no artificial barriers to entry into or exit from the market.*

**SS 5. 1. C. c) Marginal cost, marginal revenue, and price.** *For price takers, price is a given. Price takers will expand production as long as the marginal revenue is above the marginal cost – i.e., as long as they make more from producing a unit of production than it costs to make it. If production exceeds this point, they would incur a loss from further production. The result is that the optimum level of production is when marginal cost = marginal production.*

**SS 5. 1. C. d) Total revenue and marginal revenue:** *Total revenue = price X quantity sold. Since price is a given, this is a straight-line function with a constant slope equal to price per unit. Marginal revenue = change in total revenue / change in output. It is the change in revenue arising from the sale of one more unit of output. Since price is constant, marginal revenue will equal price.*

**SS 5. 1. C. e) Operate, shut down, or go out of business?** *If price is below average total cost, there are three alternatives::*

- a) *If price is below marginal cost and the situation is permanent, the firm will go out of business.*
- b) *If price is below marginal cost but the situation is considered temporary, the firm will shut down.*
- c) *If price is above marginal cost (but below average cost), and the situation is considered temporary, the firm will continue to operate because this will reduce the losses (i.e., there is a contribution toward fixed costs).*

**SS 5. 1. C. f) Short-run supply:** *The portion of the firm's short run marginal cost (MC) curve which lies above the average variable cost (AVC) curve is the firm's short run supply curve. The market's short run supply curve is the summation of the short run supply curves (MC above AVC) of the firms.*

**SS 5. 1. C. g) Cost curve slope and long run market supply:** *The long run supply curve is the minimum price at which firms will supply differing market output levels given sufficient time to adjust plant and equipment.*

- a) *Constant cost industries are those in which factor prices remain unchanged. The long run market supply curve is perfectly elastic.*
- b) *A constant cost industry is most likely to arise when the demand for resource inputs is small relative to total demand for the resources. Increasing cost industries are those in which factor prices increase as output increases. The long run quantity supplied is directly related to market price.*
- c) *Decreasing cost industries are those in which costs of production decline as the industry expands. Market supply is inversely related to price.*

**SS 5. 1. C. h) Time and elasticity of supply:** *The elasticity of supply will be greater in the long run than in the short run – there is more ability to adjust over the long run.*

## **D. "Price-Searcher Markets with Low Entry Barriers" (Ch. 22)**

**SS 5. 1. D. a) Competitive price-searcher markets:** *Firms that aren't operating in purely competitive markets face downward-sloping demand curves. They are price searchers: and must search for prices most consistent with profit maximization. Characteristics of Monopolistic Competition (Competitive Price Searchers):*

- a) *Product differentiation;*
- b) *Low barriers to entry;*
- c) *Many independent firms.*

*A monopolistic competitor maximizes profits by producing to the point where  $MR = MC$  and charging price  $P$ . The firm will make economic profits. Oligopoly is present when there are a small number of sellers in the entire industry. Oligopoly is competition among the few. Oligopolies are characterized by the following conditions:*

- a) *Interdependence exists among the firms;*
- b) *Substantial economies of scale exist;*
- c) *Significant barriers to entry;*
- d) *Products may be either homogeneous or differentiated.*

**SS 5. 1. D. b) Price and output:** *A price searcher will lower price and expand output until marginal revenue is equal to marginal cost.*

**SS 5. 1. D. c) Price-searcher markets with low barriers to entry:** *Economists once held that allocative inefficiency occurred in price searcher markets with low barriers to industry because firm's would not operate at the point where their average long-run average total cost was minimized. The sales of each competitor*

would fall short of their least-cost capacity level. The solution would be to have fewer firms each operating at the minimum cost output rate.

Offsetting these arguments are other factors, mainly centering on competition:

- a) With no / low barriers to entry, the market is contestable. I.e., it is likely that other firms will enter the industry, so that the threat of competition will lead to greater efficiency.
- b) The traditional argument ignores the factor of entrepreneurship, which has not been successfully modeled.
- c) The traditional view was that allocative efficiency was low. This traditional argument seems to have understated the effects of competition. Most importantly, the traditional view did not take account of the value that consumers place on the availability of a variety of qualities and styles.
- d) the traditional view did not include the possibility of price discrimination discussed in the next topic.

**SS 5. 1. D. d) Price discrimination:** Price discrimination arises when two (or more) different sets of consumers can be charged different prices (due to differing elasticities of demand). The traditional view was that this led to higher prices for some groups and resulted in lower allocative efficiency. More recently, the view is that stated in the text on p. 599: "On balance, however, we can expect that output will be greater with price discrimination than it would be with a single price."

**SS 5. 1. D. e) Competition as discipline:** Competition can come from potential as well as actual rivals. If entry and exit are not expensive and if there are no legal barriers to entry competitive results can occur even if only a few firms are active in the market. When barriers to entry are low businesses must compete for the loyalty of consumers. Competition promotes economic progress in three ways:

- a) Competition places pressure on producers to operate efficiently and cater to the preferences of consumer;
- b) Competition provides firms with a strong incentive to develop improved products and discover lower costs of production;
- c) Competition causes firms to discover the type of business structure and size that can best keep the per unit costs of production low.

## E. "Price-Searcher Markets with High Entry Barriers" (Ch. 23)

**SS 5. 1. E. a) Entry barriers:** Four types of barriers to entry make it difficult for potential competitors:

- a) Economies of scale;
- b) Government licensing;
- c) Patents;
- d) Control over an essential resource.

**SS 5. 1. E. b) Monopoly and oligopoly:** Monopoly is a market structure characterized by:

- a) High barriers to entry;
- b) Single sellers of a well-defined product for which there are no good substitutes.

Oligopolies are characterized by the following conditions:

- a) Interdependence exists among the firms;
- b) Substantial economies of scale exist;
- c) Significant barriers to entry;
- d) Products may be either homogeneous or differentiated.

**SS 5. 1. E. c) Profit-maximizing monopolists:** Monopolists will want to expand output as long as marginal revenue exceeds marginal cost. A monopolist will face a downward-sloping demand curve. Since the monopolist is the only producer the firm's demand curve is the same as the industry demand curve.

**SS 5. 1. E. d) Oligopoly, price, and output:** *If each oligopolistic firm acts independently, they will each try to gain through lowering prices, competing until the point at which price equals the cost of production is reached. If the firms collude, the industry as a whole will now set price equal to marginal cost to maximize industry revenue, resulting in a higher price and lower output.*

→ This is shown in Exhibit 23-5 on pg. 617.

**SS 5. 1. E. e) Oligopolists and collusion:** *When rival oligopolists compete on price they drive the market price down to the level of the cost of production. There is a strong incentive for oligopolists to collude, raise price, and restrict output. Collusion is an agreement among firms to avoid various competitive practices particularly price reductions. The oligopolist will have an incentive to cheat because the higher market price will be above marginal cost, so that by secretly lowering price they can receive greater profit.*

→ This is shown in Exhibit 23-6 on pg. 619.

**SS 5. 1. E. f) Obstacles to collusion:** *Obstacles to collusion are:*

- a) *When the number of oligopolists is larger, effective collusion is less likely;*
- b) *When it is difficult to detect and eliminate price cuts, collusion is less attractive;*
- c) *Low entry barriers are an obstacle to collusion;*
- d) *Unstable demand conditions are an obstacle to collusion;*
- e) *Vigorous antitrust action increases the cost of collusion.*

**SS 5. 1. E. g) Policy alternatives for high entry barriers.** *Policy options in markets with high barriers to entry are:*

- a) *Restructure the industry to increase competition;*
- b) *Reduce tariffs and other artificial variables that limit competition;*
- c) *Regulate the price and output of firms in the market;*
- d) *Supply the market with goods produced by government firms.*

## **F. “The Supply and Demand for Productive Resources” (Ch. 24)**

**SS 5. 1. F. a) Resource price and demand:** *Price and quantity demanded will be inversely related because:*

- a) *As price increases, producers will use substitutes.*
- b) *As resource prices increase, the prices of the goods using the resource will also increase, leading consumers to buy less of those goods.*

**SS 5. 1. F. b) Three factors causing shifts in a resource demand curve:** *These are:*

- a) *An increase/ decrease in demand for a product using a resource will cause an increase/decrease in the demand for the resource.*
- b) *An increase in the productivity of a resource will cause an increase in the demand for the resource.*
- c) *An increase/decrease in the price of a related resource will cause a change in demand – the relationship will be negative for compliments and positive for substitutes.*

**SS 5. 1. F. c) Marginal revenue product:** *Marginal Revenue product is the change in the total revenue of a firm if one more unit of a resource is used. It is equal to marginal product X marginal revenue. Clearly, the higher the marginal revenue product the higher the demand – the firm will expand the use of a resource until the marginal revenue product is just equal to the price of the resource.*

**SS 5. 1. F. d) Necessary conditions for cost-minimizing resource employment levels:** *The profit-maximizing rule indicates that in equilibrium the marginal revenue product of each resource is equal to the price of the resource. The cost-minimizing condition is that all factors of production will be employed at a level such that the marginal product of the last dollar spent on each factor will be equal. If a particular resource had a higher marginal per-dollar product, expenditure on that resource would increase.*

**SS 5. 1. F. e) Supply and demand of resources in the short and long run:** *The short-run supply of a resource is determined by the mobility of that resource – highly mobile resources will be more elastic. The long-run supply of a resource:*

- a) requires investment in the resource, and is dependent on how quickly such investment produces greater amounts of the resource,*
- b) also depends on how quickly the present stock of the resource depreciates – i.e., resources which degrade quickly require greater investment to affect supply.*

**SS 5. 1. F. f) Resource prices in a market economy:** *Resource demand is a derived demand. An increase in the demand for goods using the resource will cause an increase in demand for the resource. Initially, the price change can be substantial, but over the long run the supply will be more elastic and price increases will moderate.*

➔ This process is shown in Exhibit 24 – 9 on pg. 655.

**SS 5. 1. F. g) Resources prices, utilization, and economic performance.** *Resource prices coordinate the actions of firms demanding resources and the economic units providing them. The prices communicate to users as to the scarcity and provide an incentive to economize on the resources. They also communicate to suppliers, and provide an incentive to invest time and resources to provide the resources.*

**Study Session 6**  
**Investment Tools**  
**Economics: Microeconomic Analysis**

**Reading Assignments**

**1. *Economics: Private and Public Choice*, 9<sup>th</sup> edition, James D. Gwartney, Richard L. Stroup, and Russell S. Sobel (Dryden, 2000)**

**A. “Gaining from International Trade” (Ch. 17)**

**SS 6. 1. A. a) Gains from international trade:** *Nations can gain from trade when a comparative advantage exists. Comparative advantage is the ability to produce a good at a lower opportunity cost than others can produce it. Relative costs determine comparative advantage. A nation will have a comparative advantage in the production of a good when its production costs (other goods foregone) for the good are low relative to the production cost of other nations for the same good.*

**SS 6. 1. A. b) International trade and domestic supply and demand:** *International trade exposes the domestic price of a good to international supply and demand. Where domestic producers have a competitive advantage in production, they will be able to compete effectively and profit from the export of goods to foreigners. This export will in turn generate the foreign buying power to buy goods that foreigners can produce more economically. The resulting specialization will result in cheaper prices for items that are imported (higher domestic consumption) and more expensive prices for things that are exported (lower domestic consumption). The overall result is higher production and consumption as compared to a no-trade situation*

**SS 6. 1. A. c) Trade-restricting devices:** *These device include:*

- a) Tariffs – a tax on imports.*
- b) Import quotas – a limit on the amount of a product that can be imported.*
- c) Voluntary export restraints – a limit on the amount of a product that can be exported to another country, imposed by the exporter.*
- d) Licensing standards or product quality standards – requirements that make exporting to a country more difficult or costly.*
- e) Exchange-rate controls – artificially high exchange rates which make imported goods more costly.*

**SS 6. 1. A. d) Reasons for trade restrictions:** *Three arguments for protecting domestic industries are:*

- a) National defense argument;*
- b) Infant-industries argument;*
- c) Anti-Dumping argument.*

**SS 6. 1. A. e) Trade restrictions:** *A tariff benefits domestic producers (less competition, higher prices) and the government (more taxes) at the expense of consumers.*

**SS 6. 1. A. f) Validity of trade restriction arguments:** *As follows:*

- a) National defense argument – some validity, but stockpiling is sometimes more appealing, and maintaining an open and stronger economy might be more beneficial;*
- b) Infant-industries argument – somewhat valid, but difficult to remove and may produce inefficient industries;*

- c) *Anti-Dumping argument –*
- i) *dumping can in some cases be a device to gain monopoly power,*
  - ii) *consumers gain from purchasing goods at a lower price,*
  - iii) *competitive advantage may apply.*
- Overall, unless monopoly power is likely to result, dumping is probably harmless.*

## **B. “International Finance and the Foreign Exchange Market” (Ch. 18)**

**SS 6. 1. B. a) Floating exchange rates:** *Flexible exchange rates are determined by the market forces of supply and demand. Fixed exchange rates are set at a fixed rate relative to all other currencies. Government policies are used to maintain the fixed exchange rate.*

**SS 6. 1. B. b) Appreciation and depreciation:** *Three factors which cause changes in exchange rates are:*

- a) *Change in income will cause exchange rates to change. If domestic income increases the demand for imports will increase and the value of foreign currencies will rise relative to the domestic currency.*
- b) *Differences in rates of inflation will cause exchange rates to change. Domestic inflation will cause depreciation in a country’s currency whereas deflation will cause currency appreciation. Domestic inflation will increase imports and exports will decline because of higher prices. Exchange-rate adjustments will permit nations with high inflation to engage in trade with countries experiencing little or no inflation.*
- c) *Changes in interest rates will impact exchange-rates. If real interest rates increase in a country the value of its currency will appreciate in currency markets.*

**SS 6. 1. B. c) Balance of payments accounts:** *Balance of Payments components are:*

- a) *Current Account is the record of all transactions with foreign nations that involve the exchange of merchandise goods and services, current income derived from investments, and unilateral gifts.*
  - i) *Balance of Merchandise Trade is the difference between the value of merchandise exports and the value of merchandise imports.*
  - ii) *Service exports and imports are composed of insurance, banking services, transportation, etc.*
  - iii) *Balance on goods and services is comprised of the exports of goods and services of a nation minus its imports of goods and services.*
  - iv) *Net Investment income is the income earned from investments in other countries less income earned on foreign investment in the U.S.*
  - v) *Unilateral transfers are monetary gifts to foreigners such as U.S. aid, private gifts, etc.*
  - vi) *Balance on Current Account is equal to the Balance on Goods and Services, plus net investment income earned abroad, plus unilateral transfers.*

2. *Capital account transactions involve either*

- a) *the exchange of ownership rights to real or financial assets*
- b) *the extension of loanable funds.*

3. *Official reserve account will be fairly stable under a system of flexible exchange rates. Changes in the exchange rates are relied on to balance the amount goods, services and assets purchased from foreigners and the amount sold to foreigners.*

**SS 6. 1. B. d) Monetary and fiscal policy and the balance of payments:** *The effects can be broken into a series of events:*

- a) *Monetary Policy and the Current Account:*
  - i) *Assume unanticipated increase in money supply.*
  - ii) *Incomes will increase and imports will increase.*
  - iii) *Prices will increase and exports will decline.*
  - iv) *Real interest rates will decline.*

- v) *Current account will shift towards a larger deficit*
  - vi) *Because of lower real interest rates capital will leave U.S.*
  - vii) *Outflow of capital will increase the capital account deficit and depreciation in exchange value of the currency.*
  - viii) *Dollar depreciation will encourage exports and discourage imports and offset the effects of higher income growth. Since capital is mobile the financial transactions will dominate.*
  - ix) *In the short run the current account will move toward surplus and the capital account deficit will widen.*
- b) *Fiscal Policy and the Current Account:*
- i) *Expansionary fiscal policy will stimulate aggregate demand.*
  - ii) *Incomes will increase and imports will increase.*
  - iii) *Real interest rates will increase and deficits increase.*
  - iv) *Current account will shift towards deficit because of increase in imports.*
  - v) *Higher real rates will attract foreign and domestic capital and capital account will shift towards surplus.*
  - vi) *Large budget deficits will always result in large current account deficits.*

**SS 6. 1. B. e) Current account deficits:** *Current account deficits will lead to dollar depreciation, reduced imports, higher real interest rates, capital inflows, and slower economic growth.*

**SS 6. 1. B. f) Fixed and pegged exchange rates:** *A fixed exchange rate is set at constant (fixed) rates for other currencies. A pegged exchange rate is set at a constant rate (or range of rates) for a particular currency (or bundle of currencies). There is a difference in the way these exchange rates are maintained, and in their implications. A fixed rate is by government fiat, and provides some leeway in conducting monetary policy. If, however, a country ran out of reserves of foreign currency, it would need to devalue or use some other mechanism to redress the balance. With a pegged rate, the country would lose flexibility in conducting monetary policy, since the monetary policy would need to be consistent with maintaining the exchange rate.*

## **2. “The Foreign Exchange Market,” Ch. 5, *Foundations of Multinational Financial management*, 3<sup>rd</sup> edition, Alan C. Shapiro (Prentice hall, 1998)**

**SS 6. 2. a) Spot and forward markets.** (pp.30) *The spot market is trading in currencies for immediate delivery (two business days), while the forward market is trading in contracts for future delivery of currency.*

**SS 6. 2. b) Foreign exchange quotations.** (pp.35-36) *A direct foreign exchange quotation gives the home currency price of the foreign currency – e.g., in Jordan a direct quotation for \$US might be 0.7095\$JD/\$US. An indirect quotation gives the foreign currency price of the home currency – e.g., 1.4094\$US/\$JD. I.e., if your currency is in the numerator, it is a direct quotation.*

**SS 6. 2. c) Calculating spread.** (pp.36-37) *Spread is calculated as a percentage departure from the ask price – i.e., the ask price is the denominator. E.g., if the bid is 1.4090\$US/\$JD, and the ask is 1.4105\$US/\$JD, the spread is  $(1.4105 - 1.4090)/1.4105 = 0.11\%$*

**SS 6. 2. d) Factors affecting spread.** (p. 37) *Spread is:*

- a) *narrower for widely traded currencies,*
- b) *narrower for less volatile currencies,*
- c) *wider for longer forward contracts.*

*The spread may also be a function of the position of the particular dealer – i.e., oversold (shortage) or overbought (excess).*

**SS 6. 2. e) Cross rates.** (p. 37) *If two currencies are quoted in terms of a third currency – e.g., DM/\$US and \$JD/\$US - the cross rate for the two currencies can be calculated. E.g., if DM/\$US = 1.7130 and \$JD/\$US = 1.4095, \$JD/DM = (\$JD/\$US)/(DM/\$US). One possible complication is the inclusion of spreads. If bid and ask quotations are given, the cross rate is calculated assuming you buy at the ask, and sell at the bid – i.e., the worst possible combination.*

**SS 6. 2. f) Triangular arbitrage.** (pp. 39-40) *Triangular arbitrage exploits mispricing/unbalanced exchange rates among currencies. Consider two paths for converting \$ into £:*

- a) \$ directly into £,
- b) \$ into DM, DM into £.

*If these two paths result in a different number of £, triangular arbitrage is possible. The arbitrage would be to buy £ low (using the path that would give the most £ per \$), and sell £ high (reversing the that would give the least £ per \$). E.G., using the example in the reading:*

- a) \$ directly into £: \$1 => 0.504821£.
- b) \$ into DM, DM into £: \$1 => 1.599744DM => 0.505448£.

*The arbitrageur would buy £ cheaply using the \$ into DM, DM into £ path, and sell the £ at a higher rate by reversing the \$ directly into £ path (i.e., £ directly into \$). The first step would result in 0.505448£, which would be exchanged directly for 0.505448/0.504821 = 1.001242\$ (it is more likely that the arbitrageur would do this for a large amount). The key to detecting the arbitrage is to look for the imbalance. The profit is easily calculated.*

**SS 6. 2. g) Forward discount and premium.** (p. 43) *“A foreign currency is at a forward discount if the forward rate expressed in dollars is below the spot rate, whereas a forward premium exists if the forward rate in dollars is above the spot rate..*

**SS 6. 2. h) Forward discount or premium calculation.** (pp. 44-45) *The forward discount or premium is calculated as a percent, based on the spot rate. It is annualized on a simple interest (no compounding) basis:*

$$\text{forward premium or discount} = \frac{\text{forward rate} - \text{spot rate}}{\text{spot rate}} \times \frac{360}{\text{days to maturity}}$$

**SS 6. 3. i) Interest rate parity.** (pp. 46-51) *Essentially, interest rate parity indicates that there should be no opportunities to arbitrage interest rates. I.e., any potential gain or loss of converting to another currency and lending should be offset by a change in the exchange rates. This implies that a country with a higher interest rate than country A should experience devaluation of its currency relative to country A. E.g., if interest rates in Britain are higher than the U.S., the pound would devalue vs. the dollar. Any higher gain from converting to pounds and lending would be wiped out by the decrease in the dollar value of a pound.*

*Note that interest rate parity requires that:*

$$1 + r_h = \frac{(1 + r_f)f_1}{e_0}$$

*where  $r_h$  is the home country interest rate,  $r_f$  is the foreign interest rate,  $f_1$  is the forward exchange rate, and  $e_0$  is the spot rate. Alternately, this can be written as:*

$$\frac{1 + r_h}{1 + r_f} = \frac{f_1}{e_0}.$$

*This makes it quite easy to find the interest rate required by interest rate parity.*



**Study Session 14**  
**Asset Valuation**  
**Debt Instruments: Basic Concepts**

1. ***Fixed Income Readings for the Chartered financial Analyst Program, Level I and II Readings, Frank J. Fabozzi, ed., (Frank J. Fabozzi Associates, 2000).***

**A. “Features of Fixed income Securities,” Ch. 1 (Level I)**

This is an introductory chapter that defines the basic characteristics of bonds.

1. A bond is issued under an agreement called an “indenture.” The indenture will contain covenants setting forth conditions under which the issue will operate.
2. The maturity of a bond is the length of time over which the issuer agrees to make interest payments. At the end of that time, principal will be repaid. Note that this maturity may be ended earlier under some conditions.
3. The “amount” of the bond is the par value or principal amount that will be repaid at maturity.
4. The coupon rate is the rate at which interest on the principal will be paid. This rate may be constant or variable or zero, and there may be limits on the rate.
5. Although the bond issue has a final payment date or maturity, there may be several arrangements and embedded options that can result in early payment, ending the life of the bond. This early payment may be an early repayment by the issuer, or it may be triggered by covenants in the indenture, or it may be caused by redemption of the bonds by the buyer. In some cases, the repayment may be partial. There are also occasionally arrangements for payment in forms other than cash.
6. Some bond issues may be converted into common stock of the issuer, or of a third party.
7. Bonds may be denominated in different currencies, and principal and interest may be denominated in different currencies.
8. Bond buyers may use margin, and institutional buyers often use ‘repurchase agreements’ (sale of the bond with an agreement to repurchase) to finance bond holdings.

**SS 14. 1. A. a) Basic features of a bond. (pp.5 – 22)**

- a) *Maturity: The maturity is the time at which interest payments on a bond cease, and the investor is paid the par value of the bond.*
- b) *The coupon rate is the percentage of the par value of the bond that will be paid each year to holders of the bond.*
  - *this payment most often is paid out in two equal payments at six month intervals (semiannual pay).*
  - *the coupon rate may be zero (zero coupon).*
  - *some payments may be deferred (deferred coupon).*
  - *the coupon rate may vary over time according to a defined schedule (step-up).*
  - *the coupon may vary over time according to a number of schemes (floating rate).*
  - *the coupon rate may have a maximum or a minimum (cap or floor).*
- c) *The par value is the amount that will be paid to the investor at the maturity of the bond.*

➔ **Note that the par value is not the price or market value of the bond, and the coupon rate is not the rate of return on the bond. Par value and coupon rate are used *only* to specify the cash payments to the bond.**

d) *Bonds have several provisions for paying the par value back to the investor:*

- *lump sum payment at maturity (bullet maturity)*
- *serially: the serial bond is actually a series of bonds with different maturities which are all issued together (serial bond).*
- *sinking fund: a certain amount of the bond issued must be retired each year, either by repurchase in the market or by call (sinking fund issue). The premium in the case of a sinking fund repurchase is generally smaller than the premium for a recall not associated with a refunding.*
- *A bond that is callable may be repurchases (called) at the discretion of the issuer, this usually requires payment of a premium in addition to the par value of the bond (callable). The call may be restricted until a certain date (call protected), and the call premium may vary over time. A nonrefundable bond may not be called for purposes of refunding the bond issue (i.e., replacing the bond issue with a cheaper issue).*

e) *The bond will specify the currency in which interest payments and the repayment of par value will be paid – they need not be the same.*

f) *Options granted to the issuer or the investor include:*

- *the call option discussed above, to the issuer.*
- *a put option (the right to sell the bond back to the issuer), to the investor.*
- *the cap (maximum) on the coupon rate (to the issuer).*
- *the floor on the coupon rate (to the investor).*
- *the right to recall more bonds than necessary for a given sinking fund repurchase (to the issuer).*
- *the right of the issuer to prepay amounts in excess of scheduled payments (usually associated with mortgage backed securities) (to the issuer).*

**SS 14. 1. A. b) Indenture and covenants.** (p. 5) *As follows:*

a) *The indenture specifies the promises of the issuer and the rights of the purchasers. This indenture is directed toward the trustee as the representative of the bondholders.*

b) *Covenants are parts of the indenture. Affirmative covenants set for the obligations of the borrower, such as:*

- *pay interest and principal in a timely manner.*
- *pay taxes and all other claims as they become due.*
- *maintain all properties in good working order.*
- *Submit periodic reports to the trustee.*

*Negative covenants specify limits and restrictions on the actions of the borrower.*

**SS 14. 1. A. c) Coupon rate structures.** (pp.6-12) *As follows:*

a) *Zero coupon bonds pay no interest (zero coupon rate). The return is provided by purchase at a price below par (discount).*

b) *Step-up notes have a coupon that increases at given times according to a set schedule.*

c) *Deferred coupon bonds do not begin paying interest payments until some future date, the first payment is a lump sum payment.*

d) *Floating-rate securities have a coupon that changes (resets) over time based on some reference rate.*

**SS 14. 1. A. d) Structure and types of floating-rate securities.** (pp. 8-12) *As follows:*

a) *The basic floater rate is specified as the reference rate plus or a “quoted margin.” The quoted margin need not be positive.*

- b) A “cap “ is a maximum interest rate, a “floor” is a minimum interest rate. A bond having both a cap and a floor is said to have a “collar.” A “drop-lock” would automatically change from floating rate to fixed rate under specified circumstances.
- c) An “inverse floater” or “reverse floater” has an interest rate that is set by the formula:  
$$\text{coupon rate} = K - L(\text{reference rate}),$$
where  $K$  and  $L$  are specified constants. Note that the coupon rate will be no more than  $K$  and will move inversely to the reference rate.
- d) The coupon rate for a “dual-indexed floater” is a function of the difference between two indices, i.e., it is of the form:  
$$\text{Dual indexed coupon rate} = \text{Index A} - \text{Index B} + X \text{ basis points}$$
- e) The coupon rate on a “ratchet bond,” like a floater, adjusts periodically based on a reference rate, BUT the adjustment is downward only and cannot increase from its lowest level. I.e., the coupon can only go down, never up.
- f) The quoted margin portion of the coupon rate for “stepped spread floater” may change to (step to) a higher or lower level over the life of the bond.
- g) The coupon rate of a “non-interest-rate indexed floater” simply has a reference rate that is not an interest rate index. Examples are indexing to movements in foreign exchange rates, a commodity price, and equity indices.

**SS 14. 1. A. e) Accrued interest, full price, and clean price.** (pp. 13-14). The accrued interest is the interest that has accumulated on a bond since the last interest payment (usually computed on a daily basis). When you buy the bond, you will normally be expected to pay the seller the quoted price of the bond plus the accrued interest, and the total amount you will pay is referred to as the full price (sometimes called the “dirty price”). The quoted price of the bond, which does not include the accrued interest, is called the “clean” price.

**SS 14. 1. A. f) Provisions for paying off bonds - non-amortizing and amortizing.** (pp.14-20). The following arrangements exist:

- a) “Bullet maturity:” all of the bonds in the issue mature at the same date, and the principal is repaid in full at maturity.
- b) “Serial bonds:” a serial bond issue contains bonds of differing sequential maturities and coupons. The maturity dates of the individual bonds are fixed.
- c) “Amortizing securities:” the periodic payments to a non-amortizing security are only interest, and the principal amount is not changed by the payments. The periodic payments on amortizing securities have another component - a partial repayment of the principal amount. Over the life of the security, the principal value of an amortizing security is reduced (“amortized”), either in part or in full.

**SS 14. 1. A. g) Provisions for early retirement of debt.** (pp.14-20). As follows:

- a) A call provision gives the issuer the right to repurchase (call in) the security. The repurchase price will usually be the principal plus a “call premium,” may change over time according to some “call schedule.” A “deferred call” provision does not take effect until some later date; to the extent that the bond cannot be called, the bond is called “call protected.”
- b) Prepayment provisions allow the issuer to repay all or a part of the security in advance of the scheduled repayment. It is much like a call, except that the prepayment is at par value with no premium. This is usually encountered in amortizing securities such as mortgage-backed securities.
- c) A “sinking fund” is a provision that a stated amount of bonds must be retired each year, either through repurchase at market price or through refunding, so that the principal amount is

*decreased. Note this is not considered an amortizing security, since there is no principal repayment component in the periodic payments. The call premium on bonds called to meet sinking fund requirements is generally less than the call premium for other purposes (sometimes zero). There is often a provision allowing the issuer to accelerate the sinking fund by retiring more bonds than required to meet the sinking fund obligation.*

**SS 14. 1. A. h) Nonrefundable and noncallable bonds.** (pp.16 – 18). A “noncallable” bond has no call provision (may not be called). A “nonrefundable” bond may be called, but not if the source of the funds for repayment are raised by issuing lower-cost bonds. Another way of saying this is that recall for purposes of refunding the issue (i.e., replacing the issue with a lower cost issue) is not allowed.

**SS 14. 1. A. i) Regular (general) redemption price and special redemption price.** (p. 19). The regular redemption price is the price on a call that is not associated with exercise of a sinking fund or other special provision. A special redemption price is the call price associated with exercise of special provisions. The special redemption price is lower, and may actually be below par in some instances.

**SS 14. 1. A. j) Bond options and who benefits.** (pp.21-22). An option is, literally, the right to take an action. This right is usually conditional on some scenario. Options granted to the issuer or the investor include:

- the call option discussed above (to the issuer).
- a put option (the right to sell the bond back to the issuer) (to the investor).
- the cap (maximum) on the coupon rate (to the issuer).
- the floor on the coupon rate (to the investor).
- the right to recall more bonds than necessary for a given sinking fund repurchase (to the issuer).
- the right of the issuer to prepay amounts in excess of scheduled payments (usually associated with mortgage backed securities) (to the issuer).
- the right to convert the bond to the common stock of the issuer (convertible bond) or to the common stock of another firm (exchangeable bond) (to the investor)

**SS 14. 1. A. k) Importance of embedded options.** (pp.21-22). The options embedded in a security issue will affect the pattern of cash flows (interest and principal payments). This makes the valuation of the security much more complex because the pattern of cash flows will depend on i) the future conditions of the variables affecting exercise of the option, and ii) the reaction of the option holder to those conditions. This increases the exposure to “modeling risk,” or the risk that the model of the variables and reaction is incorrect.

**SS 14. 1. A. l) Repurchase agreements.** (pp. 22-23). A repurchase agreement is the sale of a security with the simultaneous commitment to repurchase the security at some future time (“repurchase date”) at a stated price (repurchase price”). This is essentially a (usually short term) borrowing device, i.e., the seller receives a loan with the security serving as collateral. The implied interest rate is called the “repo rate.”

**SS 14. 1. A. m) Institutional investors and purchase financing.** (pp.22-23). There are two general methods: margin buying and repurchase agreements.

- a) The repurchase agreement was described above as a borrowing device. Where the party borrowing the funds is not a dealer, the agreement is usually called a “reverse repurchase agreement.”
- b) Margin buying is the purchase of securities using funds borrowed from the broker. The amount of borrowing is limited by requiring that the investor provide a stated % of the value of the securities at purchase (initial margin) and must maintain the net value of the position above a different % (maintenance margin) of value after purchase.

**SelfTest Question:** When will a bond be paid off and retired?

**Suggested Answer:** The first (and incomplete) answer is that the bond will be paid off and retired at maturity. This answer is incomplete because the bond may be paid off and retired before then due to a call by the issuer (whether for refunding or for other purposes such as sinking fund requirements), a put by the buyer, conversion to common stock, trigger of indenture covenants, or default.

## **B. “Risks Associated with Investing in Bonds”, Ch. 2 (Level I)**

This chapter breaks risk into several components, each arising from a different source. An understanding of risk is necessary to control of risk.

1. The most important source of risk in bonds is movement in the level of interest rates – interest rate risk. Changes in interest rates are inversely related to the value of a bond.
2. The sensitivity of bond value to changes in interest depends on a number of bond characteristics such as maturity, coupon, and embedded options. The most widely used measure of interest rate risk is duration, a measure of the percent change in value as yields change.
3. Another component of risk, yield curve risk, arises from changes in the shape of the yield curve (as differentiated from changes in the level of the curve)..
4. As noted above, the “life” of a bond is uncertain due to call or other arrangements that lead to early payoff and retirement of the bond. This is another source of risk.
5. The rate at which cash flows received during the life of the bond will be reinvested is uncertain, leading to “reinvestment rate risk.”
6. Unfortunately, the ability of bond issuers to make required payments in a timely fashion is not certain. Even short of default, perceived changes in the probability that payments can be made in a timely manner will affect bond value.

**SS 14. 1. B. a) Bond risks.** (pp. 34-53). *As. Follows:*

- a) *Interest rate risk is the risk changes in market rates that affect the price of a bond.*
- b) *Call and prepayment risk has three facets:*
  - *the cash flow of the security is uncertain.*
  - *calls and prepayment take place at low interest rates, when the proceeds can only be reinvested at low rates.*
  - *since calls and prepayments take place at low interest rates, the appreciation potential is limited.*
- c) *Yield curve risk is the risk arising from non-parallel changes in the yield curve.*
- d) *Reinvestment risk is the risk that interest payments may have to be invested at lower rates than the rate on the underlying instrument.*
- e) *Credit risk has three facets:*
  - *default, or postponement or reduction of the scheduled cash flows.*
  - *credit spread risk, the risk of changes in the relationship of yields to credit ratings.*
  - *downgrade risk, the risk that the credit rating of the individual asset may change.*
- f) *liquidity risk is the risk that the asset cannot be sold quickly at a fair price / true value (as measured by recent transactions).*
- g) *exchange-rate risk is the risk that changes in the exchange rate will lower return on an investment paying in a foreign currency.*
- h) *volatility risk is the relative size of the change in bond price for a given change in yield.*

**SS 14. 1. B. b) Interest rates and bond prices.** (pp. 34-35). *Similar bonds must be priced similarly – i.e., have the same yield. Since the cash payments to a bondholder are fixed, the only thing that can change to adjust the yield is the price of the bond. If rates go up, the price of the bond must decrease to provide the investor a higher return, and vice versa.*

**SS 14. 1. B. c) Required yield and bond price.** (p. 35).

- a) *If the coupon rate is equal to the required market yield, the bond will be priced at par. I.e., if the bond is priced at par, the coupon yield is equal to the required market yield.*
- b) *If the bonds coupon rate is below the yield required by the market, the price of the bond will be below par. I.e., other bonds provide the market rate - would you pay full price for a bond which had a yield below that available on other bonds?*
- c) *If the coupon rate is above the yield required by the market, the bond will be priced above par. I.e., at par the bond is paying more than the market rate, and its price would be bid up.*

**SS 14. 1. B. d) Maturity, coupon, embedded options and interest rate risk.** (pp.36-37).

- a) *All other things constant, bonds of longer maturity have bigger price changes (are more volatile) when interest rates change.*
- b) *All other things constant, bonds of higher coupon have smaller price changes (are less volatile) when interest rates change.*
- c) *The value of the embedded options is a function of the yield. This is an added dimension of risk beyond the reaction of the value of the specified payments to interest rate changes. A bond with embedded options is thus affected by two factors. Further, since the bond will be called when interest rates are low, the price of the bond will be capped at the call price, and a decrease in yields will result in a smaller increase in bond price.*

**SS 14. 1. B. e) Price of a callable bond, price of an option-free bond, and price of the embedded option.** (p36). *A bond with an embedded option can be thought of as a combination of a bond and an option, and the value of the combination is the value of the bond minus the value of the option (because the option is “owned” by the issuer), or:*

$$\text{price of callable bond} = \text{value of bond} - \text{value of call.}$$

**SS 14. 1. B. f) How does the market yield affect the interest rate risk of a bond.** (p.37). *As the yield on a given bond increases, the sensitivity of the price of the bond to changes in interest rates decreases.*

**SS 14. 1. B. g) Interest-rate risk and price of a floating-rate security.** (p38). *If the interest rate on a floating rate security were set equal to the yield required by the market at each point in time, the floating rate security would always be equal to par. The yield on the floating rate security, however, will likely not be exactly equal to the required market rate for three reasons:*

- a) *The floating rate is not reset constantly, but rather is reset at discrete intervals. The longer the time until the next reset, the greater is the chance of inequality and a price different from par.*
- b) *The reset is determined by the formula set at issue, which provides a margin over the index. But there is no guarantee that the formula will provide the exact margin required by investors for bonds of this type. Further, this required margin will likely change over time. Even at the reset point, then, the new rate may not be exactly that required by the market on bonds of the given characteristics.*
- c) *The floating rate is often capped, and so the investor faces cap risk that increases as yields increase toward the cap and decrease as yields decrease away from the cap.*

**SS 14. 1. B. h) Computing the duration of a bond.** (pp. 39). *Fabozzi defined duration as the percent change in the price of a bond for a 100 basis point change in yield. The formula given on p. 39 is based on an equal increase and decrease around the midpoint. I.e.:*

- a) *The interest rate is first increased by X basis points from the midpoint  $P_0$  the new price  $P_{X+}$  is computed, then the interest rate is decreased by X basis points from the midpoint  $P_0$  and the new price  $P_{X-}$  is computed. The total price change is the sum of the increase and the decrease,  $P_{X+} + P_{X-}$ ; the total change in yield is 2X basis points*
- b) *The total price change is divided by the midpoint and multiplied by 100 to find the percent price change for a 2X basis point change in yield.*
- c) *The percent price change for a 100 basis point change in yield is found by multiplying by the factor  $100 / 2X$ .*
- d) *This can be expressed as:*

$$\text{duration} = \frac{P_{X+} + P_{X-}}{P_0} \times 100 \times \frac{100}{2X}$$

*or by the equivalent formula given in Fabozzi, since multiplying by  $100 \times (100/2X)$  is equivalent to dividing by X expressed in decimal form.*

**SS 14. 1. B. i) Interpretation of bond duration?** (p. 39-40). *Formally, duration is the (approximate) percent change in a bond's price if the yield changes by 100 basis points. Informally, duration is used as a measure of the sensitivity of the price of a bond to changes in yield.*

**SS 14. 1. B. j) Duration and the approximate percentage price change of a bond.** (p. 39). *The percent change in the price of a bond,  $\% \Delta P$ , for a change in yield of Y basis points,  $\Delta Y$ , is given by:*

$$\% \Delta P = -\text{duration} \times (\Delta Y/100)$$

*I.e., to find the percent change in price, multiply the basis point change in yield by the negative of the duration.*

**SS 14. 1. B. k) Duration and price change.** (p. 40). *To find the \$ change in price, multiply the original price of the bond by the percent change in price and divide by 100. To find the new price, add the change in price to the original price. I.e.,*

$$\begin{aligned} \text{new price} &= [(\% \Delta P \times P_0)/100] + P_0 \\ &= [-\text{duration} \times (\Delta Y/100) \times P_0]/100 + P_0 \end{aligned}$$

*This can also be done using "dollar duration," which is the change in price for a 100 basis point change in yield. The dollar duration is simply the duration multiplied by the original price, so that the change in price is the dollar duration multiplied by  $\Delta Y/100$ :*

$$\text{change in price} = \text{dollar duration} \times \Delta Y/100$$

**SS 14. 1. B. l) Yield curve risk and duration.** (p.42). *The duration measures the percent price change for a 100 basis point change in yields. However, the actual percent change in price is dependent on the actual change in the yield in basis points. Duration would be an accurate measure of the price sensitivity of a portfolio only if all of the bonds had the same change in yield. In a portfolio containing bonds of different maturity, this would require the unlikely event that changes in the yield be the same at all points along the yield curve (a "parallel shift"). Duration does not take account of yield curve risk – the possibility of changes in the shape of the yield curve.*

**SS 14. 1. B. m) Key rate duration.** (p42). *A "rate duration" is the percent change in the value of a portfolio if yield changes only at a particular maturity, while yields at all other maturities remains constant. There are an infinite number of possible maturities to be used for rate duration; in practice, the rate duration is computed for several key (important) maturities and is referred to as key rate duration.*

**SS 14. 1. B. n) Callable and payable securities.** (p.43). *In both cases, the issuer has the right to shorten the payment schedule. This is disadvantageous for three reasons:*

- a) The cash flow pattern becomes uncertain.*
- b) The shortening of the payment schedule will occur when interest rates are low and reinvestment will be at a lower rate (i.e., exposure to reinvestment risk).*
- c) Because the shortening of the scheduled payments will occur if interest rate are low, the price appreciation of the securities will be limited.*

**SS 14. 1. B. o) Reinvestment risk.** (pp.43-44). *Factors affecting the reinvestment risk of a security include:*

- a) Call risk, since the call price must be reinvested.*
- b) Prepayment, since the prepaid amount must be reinvested.*
- c) Amortizing, since the amount to be reinvested includes the repayment of principal.*
- d) Higher coupon, since higher interest payments must be reinvested (zero coupon bonds have no reinvestment risk for interest payments).*

**SS 14. 1. B. p) Prepayable amortizing securities, nonamortizing securities, and reinvestment risk.** (p. 44). *Prepayable securities have greater reinvestment risk since the prepayments must be reinvested at lower rates. Amortizing securities have greater reinvestment risk because the periodic payments include payment of principal that must also be reinvested. Nonamortizing securities pay only interest until maturity.*

**SS 14. 1. B. q) Default risk, credit spread risk, and downgrade risk.** (pp.45-46). *As follows:*

- a) Default risk is the possibility that the issuer may not be able to make the scheduled payments in a timely manner. Note that this is not total loss, the default may run from late payment to failure to make further payments.*
- b) Credit spread risk is the risk that the spread (the premium over the yield on a default-free security) will change.*
- c) Downgrade risk is the risk that the credit rating of the security will decrease.*

**SS 14. 1. B. r) Rating upgrades and downgrades?** (pp46-47). *The role of a rating agency is to assign bonds to a ranking based on the amount of credit risk (note that only credit risk is considered). An upgrade would be movement to a higher (less credit risk) rating, while a downgrade would be movement to a lower (more credit risk) rating.*

**SS 14. 1. B. s) What is the difference between investment grade bonds and non investment grade bonds.** (p. 46). *An investment grade bond is one that is rated in the upper four general categories of BBB or better, while a non investment grade bond is rated in the BB or lower ratings.*

**SS 14. 1. B. t) Liquidity risk and buy-and-hold.** (pp. 47-48). *Liquidity is important for investors planning to hold an investment to maturity if they may need to value (mark a position to market) the security at some time or times before maturity. Typically, this might arise from the need to value a portfolio for various reasons, such as fixing the value of a mutual fund portfolio. Also, expectations do not always hold.*

**SS 14. 1. B. u) Changes in liquidity risk.** (p. 49) *Changes in liquidity risk might be the result of changing market conditions or of changes in the desirability of a particular bond structure. For instance, the bid-ask spread might widen in times of financial distress, or a particular bond structure may prove more or less popular over time.*

**SS 14. 1. B. v) Market bid-ask spread and dealer bid-ask quotations.** (pp. 47-48). *The market bid-ask spread would be the spread between the highest bid and the lowest ask of the dealers.*

**SS 14. 1. B. w) Exchange rate risk.** (pp.49). *The cash flows in the investor's domestic currency are dependent on the exchange rate in effect when the payments are received. Exchange rate risk is the risk associated with changes in the exchange rate.*

**SS 14. 1. B. x) Inflation risk and bondholders.** (p.50). *Inflation risk is the risk that the purchasing power of the cash received will change. It arises in fixed income investing because the payments are fixed in currency terms, not in terms of purchasing power.*

**SS 14. 1. B. y) Yield volatility and the price of bonds with embedded options.** (pp.50). *The value of an option increases with the expected volatility. E.g., would there be any reason to buy an option if conditions did not change? For a callable bond, the option goes to the issuer, so that the higher option price associated with increased volatility reduces the value of the bond. For a puttable bond, the option goes to the investor, so that the higher option price associated with higher volatility increases the value of the bond.*

**SS 14. 1. B. z) Event risk, regulatory risk, and political risk).** (pp51). *Event risk may be associated with natural catastrophes such as hurricanes, with corporate takeovers (what will the new management do?), and with restructurings (what will be the effect on the security?). Regulatory risk is a form of event risk arising from new regulation, which can have widely varying impact in many forms. Similarly, political risk is a form of event risk that may arise from regulatory risk, or from reluctance to undertake necessary but unpopular actions, or from outright repudiation of sovereign debt. Changing of leaders may affect various parts of an economy differently.*

**SelfTest Question:** Describe the shortcoming of duration as a measure of price sensitivity for portfolios. The problem is that duration assumes a parallel shift in the yield curve – i.e., that all yields at all maturities change by the same amount. It is likely, however, that the shape of the yield curve will change – i.e., that yields at different maturities change by different amounts – so that the change in price computed using duration will be inaccurate. E.g., if short-term yields increase by less than long-term yields and portfolio duration is used: the price decrease for the short-term securities will be overestimated, the price decrease of the long-term securities will be underestimated, and the net result would be underestimation.

### C. “Overview of Bond Sectors and Instruments,” Ch. 3 (Level I)

Chapter 1 discussed basic bond characteristics. This chapter continues that discussion by separating bonds into sectors, depending on more specific characteristics.

1. Treasury securities are those issued by the US Department of the Treasury, and are backed by the full faith and credit of the US government.
  - a) Treasury bills are short-term, with maturity less than one year.
  - b) Treasury notes have maturity from one year to ten years.
  - c) Treasury bonds have maturity greater than ten years.
  - d) Treasury inflation protection securities (TIPS) have an inflation-adjusted principal.
  - e) Treasury securities are issued on a regular basis through an auction process.
  - f) There is an active secondary market for Treasury securities – they are highly liquid.
2. Although the Treasury does not issue zero-coupon securities, private dealers “strip” Treasury securities to create zero-coupon securities called “strips.”
3. Several agencies and government sponsored enterprises (GSEs) of the US government also issue securities.

- a) Most agency securities are backed by the full faith and credit of the US government, but most government sponsored enterprise securities are not.
- b) Among other securities issued by agencies and GSEs are “mortgage-backed securities,” which are bonds collateralized by a pool of mortgages. These securities may be a simple “passthrough” of mortgage payments, or they may be “collateralized mortgage obligations” which rearrange the cash flow from the payments to better suit the objectives of various investors. The cash flows from the underlying mortgages are uncertain because mortgages holders may prepay (in full or in part).
- 4. Municipal securities are those issued by state and local governments.
  - a) Municipal securities are not subject to US Federal taxes, and may not be subject to state or local taxes. Because of this tax treatment, the yield is lower than the yield on comparable corporate bonds.
  - b) Municipal securities may be separated into “General Obligation” bonds that are supported by the taxing power of the issuing entity, and Revenue bonds which are supported by the revenues from some specific project.
- 5. Corporate bonds have priority over the claims of common and preferred stockholders.
  - a) There is a hierarchy of claims among the creditors.
  - b) The “credit risk” (probability of timely payment of obligations) of a bond issue is rated by private firms, based on the characteristics of the issue.
  - c) Corporate debt may be in the form of unsecured debentures, or may be secured by some assets.
  - d) Medium-term notes are issued on a continuous basis, rather than as a group at a single point in time.
  - e) Commercial paper is very short-term, unsecured promissory notes.
- 6. Asset-backed securities are similar to mortgage-backed securities, except for the underlying assets securing the issue. Securing assets include second mortgages, auto loans, credit card receivables. These securities are sometimes “enhanced” by various increases in collateral or guarantees.
- 7. International bonds are subdivided into different types:
  - a) Foreign bonds are bonds whose issuer is not domiciled in the country in which the bonds are issued and traded.
  - b) Eurobonds are offered in multiple national markets, outside the jurisdiction of any single market.
  - c) Global bonds are bonds which are both Eurobonds *and* “Yankee bonds” (Yankee bonds are foreign bonds traded in the US.)
  - d) Sovereign debt is debt issued by a central government other than the US central government.

**SS 14. 1. C. a) Treasury Securities.** (pp. 66-68). *As follows:*

- a) *Treasury bills are short-term, with maturity less than one year, sold as discount securities (no interest payments, sold at a discount). They are issued on a regular basis with maturities of 91, 182, and 364 days.*
- b) *Treasury notes have maturity from one year to ten years, and are coupon (interest paying) securities.*
- c) *Treasury bonds have maturity greater than ten years.*
- d) *Treasury inflation protection securities (TIPS) have an inflation-adjusted principal.*

**SS 14. 1. C. b) Coupon and principal for Treasury Inflation Protected Securities (TIPS).** (p.67).

*The principal value of a TIPS is adjusted each month to reflect inflation:*

$$\text{adjusted value of TIPS} = \text{previous value of TIPS} \times \text{semiannual inflation rate}$$

*The coupon rate remains the same, but is applied to the new principal amount so that the dollar interest payment increases.*

*E.g., if a TIPS with a coupon rate of 6% has a \$119,000 principal at the beginning of a six month period, and the annual inflation rate over the period is 4%, the bond principal would be adjusted to  $1.02 \times \$119,000 = 121,380$ , and the (semiannual) interest payment would be  $0.03 \times 121,380$  or \$364.14.*

**→Note: Be careful to use semiannual rates for the inflation adjustment and for the dollar interest payment.**

**SS 14. 1. C. c) Treasury security auctions.** (pp. 68-69). *Auctions occur on a regular basis, varying from weekly auctions three-month (91 day) and 6-month (182 day) bills to quarterly auction for the 30 year bonds. An auction announcement specifies the amount and maturities to be auctioned. The auction may actually “reopen” (i.e., increase the amount of) a previous issue rather than begin a new issue. The auction is conducted as a competitive bid, with the competitive bid specifying the quantity and yield (note that the yield implies the price). The Treasury also accepts non-competitive bids – i.e., bids that specify quantity only. Finally, there may be non-public purchases of bonds by other federal entities. The Treasury then:*

- a) Subtracts the total quantity of non-competitive bids and non-public purchases from the quantity of bonds to be issued.*
- b) Awards the remaining auction quantity to the competitive bids, in order of yield, as far as possible. I.e., the lowest yield is filled, then the next, until there is not enough left to fill the next highest yield level. The yield level that can only be partially filled is called the “stop yield,” each bidder at this yield level is receives a proportional quantity of the available quantity.*
- c) The non-competitive and public bids are filled.*
- d) The stop yield becomes the yield of the entire issue. All bidders receiving bonds will pay the same price (receive the same yield). This is referred to as a “single price” or “Dutch” auction.*

**SS 14. 1. C. d) On-the-run and off-the-run Treasury securities?** (p.69) *“On-the-run” Treasury securities are the most recently issued securities of the given characteristics. The issues that are no longer the most recently issued are the “off-the-run” securities.*

**SS 14. 1. C. e) Government securities dealers.** (pp69-70). *The secondary market is an over-the-counter market of government securities dealers that functions virtually 24 hours a day, with next-day settlement.*

**SS 14. 1. C. f) Stripped Treasury Securities.** (pp. 70-72). *Stripped treasury bonds (“Treasury strips”) are created by the private sector from coupon treasury bonds. Treasury bonds are purchased and placed in escrow. Receipts are then issued and sold, with each receipt representing a claim on a particular payment from the treasury – i.e., either a single scheduled interest payment or the scheduled repayment of principal. In effect, each receipt is a zero-coupon security. Note that these strips are created by the private sector, but the Treasury has in place a program to facilitate the trading of strips. “Coupon strips” are a claim on coupon payments, “principal strips” are a claim on a principal payment. The difference is significant because of tax advantages (preferential capital gains treatment) of principal strips for some non-us investors.*

**SS 14 1. C. g) Types of securities issued by federal agencies.** (pp. 72-80). *These are:*

- a) Debentures, bonds that are not backed by specific collateral, but depend on the ability of the agency to generate sufficient funds to satisfy the obligation. They may be noncallable or have call features.*
- b) Mortgage-backed securities, bonds that have collateral in the form of pools of mortgage loans. There are also some securities that have student loans as collateral. The underlying pool of mortgages is said to be “securitized,” i.e., made capable of being sold as securities.*

**SS 14. 1. C. h) Mortgage-backed securities and cash flows.** (pp. 76-80). *There are two types of mortgage-backed securities:*

- a) *Mortgage Passthrough Securities simply pass the payments received on the pool of mortgages through to the bondholder (minus, of course, a processing fee).*
- b) *Collateralize Mortgage Obligations (CMOs) use the payments received on a pool of mortgages to make payments on the CMOs, but do not simply pass the payments through to the bondholders. Instead, the payments on the pool of mortgages are modified into various streams of payments to the bondholders. The intention is to provide differing streams of payments (called “tranches”, which they tell me is French for “slice”) which investors might find more attractive (and pay more for!). These modified streams of payments are often quite complex in nature.*

*The cash flows to a mortgage-backed security have two general components: scheduled payments of interest and principal, and unscheduled prepayments of principal. Although the scheduled payments are set in advance, the prepayments are not set or known in advance, and can only be estimated. Further, prepayments will reduce the future scheduled payments. The result is uncertainty about what the cash flows from the security will be.*

**LOS 14. 1. C. i) Prepayments, curtailments, and prepayment risk.** (p. 76). *As follows:*

- a) *Prepayments are payments on the principal amount of a mortgage above the scheduled payment on principal.*
- b) *A curtailment is a prepayment of less than the entire amount of the remaining principal – i.e., the loan is curtailed or stopped by the prepayment.*
- c) *Prepayment risk is the uncertainty about the cash flows that will actually be received from a mortgage-backed security.*

**SS 14. 1. C. j) Mortgage passthrough securities and collateralized mortgage obligations.** (pp76-80).

*The difference is in the treatment of the cash flows received from the underlying pool of mortgages. The passthrough simply divides the payments and passes the divided payments through to investors, with no modification except the deduction of a processing fee. A CMO, however, modifies the payments so that differing “tranches” of investors receive different streams of payments.*

**SS 14. 1. C. k) Municipal securities.** (pp80-82). *There are two type of securities issued by municipalities:*

- a) *Tax-backed debt, which is secured by the taxing power of the municipality. These may be:*
  - *general obligation debt, (backed by the general taxing power),*
  - *appropriation-backed bonds (backed by an appropriation from a legislative body),*
  - *credit enhanced debt obligations (appropriations are promises but not binding obligations, a debt obligation is credit enhanced when there is a guarantee or binding obligation).*
- b) *Revenue bonds, which are secured by the revenues from some project (e.g., roads, bridges, sewer lines).*

➔ **Note that “municipality” includes states or other political entities below the federal level!**

**SS 14. 1. C. l) Tax-backed debt obligations and revenue bonds.** (pp. 80-82). *A tax-backed obligation relies on the taxing power of the municipality to provide the funds to make the payments, while a revenue bond relies on the revenues from a municipal project.*

**SS 14. 1. C. m) Types of tax-backed debt.** (pp. 80-82) *These are:*

- a) *General obligation (GO) debt. The funds for payment of the obligation will come from the taxing power of the municipality.*
  - *for an “unlimited tax GO,” the taxing power is not limited (by statute, although of course there is an upper limit to the taxes which can be imposed)*

- for a “limited tax GO,” the amount of the taxes that can be imposed to make payments is limited by statute.

- a “double-barreled” GO is one which has additional security other than the taxing power.

b) Appropriation-backed obligations are secured by an appropriation from the state legislature.

However, this appropriation is not legally binding, but is more of a promise for which funding may or may not be approved by the legislature. Because the appropriation is a promise, these bonds are called “moral obligation” bonds.

c) Public credit enhancement programs are various forms of legally binding obligations on the state to actually fund payments if necessary.

**SS 14. 1. C. n) Insured bonds and prerefunded bonds?** (pp.82-83). An insured bond is backed by an insurance policy written by (purchased from) a commercial insurance company. A prerefunded bond is a bond issue that is backed by an “escrowed” (i.e., pledged to be used only for this purpose) portfolio of obligations guaranteed by the US government, which will produce enough revenue to make the required payments.

**SS 14. 1. C. o) Bankruptcy and bondholder rights.** (pp. 83-84) Bankruptcy may be either voluntary (filed by the company) or involuntary (filed by the creditors). The bankruptcy may lead to either liquidation (breakup and sale) or reorganization of the firm. The rights of bondholders are that they have absolute priority over equity holders in claiming the proceeds from bankruptcy ( i.e., bondholders get paid first!), although there may be a structure of priorities among the various bond issues. The absolute priority may not be exactly followed in reorganization.

**SS 14. 1. C. p) Credit rating of corporate debt instruments.** (pp84-85). There are four factors, known as the “four Cs:”

- a) Character,
- b) Capacity,
- c) Collateral,
- d) Covenants.

**SS 14. 1. C. q) Secured debt, unsecured debt, and credit enhancements.** (85-87). Secured debt is collateralized by a specific assets of the firm, and the proceeds from the sale of these specific assets are to be used first to pay back the secured bondholders. Only the proceeds that exceed the claim of the secured bondholder can be used to pay other obligations. Unsecured debt (generally called debentures) is secured by a general claim on all the assets of the firm, but do not have a claim on specific items. Credit enhancements are guarantees of the debt by third parties.

**SS 14. 1. C. r) Default rate and default loss rate.** (pp.87-88). The default rate is the fractional rate of default of bonds over a year. It can be measured either in terms of numbers of issues failing (the issuer default rate) or in terms of the par value amounts defaulting (the dollar default rate). It is unusual, however, for a default to be total, and investors usually recover some fraction of their claims. The default loss rate (or the similar recovery rate), or fraction of claims actually lost in a year, takes account of this recovery. Note that this rate is usually defined for a class of bonds rather than for all bonds.

➔ Note that Fabozzi does not accurately define the default loss rate – is it to be defined as the rate using the fraction of loss of total bond value, or as the rate of loss using only the defaulted issues? Judging from the discussion of recovery rates, it appears that the default loss rate is defined as the actual loss rate on defaulted bonds, rather than the actual loss rate on all bonds.

**SS 14. 1. C. s) Medium-term notes.** (pp. 88-89) A “medium-term note” is a debt instrument that is registered under SEC Rule 415 (“shelf registration” allowing sale of the security at any time without further registration), and is offered continuously to investors. Note that the name is misleading: the original maturity of a “medium-term note” may vary from less than a year up to thirty years.

**SS 14. 1. C. t) Medium-term notes and a corporate bonds.** (p.89) *Corporate bonds are typically distributed in one large offering by investment bankers through an underwritten offering, in which the investment banker essentially guarantees the sale price (and amount sold) by buying the entire issue and reselling. An alternative to an underwritten distribution is a “best efforts” offering, in which the investment banker acts only as an intermediary, with no guarantee as to the sale price or the amount sold. Medium-term notes are typically distributed basis by the investment banker on a “best efforts” basis over time (continuously or in multiple small offerings).*

**SS 14. 1. C. u) Structured notes.** (p.90). *“Structured notes” are issues of medium-term notes (MTNs) that are coupled with derivative transactions. The effect of the derivative transactions is to create debt obligations with more complex risk/return features than are available in the corporate market. The motivation is to create instruments that are more interesting to institutional investors and that allow those investors to participate in markets that they are not allowed to participate directly, but that help achieve investment objectives.*

**SS 14. 1. C. v) Types of commercial paper.** (pp. 90-91). *Commercial paper is a short-term unsecured promissory note that is issued in the open market and represents the obligation of the issuing corporation. In the US it typically has a maturity of less than 270 days, and most often 50 days or less. It may be either “direct paper” (sold directly to the investor without the help of an agent), or “dealer paper” (sold through an agent). It is typically paid off through replacement by another issue and is typically backed by unused bank credit lines.*

**SS 14. 1. C. w) Asset-backed securities.** (pp. 91-93). *An asset-backed security has some other asset as collateral. Mortgage-backed bonds are one form of asset-backed security, but the collateral can also be merchant receivables, auto loans, or other assets.*

**SS 14. 1. C. x) Special purpose vehicles in asset-backed securities transactions.** (pp. 92-93). *If corporation A wishes to issue securities using receivables as collateralization, the bond issue will generally not be rated higher than that of firm A itself. This is because default on any obligation of firm A can trigger default, and all of the assets of firm A, including the receivables, are at risk. Firm A can, however, set up a separate corporation, B, and sell the receivables to that firm. In this case, Firm A no longer owns the receivables, and bonds secured by those receivables are not threatened by bankruptcy of firm A. Because the receivables are not threatened by bankruptcy of firm A, firm B can potentially receive a higher credit rating than firm A on bonds issued using the receivables as collateral. The role of the special purpose vehicle, then, is to shield the assets from the other creditors of firm A.*

**SS 14. 1. C. y) Reasons for asset-backed securities** (p.92). *The motivation to issue asset-backed securities instead of corporate bonds or medium-term notes is the lower interest cost which would accompany the higher credit rating of the asset-backed security.*

**SS 14. 1. C. z) Eurobonds, global bonds, and sovereign debt.** (pp.93-97). *As follows:*

- a) *Foreign bonds – a bond that is issued and subsequently traded in a market which is not the issuing firm’s country of domicile. E.g., “Yankee bonds,” which are bonds issued and traded in the US by a British firm.*
- b) *Eurobonds – Eurobonds are bonds that are:*
  - *issued by an international syndicate.*
  - *at issue are offered simultaneously to investors in several countries..*
  - *issued outside the jurisdiction of any single country.*
  - *in unregistered form.*
- c) *Global bonds are debt obligations that are issued and traded in both the US “Yankee bond” market and the Eurobond market.*
- d) *Sovereign debt is debt issued by central governments of countries.*

**SelfTest Question:** Relate “credit risk” to default.

**Suggested Answer:** “Credit risk” is the uncertainty arising from the level of, and changes in the level of, the probability that the issuer of a security will meet all of the obligations of the issue in a timely manner. Note that this includes not only the level, but changes on the level of that probability, since any changes in credit risk will be reflected in the price of the security and will affect return. The condition of default is only part of credit risk – credit risk is based on the probability of default, not on its occurrence. Short of default, there may also be delays in meeting obligations. Finally, even in default, there may be partial recovery of principal and interest or even delayed full recovery.

#### **D. “Understanding Yield Spreads,” Ch. 4 (Level I)**

Since risk is an important determinant of the return investors will require on a security, the yield on a security is usually compared to that of a the highest-quality security available – US Treasury bonds – by computing the “spread.” This chapter discusses the concepts and difficulties of various spread measures.

1. It is important to understand that, although treasury securities are used as the standard of comparison, they are not risk free. The exposure to various types of risk varies, but it is only credit risk that is totally eliminated by holding treasuries.
2. The Treasury yield curve is constructed from the yields of “on-the-run” (most recently issued) treasury securities.
3. The “yield spread” is the difference between the yield of two securities. This spread may be taken with respect to the treasury yield, or as a spread within (intramarket) or between (intermarket) various bond market sectors. It can be measured as an absolute amount, a relative amount, or a ratio. “Credit spreads” are spreads based on differences in credit quality.
4. The presence of embedded options complicates the interpretation of spread, and alternate methods of computation are available. The spreads discussed at Level I are “nominal spreads,” calculated directly from observed yields without any adjustment to reflect the effects of embedded options.
5. Spread will also reflect the liquidity of an issue.
6. The tax treatment of municipal bonds affects the yield. The spread to treasuries of municipal bonds is typically measure as a ratio.
7. Outside the US, yield spreads may be based on various government issues.

**SS 14. 1. D. a) Central bank interest rate tools.** (pp. 115) *Generally, there are four tools:*

*a) open market operations – influencing supply and demand by buying and selling government securities.*

*b) the discount rate – changing the rate that banks must pay to borrow funds to meet reserve requirements.*

*c) bank reserve requirements – changing the reserve that banks must maintain against loans.*

*d) verbal persuasion – attempts to influence the willingness of banks to supply credit.*

**SS 14. 1. D. b) Risks associated with U.S. Treasury securities.** (pp. 116). *The risks are:*

*a) interest rate risk – the effect in changes in the level of yields,*

*b) call and prepayment risk – the uncertainty about the actual life (actual cash flows) of a security,*

*c) yield curve risk – the effect of changes in the shape of the yield curve,*

- d) reinvestment risk – the uncertainty about the rate at which cash flows can be reinvested,
- e) note that there is no credit risk for treasury securities (although other risks remain),
- f) liquidity risk -treasuries are highly liquid ( but there are differences between the liquidity of on-the-run and off-the-run treasuries), while other issues may be less liquid,
- g) exchange-rate risk (for non-US investors) – the uncertainty of value in the investors currency,
- h) volatility risk –the volatility of rates for the particular issue ,
- i) inflation (purchasing power) risk,
- j) event risk.

**SS 14. 1. D. c) Treasury yield curve – construction and observed shapes.** (pp. 117-121). As for any yield curve, the treasury yield curve is the relationship between the yield of and the maturities of on-the-run treasury bonds. There are three general types of yield curve shapes:

- a) upward sloping (sometimes called the “normal” yield curve) – longer maturities, higher yields,
- b) inverted yield curve – longer maturities have lower yields,
- c) flat yield curve – the yield is the same across maturities.

The securities used to construct the yield curve are on-the-run treasury securities. Note that on-the-run maturities are only available for 3 month, 6 month, 1 year, 2 year, 5 year, and 30 years maturities. At other maturities, the yield is found through interpolation.

**SS 14. 1. D. d) Treasury spot rates.** (p.122). A spot rate is the discount rate on a zero coupon security, the treasury spot rate is the rate on a zero-coupon treasury security.

**SS 14. 1. D. e) Term structure of interest rates.** (p.122). The “term structure of interest rates” is the relationship between spot rates and maturities for treasury securities.

➔ **Note the difference between “yield curve” and “term structure of interest rates.” There is only one “term structure of interest rates,” which applies to the spot rates for treasury securities.**

There are many “yield curves,” which apply to yields for different types of securities.

**SS 14. 1. D. f) Spread product and a spread sector.** (p.122). Spread is often measured with respect to or relative to treasury securities. Following that practice, non-treasury bond sectors are called “spread sectors,” and bonds in those sectors are called “spread products.”

**SS 14. 1. D. g) Types and computation of yield spread measures.** (pp.122-123). With respect to the spread of bond A, measured with respect to or relative to bond B (i.e., bond B is the “benchmark” bond):

- a) yield spread = yield on bond A – yield on bond B
- b) relative bond spread is the proportional difference between the yields:

$$\text{relative yield spread} = \frac{\text{yield on bond A} - \text{yield on bond B}}{\text{yield on bond B}}$$

c) yield ratio is:

$$\text{yield ratio} = \frac{\text{yield on bond A}}{\text{yield on bond B}}$$

**SS 14. 1. D. h) Relative yield spread vs. absolute yield spread.** (pp. 123). The reason that relative spread or the yield ratio may be a better measure of spread is that the magnitude of a spread is affected by the level of interest rates.

**SS 14. 1. D. i) Major sectors of the bond market.** (p.124). The major sectors of the bond market for US investors are:

- a) US government,
- b) US government agencies,
- c) municipal,
- d) corporate,

- e) mortgage,
- f) asset-backed securities,
- g) foreign.

**SS 14. 1. D. j) Intermarket and intramarket sector spreads.** (p. 124) “Inter” means “between,” while “intra” means “within.” An intermarket spread is a spread between two securities of the same maturity but from different bond market sectors. An intramarket spread is a spread between two bonds from the same bond market sector.

**SS 14. 1. D. k) Credit spreads and the well-being of the economy.** (pp.125-126). The “credit spread” or “quality spread” is the yield spread between treasury and non-treasury securities that are identical except for credit rating. The suggested relationship between credit spreads and the well-being of the economy is that credit spreads become wider in a declining or contracting economy, and narrower during economic expansions. The rationale is that in a declining or contracting economy there is more stress, a higher chance of inability to service debt, and greater importance of quality.

**SS 14. 1. D. l) Embedded options and yield spreads.** (p. 126-129). The effect of the embedded option depends on whether it is favorable to the investor or to the issuer. Options favorable to the issuer indicate that the security should have a higher yield and so a larger spread, while options favorable to the investor indicate that the security should have a lower yield and so a smaller spread. I.e., call and prepayment features are favorable to the issuer, so that investors require a higher yield on the security, resulting in a higher yield spread. Put and conversion features favor the investor, resulting in a lower required yield and smaller yield spread.

**SS 14. 1. D. m) Nominal spread and bonds with embedded options.** (p.128). A nominal spread is simply the unadjusted observed spread. There are two problems with a nominal spread:

- i) it is computed at only on maturity, ignoring the term structure of interest rates.
- ii) it fails to adjust for embedded options (or for other differences). I.e., the spread is affected by the presence of options, but nominal spreads simply provide an overall figure.

**SS 14. 1. D. n) Option-adjusted spread and bonds with embedded options.** (p.128) As noted above, nominal yield spreads are an overall measure that includes a spread for the underlying bond and a spread from the option. The option-adjusted spread removes the spread arising from the option feature, allowing a comparison to other non-option bonds.

**SS 14. 1. D. o) Liquidity and yield spread.** (p. 129). It should come as no surprise that investors will require higher yields for less liquid securities, so that spreads will widen as liquidity decreases. This is due to the greater uncertainty.

**SS 14. 1. D. p) Issue size, liquidity, and yield spread.** (p.129). Larger size is associated with greater liquidity and so with smaller spread.

**SS 14. 1. D. q) Yield on treasury securities and tax-exempt municipal securities.** (p.130). The before-tax yield on tax-exempt municipal securities will be lower than the yield on treasuries, because the cash flows from treasuries are taxable. The after-tax yield on the municipals would be higher than the after-tax yield on treasuries, reflecting the greater risk.

**SS 14. 1. D. r) After-tax yield of a taxable security and the tax-equivalent yield of a tax exempt security.** (pp. 130-131). The after-tax yield of a taxable security is computed as:

$$\text{after-tax yield} = \text{pre-tax yield} \times (1 - \text{marginal tax rate}).$$

The tax-equivalent yield is the yield required on a taxable security so as to have the same after-tax yield as the non-taxable security:

$$\text{tax - equivalent yield} = \frac{\text{tax - exempt yield}}{1 - \text{marginal tax rate}}$$

**SS 14. 1. D. s) What technical factors might affect the yield spread?** (p.133). *Technical factors are those factors that cause temporary imbalance in the supply / demand relationship. An example would be a temporary over-supply of issues within a market sector.*

**SS 14. 1. D. t) Yield spread between non-US government bonds and US government bonds as nominal spread.** (p.133) *It is a “nominal spread” because it fails to take into account the exchange rate risk.*

**Selftest Question:** Why is the “on the run” treasury yield curve used as the basis of comparison? How is the yield curve derived?

**Suggested Answer:** Although the “on the run” treasury yield curve does not reflect riskless securities, it does reflect a minimum required rate of return for comparison purposes, and has no credit risk. The “on the run” curve is used because it is the lowest yield – any non-Treasury bond or off-the-run treasury must have a higher yield. The curve is actually derived by observing the yield at five maturities, and then interpolating.

## **2. Investment Analysis and Portfolio Management ,” 6<sup>th</sup> edition, Frank K. Reilly and Keith C. Brown (Dryden, 2000)**

### **A. “Alternative Bond Issues.” (Ch. 15)**

**SS 14. 2. A. a) Bond types (US).** (pp. 524-533). *There are several bond types:*

- a) *Mortgage bonds are collateralized by a first-mortgage lien on some specified property. Note that these are different from “Mortgage Backed Bonds,” (MBSs), which are bonds collateralized by a pool of mortgages.*
- b) *Collateralized Mortgage Obligations (CMOs) are, like pass-throughs, collateralized by a pool of mortgages, with the bondholders receiving the principal and interest payments on the mortgages. Unlike pass-throughs, the principal and interest payments are not divided pro-rata among the bondholders, but are rather divided into various “tranches” according to some specified scheme. The “tranches” are in effect securities having varying maturities and characteristics that may appeal to a wider range of investors .*
- c) *Asset-Backed Securities (ABSs) include Mortgage Backed Securities, but the term is usually applied to securities that are collateralized by credit assets other than mortgages – examples include car loans (CARs) and credit-card debts.*
- d) *International bonds are of two types:*
  - i) *Foreign Bonds – issues sold primarily in one country and currency by a borrower of a different nationality.*
  - ii) *Eurobonds – issues underwritten by international bond syndicates and sold in several different national markets. Note that the “Euro” prefix does not mean that these issues originate or are sold or are traded only in Europe. The Euro prefix is an historical anachronism, held over from the beginnings of this market in Europe.*

**SS 14. 2. A. b) Corporate bond markets.** (pp. 524-532) *These differ somewhat:*

- a) *The corporate bond market in Japan is made up of industrial/utility bonds (10% of the overall market), and bank bonds (18% of the overall market (the balance is made up of government bonds). The corporate bond market is regulated by the non-governmental “Kisaikai,” operating*

*under the authority of the Ministry of Finance and the bank of Japan. The Kasaikai fixes the coupon on corporate bonds with reference to government bonds so as to avoid any competition with the government bond market. The Ministry of Finance sets issuing standards and rotates the lead-underwriting position among the big four securities firms.*

*Bank bonds are issued by banks in order to raise funds.*

- b) The German corporate bond market is also a combination of pure corporate bonds and bank bonds, although bank bonds predominate. Bond types include:
  - i) Mortgage bonds*
  - ii) Commercial bonds collateralized by loans or by a public-sector entity.*
  - iii) "Schuldscheindarlehen," private loan agreements that are sold or divided among several investors.**
- c) UK corporate bonds are available as debentures, unsecured loans, and convertible bonds. These may be offered through public offerings or through private placements.*

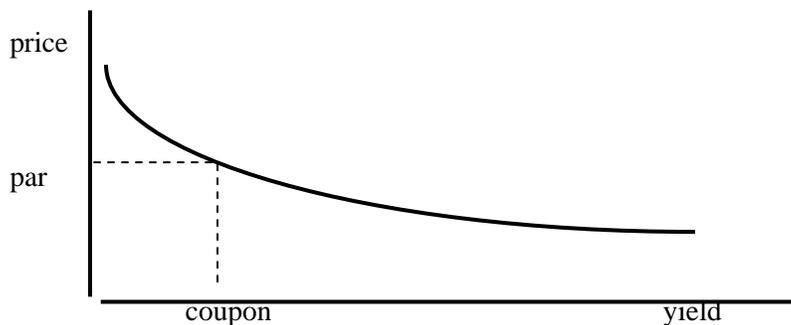
**Study Session 15**  
**Asset Valuation**  
**Debt Instruments: Analysis and Evaluation**

1. *Fixed Income Readings for the Chartered financial Analyst Program, Level I and II Readings, Frank J. Fabozzi, ed., (Frank J. Fabozzi Associates, 2000).*

**A. “Introduction to the Valuation of Fixed Income Securities,” Ch. 5**

This chapter discusses the valuation of fixed income securities. While the basic concept is relatively simple, application to more complex bonds reflects the complexity of the bonds.

1. The general principle of valuation is that of other financial assets: determine the amount necessary to recreate the cash flows (the present value) at a rate reflecting the risk of the asset. This requires three steps:
  - a) estimate the expected cash flows,
  - b) determine the appropriate discount rate,
  - c) calculate the present value.
2. For more complex bonds, or bonds with embedded options, the projection of the expected cash flows is complex.
3. The question of the discount rate depends on the risk, but also on the time of the cash flow.
4. The price-yield relationship for an option-free bond is a convex curve:



The bond is priced at par when the yield is equal to the coupon rate.

5. The price of the bond will converge to the principal amount at maturity.
6. US bonds typically pay interest semiannually. In computing the present value, it is necessary to double the number of annual periods and divide the yield by two.
7. Present value calculations give the “full price” or value of the bond – i.e., the price of the bond including any accrued interest. The accrued interest is deducted to find the “clean” price of the bond.
8. The traditional approach to bond valuation uses a single discount rate for all cash flows, regardless of timing. A more correct method is to discount the cash flows at a rate which depends on the timing of the cash flow. The rates used in this approach (the “arbitrage free” approach) for a Treasury security are the Treasury “spot” rates – i.e., the rate applicable to a zero maturing at the time of the cash flow.
9. Note the difference between a “yield curve,” which is the relationship between yield and maturity, and the “term structure of interest rates,” which is the Treasury spot rate curve. There are many possible yield curves, but only one term structure of interest rates.

10. The approach of discounting the cash flows at the Treasury spot rates is termed arbitrage-free because at the price found by this approach, there will be no profit in buying treasury securities for “stripping” (or in reconstituting stripped Treasury securities)..
11. When the approach of discounting the cash flows at the Treasury spot rates is applied to non-treasury securities, a yield spread is added to reflect the additional risks. When the benchmark spreads for a given credit rating and market sector are added to the Treasury spot rate curve, the resulting term structure is referred to as the benchmark spot rate curve or the benchmark zero-coupon rate curve.
12. More general models, such as the binomial model or the Monte Carlo model, are used to value securities with embedded options.

**SS 15. 1. A. a) Fundamental principle of bond valuation.** (p.148). *The principle of bond valuation is that the value of any asset is the present value of the cash flows – i.e., the amount necessary to exactly recreate the cash flows from the bond if invested at the discount rate.*

**SS 15. 1. A. b) Steps in the valuation process.** (p. 148). *The three steps are:*

- a) *Estimation of the expected cash flows,*
- b) *Determination of the appropriate interest rate (or interest rates) to be used in discounting.*
- c) *Calculation of the present value of the cash flows.*

**SS 15. 1. A. c) Bond cash flows.** (p. 148). *The cash flow of the bond has three components:*

- a) *periodic cash flows or interest payments (may be zero for a “zero-coupon” bond),*
- b) *repayment of principal,*
- c) *any premiums such as call premiums.*

**SS 15. 1. A. d) Difficulty in estimating the expected cash flows for bonds.** (pp. 148). *There may be difficulties in estimating the cash flows to a bond if:*

- a) *either the issuer or the investor can change the contractual date of principal repayment (callable bonds, puttable bonds, mortgage-backed securities, asset-backed securities),*
- b) *the coupon rate is reset periodically (floating-rate securities),*
- c) *the investor can convert the bond into common stock (convertible bonds, exchangeable bonds).*

**SS 15. 1. A. e) Bond discount rates.** (pp. 149). *In traditional bond valuation models, all cash flows are discounted at the same interest rate. This single discount rate is composed of, at a minimum, the market rate on a discount-free cash flow (taken as the yield on US treasury securities). For bonds that are not default-free, a premium is added to reflect risk (the yield spread). This use of a single discount rate is widely applied, but since each cash flow has different timing, it is more appropriate to use an interest rate specific to that cash flow (this is covered in later material).*

**SS 15. A. f) Value of a bond.** (pp. 149-150). *The present value of any cash flow at a discount rate  $i$  is:*

$$\text{present value of cash flow at period } t = \frac{\text{cash flow at period } t}{(1+i)^t}$$

*Present value functions are built into the calculators allowed in the exam, the candidate is urged to obtain a calculator and learn how to use it. The allowed calculators are the HP12C and the BAI Business Analyst.*

**SS 15. 1. A. g) Effect of discount rate increases or decreases on bond value.** *The change in the value of a bond is opposite the direction of the change in discount rate (yield). I.e., an increase in discount rate (yield) results in a drop in price, a decrease in discount (yield) results in an increase in price.*

**SS 15. 1. A. h) Bond price and time to maturity.** (pp. 152). *Whatever the price of the bond at the moment, at the time of maturity its value is equal to par. Thus:*

- a) *If the bond value is above par (bond is at a premium), price will decrease maturity approaches..*
- b) *if the bond is at par, the price will remain the same as maturity approaches.*
- c) *In the bond value is below par (bond is at a discount), the price will increase as maturity approaches.*

➔ **Note that these rules assume that the discount rate (yield) does not change.**

**SS 15. 1. A. i) Value of a zero-coupon bond.** (pp. 157-158). *The value of a zero-coupon bond is:*

$$\text{value of an N - year zero - coupon bond} = \frac{\text{maturity value}}{(1 + i)^{N \times 2}}$$

➔ **Although this is the formula given in Fabozzi, it requires some explanation. It assumes that the discount rate  $i$  is a semiannual rate, which is why the  $(1 + i)$  term is raised to the  $N \times 2$  power instead of the  $N$  power. Note, however, that interest rates (yields) are usually given as a bond equivalent annual rate, i.e., twice the semiannual rate. Be very careful to note whether the discount rate is specified as a semiannual rate. If the rate is not specifically stated as a semiannual rate, assume it is an annual rate! This will require dividing by two to get the semiannual rate!**

**Note that the convention of quoting bond equivalent rates is actually an error – the true annual rate is given by:**

$$\text{true annual rate} = (1 + \text{semiannual rate})^2$$

**Unfortunately, we are stuck with this convention, and you will have to learn it!**

**SS 15. 1. A. j) Dirty price, accrued interest, and clean price of a bond.** (pp.158-159). *This is actually a fairly complex problem, with three steps.*

- a) *Compute the fraction of the period that remains (referred to as “w” in Fabozzi). The problem here is that there are two conventions used in the US:*

*- Treasury securities use actual/actual. I.e., the fraction of the period that has passed is:*

$$\text{fraction of period, treasury security} = \frac{\text{actual days since last payment}}{\text{actual number of days between periods}}$$

*Computing the number of days this way is relatively straightforward, although often confusing.*

*- All other US bonds use a “30/360” convention, i.e., a 360-day year made up of two 180-day semiannual periods or twelve 30-day months. To find the number of days remaining in a month, subtract the number of days elapsed in the month from 30. E.g., if it is the 14<sup>th</sup> day of the month, there are 16 days left in the month. If it is day 14 of the month, and the next payment is three months from now on the 5<sup>th</sup>, the number of days until the next payment would be:*

$$\begin{array}{r} \text{days left in this month} = 30 - 14 = 16 \\ \text{days in the next two months} = 3 \times 30 = 60 \\ \text{days in last month} \quad \quad \quad \underline{5} \\ \text{total days until next payment} \quad \quad \quad 81 \end{array}$$

*Assuming a 180-day period between payments,  $81/180 = 0.45$  or 45% of the period remains.*

- b) *The “full” or “dirty” price is computed as the present value of the payment. This is the normal computation, except that it involves fractional periods. E.g., in the example above, for the first payment would be 0.45 semiannual periods away and the present value of that cash flow would be:*

$$\text{present value of first cash flow} = \frac{\text{amount of first cash flow}}{(1 + i)^{0.45}},$$

*and so on.*

c) Compute the accrued interest and the “clean” price of the bond. The ‘full’ or “dirty” price of the bond included the full amount of the next interest payment. Only part of that payment is rightfully yours, i.e., the interest that accrued up to the purchase date belonged to the previous owner. The full price of the bond was actually made up of two parts. One part was a payment of the accrued interest to the previous owner, while the other part (the “clean price”) was the actual bond price.

“dirty” price = “clean” price + accrued interest.

The accrued interest is computed by multiplying the semiannual interest payment by the fraction of the period that has passed. E.g., in the example above, 45% of the period remains, so that  $1 - 0.45 = 0.55$  or 55% of the period has passed:

accrued interest = semiannual interest  $\times$  0.55

Note here that the accrued interest is computed on a simple interest basis – I.e., compounding is ignored. Finally, the clean price is computed by subtracting accrued interest from bond price:

“Clean” price = “dirty” price – accrued interest.

**SS 15. 1. A. k) Deficiency of the traditional approach to bond valuation.** (p.162). The deficiency of the traditional approach to valuation in which each cash flow is discounted at the same discount rate, is that it does not provide a price which would eliminate the possibility of arbitrage – of purchasing the security and “stripping” the individual payments for individual sale at prices which would, in total, exceed the price of the bond. I.e., it does not provide an “arbitrage-free” price.

**SS 15. 1. A. l) Arbitrage-free valuation approach using Treasury spot rates.** (pp.163-164). In the arbitrage-free valuation approach, each cash flow is discounted at the treasury spot rate for that particular maturity.

**SS 15. 1. A. m) Stripping, reconstitution, and arbitrage-free value.** (pp.165-167). If the price of the bond is less than the sum of the present value of the cash flows discounted at the spot rates, it would be possible to arbitrage – to purchase the bond and sell off the individual cash flows of zero-coupon bonds at a total price greater than the price of the bond. Conversely, if the price of the bond is above the sum of the discounted present values of the cash flows, it would be possible to arbitrage by reconstituting the bond – i.e., to purchase and recombine the individual cash flows (or the zero-coupon bonds representing those cash flows) – and sell them at the higher bond price. Clearly, market pressures would force the prices to the point where this was no longer possible.

**SS 15. 1. A. n) Arbitrage profit.** (pp. 165-167). If the price of the bond is less than the sum of the present value of the cash flows discounted at the spot rates, the dealer can purchase the bond and sell off the individual cash flows at a total price greater than the price of the bond. Conversely, if the price of the bond is above the sum of the discounted present values of the cash flows, the dealer can arbitrage by reconstituting the bond – i.e., to purchase and recombine the individual cash flows – and sell them at the higher bond price. The profit is computed as the difference between the bond price and the sum of the prices if the individual cash flows.

**SelfTest Question:** How are the discounts rates in the arbitrage free approach different from those in the traditional approach, and how are those discount rates obtained?

**Suggested Answer:** The discount rate used in the traditional approach is a constant for all maturities, while the discount rates used in the arbitrage free approach are specific to a specific maturity. The arbitrage free discount rates are obtained from the treasury spot rate curve, with a yield spread added to reflect the risk over that of treasuries. The yield spread will reflect such variables as maturity, credit rating, market sector, and other relevant variables.

## **B. “Yield Measures, Spot Rates, and Forward Rates,” Ch. 6.**

Yield measures must make assumptions about the expected cash flows and the reinvestment rates of those cash flows. This chapter discusses yield measures, and goes on to consider the yields over future periods.

1. There are a number of traditional yield measures, those discussed are current yield (of limited usefulness) and yield to maturity
2. Bond yield quotes are typically based on the “bond-equivalent yield.” This yield is computed by first computing the semiannual yield, and then multiplying by two to annualize. Although the standard, it ignores reinvestment and understates the actual yield.
3. Yield to maturity assumes:
  - a) all interim cash flows can be reinvested at the yield to maturity,
  - b) the bond is held to maturity.
4. For callable bonds there are a number of “yield to” (e.g., yield to first call, yield to worst) which can be computed. This is computed as a yield to maturity, except that the cash flows are those that would occur if the bond were called.
5. Computing the yield of mortgage-backed securities is more difficult because the prepayment option makes the cash flows harder to estimate.
6. Treasury bills are quoted on a discount basis, and must be converted to price before the discount yield is computed.
7. Unfortunately, there are no Treasury zeros longer than one year. Spot rate for longer periods can be calculated using a sequential “bootstrapping” method in which the prices of zeros are inferred from the observed prices of sequentially longer coupon bonds.
8. The “nominal” spread is the difference between the yield of a security and the yield of a treasury of the same maturity. Nominal spread is inadequate in that it is based on only one point on the yield curve (and that it ignores the effect of embedded options). An improvement is the “zero volatility spread,” which is the (constant) spread that, when added to the treasury spot curve, will equate price and present value. It is superior because it considers the entire yield curve, rather than a single maturity point (note that zero volatility spread still ignores the effect of embedded options).
9. The Option Adjusted Spread (OAS) is meant to solve the problem of the zero-volatility spread, i.e., it considers the effect of embedded options on the cash flows from a bond. OAS, however, is model dependent, since assumptions must be made about the future path of interest rates and the effect of interest rates on the embedded options.
10. Spot rate were defined as the discount rate on a zero of the given maturity. Forward rates are the rates between successive spot rates – i.e., the rate to be obtained over some future period. The forward rate can be computed as the ratio of the compounded spot rates at the start and the end of the forward period, while conversely the spot rate can be computed as the compounding of the forward rates over the maturity of the spot rate.

**SS 15. 1. B. a) Sources of bond returns.** (p. 186). As follows:

- a) *coupon interest payments – the periodic scheduled payments on a non-zero coupon bond.*
- b) *capital gain / loss – the increase or decrease in the bond price from the purchase price.*
- c) *reinvestment income – the return on the reinvestment of the scheduled payments.*

**SS 15. 1. B. b) Traditional yield measures for fixed-rate bonds.** (pp. 187-198). As follows:

a) The current yield is computed as:

$$\text{current yield} = \frac{\text{annual dollar coupon interest}}{\text{price}}$$

b) Yield to maturity is the internal rate of return on the bond – the discount rate which will set the present value of the cash flows equal to the price.

➔ **Note that there is not a closed-formula solution to the yield to maturity – it is an iterative process of sequential approximations. The answer is most often an approximate solution. If you use a calculator, the calculator solution is also an approximation – but the error is smaller than the number of significant digits shown on the calculator! The reason that the calculator usually takes a while to come up with the answer is that it also uses an iterative process.**

c) Yield to first call is also an internal rate of return, but now the cash flows are those that would occur if the bond were called at the first possible call date.

d) Yield to first par call date is also an internal rate of return, but now the cash flows are those that would occur if the bond were called at the first possible date at which the bond can be called at par.

e) Yield to put date is also an internal rate of return, but now the cash flows are those that would occur if the bond were put (back on the firm) at the first possible date at which the bond can be put back on the firm.

f) Yield to worst: this is the lowest rate of return from among all possible call dates, put dates, or yield to maturity.

g) Cash Flow Yield is simply the yield to maturity of an asset-backed security, based on the projected cash flows.

**SS 15. B. c) Treasury Bill yields.** (pp. 200-201). Treasury Bills are discount instruments – they make no interest payments, and the investor makes a return because the bills are sold at less than maturity value. The convention is to quote T-Bill yields on a “discount basis.” This “discount basis yield” is actually not a yield, but is instead a discount from face value annualized to a 360 day basis using simple interest:

$$\text{discount basis yield} = \left( \frac{\text{maturity value} - \text{price}}{\text{maturity value}} \right) \left( \frac{360}{N_{SM}} \right),$$

where  $N_{SM}$  is the number of days between settlement (purchase) and maturity. This “discount basis yield differs from the true yield in three ways:

a) true yield should be based on price, not maturity value.

b) the yield should be annualized by compounding, not by simple interest.

c) the annualization should be based on a 365 (or 366) day year, not on a 360 day year.

Fabozzi indicates that the conversion to a true yield is “complex and beyond the scope of this chapter.”

We can assume that the true yield conversion will not be covered, but it is actually rather simple and straightforward:

a) undo the incorrect annualization procedure – multiply by  $N_{SM}/360$ .

b) correct the basis from maturity value to price – multiply by (maturity value)/price.

c) compound on a 365 day basis – add 1, raise to the  $N_{SM}/365$ , remove the 1.

The result is:

$$\text{true yield} = \left( \text{discount yield} \times \frac{N_{SM}}{360} \times \frac{\text{maturity value}}{\text{price}} \right)^{\frac{N_{SM}}{365}}$$

**SS 15. 1. B. d) Underlying assumptions and the limitations of traditional yield measures.** (pp. 187-198). As follows

- a) Current yield – fails to consider both capital gain / loss and return on reinvestment.
- b) Yield to maturity assumes that all cash flows from coupon payments can be reinvested at the yield to maturity (which is unlikely!), and that the bond is held to maturity.
- c) Yield to call assumes that the investor will hold the bond until the specific call date, and that the issuer will recall the bond on that date.
- d) Yield to put assumes that the investor will hold the bond until the specific call date, and that the holder will put the bond on that date.
- e) Yield to worst assumes that the investor will hold the bond until the specific call/maturity/put date, and that the issuer/holder will recall/redeem/put the bond on that date
- f) Cash Flow Yield is based on projected cash flow, and requires assumptions about the prepayment rate.

➔ **Note that yield to maturity, yield to first call, yield to put, yield to worst, and cash low yield are all internal rates of return. Although not yet stated in Fabozzi, all internal rate of return measures assume reinvestment of cash flows at the internal rate of return. Further, all of the measures assume that the cash flows will be as stated – i.e., no defaults or interruptions in cash flows. Note also that yield to maturity ignores the presence of embedded options (call or put), assuming that the call or put feature is not exercised.**

**SS 15. 1. B. e) Importance of reinvestment income in generating yield.** (pp. 189-192). The yield to maturity assumes that the coupon payments are reinvested at the yield to maturity. If the coupon payments are reinvested at some lower rate, the ending wealth will be lower and the investor will have received less than the (promised) yield to maturity. On the other hand, if the coupon payments are reinvested at a rate higher than the yield to maturity, the ending wealth will be higher and the investor will have received more than the (promised) yield to maturity..

**SS 15. 1. B. f) Reinvestment income required to generate yield.** (p. 189-192). The reinvestment income needed to generate the yield computed at the yield to maturity would be the future value of the coupon payments at the maturity date, compounded at the yield to maturity. This can be computed by first using the formula for the future value annuity factor:

$$\text{future value annuity factor} = \left[ \frac{(1+i)^n - 1}{i} \right],$$

where  $n$  is the number of (usually semiannual) periods, and  $i$  is the reinvestment rate, and then multiplying the factor by the coupon payment. I.e.,

$$\text{reinvestment income} = \text{coupon payment} \times \text{future value annuity factor}.$$

The future value annuity factor could also be obtained from a “future value annuity” table. Or, most simply, you could use a calculator to compute the future value of the coupon payments.

**SS 15. 1. B. g) Factors that affect reinvestment risk.** (p193). The factors affecting reinvestment risk are:

- i) The maturity of the security. The longer the time until maturity, the longer the compounding period, and the greater the reinvestment risk.
- ii) The coupon rate. The higher the coupon rate, the larger the amount that must be reinvested, and the higher the reinvestment risk.

**SS 15. 1. B. h) Bond equivalent yield.** (pp 193). “Bond equivalent yield” is computed on a simple interest basis – i.e., ignoring compounding (reinvestment of cash flows). For a semiannual-pay bond, the bond equivalent yield is found by computing the semiannual yield, and then multiplying the semiannual yield by 2. The “yield on an annual-pay basis” takes account of the compounding (reinvestment of cash flows) through the following formula:

$$\text{yield on an annual - pay basis} = \left[ \left( 1 + \frac{\text{yield on a bond - equivalent yield basis}}{2} \right)^2 - 1 \right]$$

or:

$$\text{yield on an annual - pay basis} = \left[ (1 + \text{semiannual yield})^2 - 1 \right]$$

Note that this quantity must be multiplied by 100 to get back to percentage terms.

➔Note that other texts may refer to the “yield on an annual-pay basis” as the “true” yield or “correct” yield.

**SS 15. 1. B. i) Discount margin.** (pp. 198-199). The discount margin is “the average margin over the reference rate that the investor can expect to earn over the life of the security.” Alternately, is the rate that, when added to the reference rate, sets the present value of the cash flows to the price of the security. There are two drawbacks to the discount margin: it assumes that the reference rate will remain constant over the life of the security, and it ignores any caps or floors on the security.

**SS 15. 1. B. j) Bootstrapping.** (pp. 201-204). The spot rate for a given maturity is the rate on a zero-coupon bond. Since there are no treasury zeros beyond one year, however, it is necessary to “impute” what the rate on a zero would be. The process has two steps:

a) Convert the observed price on a coupon treasury security to the price of a zero coupon of the same maturity treasury security by subtracting the present value of the coupon payments from the price. I.e.,

$$\text{price of } n\text{-period zero} = \text{price of } n\text{-period coupon bond} - \text{PV}(\text{coupon payments})$$

b) Use the converted price to impute the return on a zero. I.e.,

$$\text{imputed zero rate} = \left( \frac{\text{maturity value of coupon bond}}{\text{converted zero price}} \right)^{1/n} - 1$$

In calculating the present value of the coupon payments, it is necessary to discount using the spot rate for the time of the cash flow – i.e., the present values are computed along the spot rate curve itself. Because of this, it is necessary to “bootstrap” – to sequentially compute spot rates beginning at the short end and then using the computed spot rates to find the spot rate for the next-longest maturity.

➔Note that you must be very careful to use semiannual and annual rates and periods correctly. Unless otherwise stated, a rate is an annual rate on a bond equivalent yield basis: to get the semiannual rate divide by two.

**SS 15. 1. B. k) Value of a bond using spot rates.** (pp. 214-216). This is sort of buried in the “Valuation using Forward Rates” section. To compute the value of a bond using spot rates, the present value of any cash flow is computed using the spot rate for the time of the flow.

**SS 15. 1. B. l) Limitations of the nominal spread.** (p.128). A nominal spread is simply the unadjusted observed spread. There are two problems with a nominal spread:

a) it is computed at only on maturity, ignoring the term structure of interest rates.

b) it fails to adjust for embedded options (or for other differences). I.e., the spread is affected by the presence of options, but nominal spreads simply provide an overall figure.

**SS 15. 1. B. m) Zero-volatility spread.** (pp. 205-206) *The zero volatility spread (“z-spread” or “static spread”) is the constant spread that, when added to the treasury spot rate and used to discount the cash flows of a security, will produce a present value of the cash flows equal to the price. I.e., the present value of the cash flows, discounted at the treasury spot rates plus the constant static spread, will equal the price of the security. It is superior to the nominal spread because it considers the term structure of interest rates, whereas the nominal spread is computed at only one point, ignoring the term structure.*

**SS 15. 1. B. n) Computing zero-volatility spread.** (p.205). *The zero-volatility spread is computed by iteration, i.e., different values are tried until a spread which produces a present value (approximately) equal to the price is found.*

**SS 15. 1. B. o) Zero-volatility spread vs. nominal spread.** (p. 206). *The nominal spread is computed at only one point, whereas the zero-volatility spread is computed at various points along the term structure. If the term structure is not flat, the two will generally differ.*

**SS 15. 1. B. p) Option-adjusted.** (p.208). *Both the nominal spread and the zero-volatility spread ignore the presence of embedded options. Option-adjusted spread recognizes the presence of the embedded option by adjusting the cash flows to the security to reflect the embedded option. It is important to recognize that the option-adjusted spread is model-dependent – i.e., the result is dependent on the model used to reflect the effect of the option on the cash flows.*

*The implied cost of the option can be obtained by calculating the difference between the OAS and the zero-volatility spread. I.e., the zero-volatility spread reflects the effects of the term structure, but not of the option, while the OAS reflects both the effect of the term structure and the effect of the term structure:*

$$\text{option cost} = z\text{-spread} - \text{OAS}.$$

**SS 15. 1. B. q) Nominal spread and option risk.** (p. 209). *Note that since option cost = z-spread – OAS, it is also true that:*

$$z\text{-spread} = \text{OAS} + \text{option cost}.$$

*In many cases the difference between the z-spread and the nominal spread is very small, so that we can use the z-spread as an approximation of the nominal spread, so that:*

$$\text{Nominal spread} \approx \text{OAS} + \text{option cost}.$$

*Since the nominal spread has two components, a high nominal spread might be the result of a small OAS and a large option cost.*

**SS 15. 1. B. r) Forward rates.** (p. 210). *A forward rate is the rate expected to apply over some specified future time period. Note that the forward rate specification has two components: the rate and the time period over which it will apply. Use of forward rates provides a more accurate bond pricing model:*

$$\text{bond price} = \frac{I_1}{1 + S_1} + \frac{I_1}{1 + S_1} + \frac{I_1}{1 + S_1} + \dots + \frac{I_1}{1 + S_1} + \frac{P}{1 + S_T},$$

*Where  $I_t$  refers to the interest payment at period  $t$ ,  $S_t$  refers to the spot rate (see the following LOS) at period  $t$ , and  $P$  is the principal amount of the bond.*

**SS 15. 1. B. s) Forward rate and spot rates.** (p. 213-214). *The spot rate is simply the compounding of the forward rates over the maturity. I.e.,*

$$\begin{array}{ccc} \text{time 0} & \text{6 mos.} & \text{1 year} \\ I \text{-----} > I \text{-----} > I \\ \text{forward rate} & & \text{forward rate} \\ \\ I \text{-----} > I \\ \text{spot rate} & & \end{array}$$

**SS 15. 1. B. t) Spot rates from forward rates.** (p. 213-214). *The spot rate is simply the compounding of the forward rates over the maturity. I.e.,*

*one-year spot rate – [(1 + first six-month forward rate)(1 + second six-month forward)] – 1,*

*or:*

$$\text{one-year spot} = [(1 + f_0)(1 + f_1)] - 1,$$

*where  $f_n$  is the forward rate over  $t$  periods beginning at period  $n$ . E.g., if the forward rate over the first six months is 6%, and the forward rate over the second six months is 8%, the one-year spot rate will be  $[1.06 \times 1.08] - 1 = 0.1448 = 14.48\%$ . To find the spot rate, compound the forward rates!*

**SelfTest Question:** Contrast the weaknesses of the nominal spread, the zero volatility spread, and the Option Adjusted Spread (OAS).

**Suggested Answer:** The nominal spread does not consider the yield curve – i.e., it is only measured at one specific maturity – and does not consider the effect of embedded options. The zero volatility spread does consider the yield curve, but it also ignores the effect of embedded options. The OAS considers the yield curve and the effect of embedded options, but is model-dependent – i.e., the OAS may vary from model to model.

## C. “Introduction to the Measurement of Interest Rate Risk,” Ch. 7.

This chapter considers the ways in which risk can be measured, and relates risk to bond characteristics.. The concepts presented here will be found in most books on the subject, but the specific measures and definitions vary from author to author.

1. There are two approaches to measuring interest rate risk: the “full valuation” or “scenario analysis” approach, and the duration / convexity approach.
2. The full valuation approach uses the revaluation of a bond under various interest rate scenarios.
  - a) This approach is difficult and cumbersome for larger portfolios and larger numbers of scenarios.
  - b) This approach is useful for examining extreme scenarios in “stress testing.”
3. There are several rules concerning the relationship between price changes and yield changes:
  - a) Price and yield are inversely related.
  - b) For small changes in yield, price changes are roughly symmetrical.
  - c) For large changes in yield, price changes are not symmetrical
  - d) For the same change in yield, the price increase (from a yield decrease) is greater than the price decrease (from an increase in yield).
4. For a callable bond the call price forms an upper boundary, and the price – yield relationship will lie below the price-yield relationship for a comparable non-callable bond and will exhibit negative convexity over some range of lower interest rates.
5. For a puttable bond, the put price forms a lower boundary, and the price-yield relationship will be flatter at higher yields and will lie above the price-yield relationship for a comparable non-puttable bond.
6. Duration is an *approximate* measure of bond price sensitivity to yield changes. More specifically, it is the approximate percentage change in price for a 100 basis point change in yield.

➔ **Note that in previous readings, this was called “modified” duration, and was defined in terms of Macauley duration, while “duration” was defined as Macauley duration. Macauley duration is no longer treated. “Modified” duration now has a different meaning discussed below.**

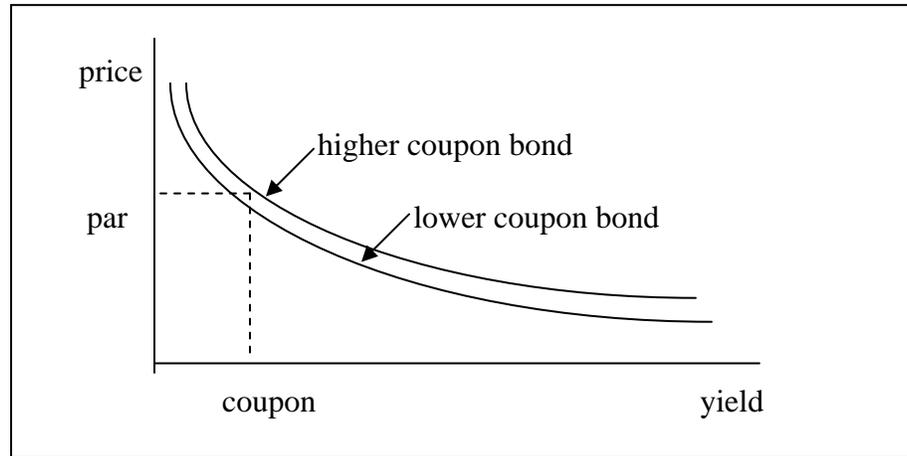
Duration is estimated by varying the yield up and down from the starting yield (referred to as “rate shocks”), computing the % price change, and adjusting to the percent price change for 100 basis points total change.

7. Given the duration, the percent price change can be estimated for a given change in yield. Note that this approximates the convex price-yield relationship as a straight line. Thus, graphically (and with some license), the duration can be represented as a tangent to the price-yield relationship. Because of this approximation, the “rate shocks” should be of reasonable size.
8. “Modified” duration is now defined as duration computed without including the effects of embedded options.  
➔ **Note that this is a slightly different definition of “modified” duration than previous readings. Modified duration in previous readings also ignored embedded options, but this was not the central focus of the definition.**
9. The duration of a portfolio is the value-weighted average of the durations of the bonds in the portfolio..
10. Convexity is a measure of the curvature of the price-yield relationship.
  - a) Convexity is estimated in a manner similar to the estimation of duration.
  - b) Convexity is used to calculate a correction to the duration based estimate of price change that reflects the curvature of the relationship.
  - c) Note that the definition of convexity differs among authors / users, so that it is necessary to use consistent measures to avoid scaling problems.
11. Effective convexity is calculated in the same manner as modified convexity, except that the model used to estimate price change includes the effects of embedded options.  
➔ **Note that this is again a change of definition from previous readings.**
12. An alternate measure of price sensitivity is the “price value of a basis point.” It is the absolute value of the change in price for a one basis point change in yield. It is quite similar to duration, except based on a smaller yield change.

**SS 15. 1. C. a) Full valuation approach, duration/convexity approach, and interest rate risk.** (pp. 244-247) *The full valuation or “scenario analysis” approach requires the revaluation of a bond or bond portfolio for a given interest rate change scenario. When the approach is applied to extreme scenarios it is called “stress testing.” The duration/convexity approach gives a single measure that indicates how the value of a bond or bond portfolio will change when rates change in parallel fashion. The full valuation approach is the recommended approach since it is more accurate and can deal with more complex situations, whereas the duration/convexity approach assumes parallel changes in a flat yield curve. The duration/convexity approach is often used because it is easier to apply.*

**SS 15. 1. C. b) Interest rate risk exposure of a bond position or of a bond portfolio.** (p. 246). *The approach here is the full valuation approach - calculate the price change for each individual bond, sum the price changes, and divide by the original price to find the percent change in the value of the bond or the value of the portfolio.*

**SS 15. 1. C. c) Price volatility of option-free bonds.** (pp. 247-249). *This is best explained graphically:*



*This is the relationship between price and yield for an option-free bond. Important points:*

a) Bond prices move oppositely to yield – i.e., yield up, price down; yield down, price up. The percent change in price (for a given change in yield) is not the same for all bonds.

b) For small changes in yield the percent price change is approximately the same (except for sign) whether rates increase or decrease (by the same amount).

c) For large changes in yield, the percent price change is not the same for an increase in yields as for a decrease in yields (of the same size). E.g., ceteris paribus, bonds with higher coupon will have smaller percent price changes.

d) For a given large change in yield, the percent price increase is greater than the percent price decrease (for the same size yield change).

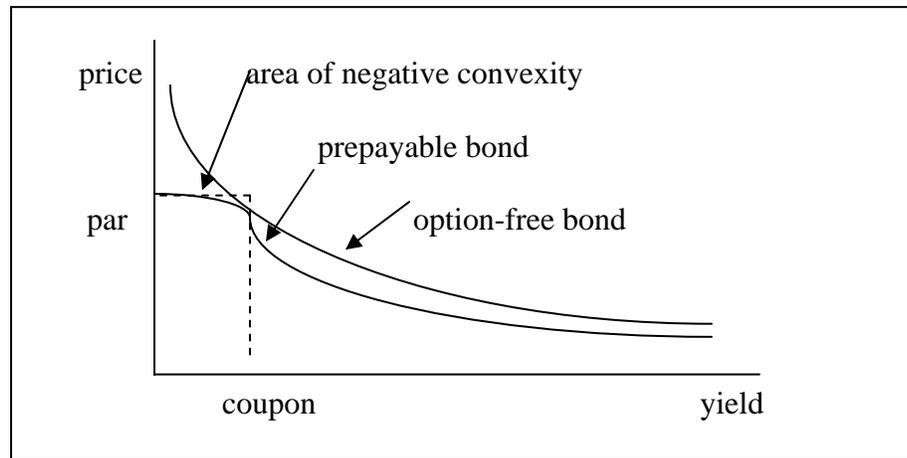
➔ **Note – The above rules are way overly complicated. Actually, the percent price increase is always greater than the percent price decrease, assuming the same size increase or decrease. It is just that for small changes in yield, the difference is small enough to be ignored! Note also that “small” and “large” increases are not defined!**

*The last point – that the increase is larger than the decrease – is the “convexity” or curvature of the price / yield relationship: as yield decreases, the price increases at an increasing rate. I.e., if yield decreased in equal steps, the price would increase, and each increase would be larger than the previous increase.*

**SS 15. 1. C. d) Price volatility of callable bonds and prepayable securities.** (pp. 251-254). *For callable bonds, the probability of call increases as yields decrease, and become a virtual certainty if yields decrease below the point at which the bond value is above par. The par (or call) price of the bond thus becomes an upper limit the price of the security. Similarly, as the mortgage rates decline toward the mortgage rate for the mortgage pool, it becomes more likely that mortgagees will be able to refinance their mortgages. They will refinance by in effect exercising their call option, prepaying the existing mortgage. The effect on mortgage-backed securities is not as direct as the effect of the call option on bonds, but is similar: price appreciation when yields decline is limited. The same reasoning applies to other prepayable securities.*

*The effect on the price-yield relationship is relatively negligible if yield are high, since the probability of decline to a yield level triggering the price limit is low. As yields decrease, however, the probability begins to increase and the effect on the price-yield relationship becomes increasingly significant. The*

price of the prepayable security will not increase as fast as the price of a similar option-free security. This is shown below:



Alternately, the value of the callable bond can be thought of as the value of an option-free bond minus the value of the option. As yields decrease, the value of the call option increases. The difference between the price of the option-free bond and the price of the callable bond will increase. Note that as yields decline, at some point the curve for the prepayable security will change from increasing at an increasing rate to increasing at a decreasing rate. I.e., the direction of the curvature changes. This is referred to a “negative convexity” (*not* as concavity).

**SS 15. 1. C. e) Computing duration.** (pp. 255- 256). The formula is:

$$\text{duration} = \frac{V_- - V_+}{2(V_o)(\Delta y)}$$

where:  $V_-$  = price if yields decline by  $\Delta y$

$V_+$  = price if yields increase by  $\Delta y$

$V_o$  = original price

$\Delta y$  = change in yield (as decimal)

Note that this assumes equal yield changes on either side of the original yield. It is easily thought of as the % change in the price if the yield changes by 100 basis points.

➔Note that this is not the definition of duration given in previous Fabozzi readings, and may also be different from the definition of duration used by other authors. In previous Fabozzi readings, the quantity defined above was referred to as “effective duration.” As will be seen below, duration as defined here is classified into “modified duration” and “effective duration” depending on how the  $V_+$  and  $V_-$  are generated.

**SS 15. 1. C. f) Approximate percentage price change for a bond.** (pp. 256-258). Since the definition of duration used here is the price change for a 100 basis point change in yield, all that is required is to find the change for the given change in  $y$ . The exact formula depends on how the change in  $y$  is measured. If the change is given in basis points, multiply negative duration by the number of basis points change in  $y$ , divided by 100. E.g., a 50 basis point change in yield for a bond with a duration of 7 years would result in a  $(50 \times 7) / 100 = 3.5\%$  change in price. OR, if the change in  $y$  is expressed in % (as in 8% to 8.5%), multiply negative duration by the % change. E.g.,  $(8.5 - 8.0) \times 7 = 3.5\%$  change in price. OR, if the change in  $y$  is expressed in terms of a decimal (as in 0.080 to 0.085), multiply negative duration by the decimal change in  $y$  and multiply by 100. E.g.,  $(0.085 - 0.080) \times 7 \times 100 = 3.5\%$  change in price.

➔Note you don't have to get upset trying to keep the decimals straight – just remember that duration is the % change for a 100 basis point change in yield, and place the decimal accordingly. I.e., the percent price change for a 50 basis point yield would be  $\frac{1}{2}$  X duration, for a 25 basis point change  $\frac{1}{4}$  X duration, for a 37 basis point change 0.37 X duration.

**SS 15. 1. C. g) Modified duration and effective duration.** (pp. 262) Duration had been previously defined as the % change in the value of a bond for a 100 basis point change in yield. This definition is now broken into two versions:

- modified duration: the % change in the value of a bond for a 100 basis point change in yield assuming that the cash flows to the bond are unchanged.
- effective (or option-adjusted) duration: the % change in the value of a bond for a 100 basis point change in yield, taking into account the effect of embedded options. Note that this assumes the application of some model of valuation.

**SS 15. 1. C. h) Effective duration, modified duration, and bonds with embedded options.** (pp. 262-263). Modified duration ignores the effect of the embedded options, and is incorrect when embedded options are present.

**SS 15. 1. C. i) Interpretation of duration.** (pp 263-265).

- Duration can be (roughly) interpreted as the first derivative of the price / yield relationship. Fabozzi does not feel that this interpretation allows any insights.
- Duration can also be thought of as a measure of the “maturity” of the bond. More accurately, it is the “present-value weighted average time of receipt of funds.” Fabozzi feels that this makes it “difficult for managers and their clients to understand the duration of some complex securities.”

The result is that Fabozzi stresses the definition that duration is the percent change in the value of a portfolio for a 100 basis point change in yield.

➔It is important to note that this is Fabozzi's personal opinion, and that many other authors would disagree! For purposes of the exam, however, .....

**SS 15. 1. C. j) Computing convexity.** (pp. 267). This is computed similarly to the duration – i.e., the yield is increased or decreased symmetrically about the original value, and the “convexity” is computed from the price changes as:

$$\text{convexity} = \frac{V_+ + V_- - 2V_0}{2V_0(\Delta y)^2},$$

where:  $V_-$  = price if yields decline by  $\Delta y$

$V_+$  = price if yields increase by  $\Delta y$

$V_0$  = original price

$\Delta y$  = change in yield (as decimal)

**SS 15. 1. C. k) Estimated percentage price change, using both duration and convexity.** (p.268). The estimate is the duration-based estimate of price change plus the convexity adjustment:

$$\begin{aligned} \text{Total estimate of price change} &= \text{duration-based estimate} + \text{convexity adjustment} \\ &= [- \text{duration} \times \Delta y] + [\text{convexity} \times (\Delta y)^2] \end{aligned}$$

Note that the duration-based estimate may be positive or negative, but the convexity adjustment is always positive.

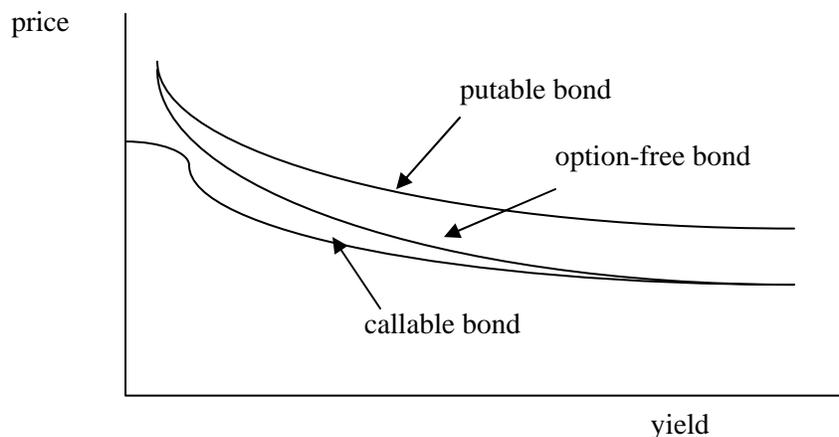
**SS 15. 1. C. l) Modified convexity and effective convexity.** (pp. 271). Modified convexity assume that the cash flows of the security do not change when yield changes (i.e., an option-free security), while effective convexity takes into account the effects of embedded options on the cash flows to the security.

**SS 15. 1. C. n) Price value of a basis point.** (p.271-272). A “basis point” is 1/100 of a percent (0.01 % or 0.001). The price Value of a Basis Point is simply the price change if yield changes by one basis point. Since duration is the % price change for a 100 basis point change in yield:

$$\text{price value of a basis point} = \text{price} \times \frac{\text{duration}}{100}$$

**SelfTest Question:** On one diagram, draw the price-yield relationship for an option-free, a callable, and a puttable bond. Approximating duration as the slope of the relationship, discuss the relative durations of the three bonds as yield varies.

**Suggested Answer:**



At high yields, the callable bond will have a duration similar to that of the option-free bond, but as yields decline the duration of the callable bond will not increase as rapidly. At yields approaching the yield at the call price, the duration of the callable bond will begin to decrease.

The duration of the puttable bond will always be less than the duration of the option-free bond, but the difference will become smaller as yield decreases. At low yields, the puttable bond will have a duration similar to that of the option-free bond.

**2. Fundamentals of Investing, 8<sup>th</sup> edition, Lawrence J. Gitman and Michael D. Joehnk (Addison Wesley, 2002).**

### Bond Valuation and Analysis, Ch. 10

**SS 15. 2. a) Theories of the term structure.** (pp. 418-423). There are three general theories of the term structure of interest rates:

- a) *The Expectations Hypothesis holds that the term structure depends on expectations as to future interest rates. I.e., if interest rates are expected to increase in the future, investors will not accept today’s low rate on longer bonds, and if interest rates are expected to decrease, borrowers will not pay today’s higher rates. Gitman and Joehnk indicate that interest rates are dependent on a base rate plus any expected inflation effect, and suggest that the shape of the term structure is thus*

*primarily a result of inflation expectations – most authors simply point out that the term structure depends on expectations*

- b) The Liquidity Preference Theory holds that all things being equal, investors will prefer the less risky/less volatile shorter maturities. A premium must be offered in order to induce investors to give up liquidity and invest in longer maturities.*
- c) The Market Segmentation theory holds that investors will have different maturity preferences (an explanation is the desire to match the maturity/duration of assets and liabilities), and will be reluctant to invest at other maturities. As a result, the market is not a continuous single market, but a series of segmented markets of different maturities. Within each market segment, the interest rate is set by the supply and demand for loanable funds at that maturity.*

**SS 15. 2. b) Implications of term structure theories.** (pp. 418-423). *From each of the theories:*

- a) Since the Expectations Theory is based on future interest rates, a rising yield curve implies increasing interest rates (increasing inflation), while a decreasing yield curve implies decreasing interest rates.*
- b) Under Liquidity Preference, the yield curve should be “somewhat” increasing. Outside of this, Liquidity Preference says little about implications. Liquidity preference is often combined with Expectations in judging the implications of the yield curve.*
- c) Market Segmentation makes implications, not about expected rate, but about the supply and demand of loanable funds. A high interest rate in a given segment would indicate a low supply relative to demand, while a low interest rate in a given segment would indicate a large supply relative to demand.*

**2. Quantitative methods for Investment Analysis, Richard A DeFusco, Dennis W. McLeavey, Jerald E Pinto, and David E. Runkle (AIMR, 2001).**

**Discounted Cash Flow Analysis, Ch. 2**

This reading discusses several topics that apply time value of money concepts.

1) U.S. Treasury bills are sold on a discount basis – i.e., they are sold at a discount from face value. T-bills pay not interest – the return comes from the increase from purchase price to maturity value. Unfortunately, there exist several methods of computing the T-bill “return,” based on different choices as to the base on which the return is computed (face value or purchase price), the number of days in a year (360 or 365), and the method of computing interest (simple or compounded).

- a) Bank discount basis ( $r_{BD}$ ) uses the face value as the base, a 360 day year, and simple interest:

$$r_{BD} = \frac{\text{Discount}}{\text{Face Value}} \times \frac{360}{t}$$

Note that this is not an accurate measure of return – it is used as a quotation convention.

- b) Money market yield ( $r_{MM}$ ) uses purchase price as the base, a 360 day year, and simple interest:

$$r_{MM} = \frac{360 \times r_{BD}}{360 - (t \times r_{BD})}$$

- c) Holding period yield (HPY) is the familiar return over the life of the T-bill (it as not an annualized return), using the purchase price as a base:

$$\text{HPY} = \frac{P_1 - P_0 + D_1}{P_0}$$

- d) Equivalent Annual yield is the annualized HPY, using a 365 day year and compounding.

$$\text{EAY} = (1 + \text{HPY})^{\frac{360}{t}} - 1$$

- 2) Similarly to T-bills, zero-coupon bonds are sold at a discount and do not pay interest.

- a) The price is computed as the present value of the maturity cash flow:

$$\text{Price} = \text{PV} = \frac{\text{FV}_N}{(1+r)^N}$$

- b) Conversely, the yield is computed as the discount rate that sets the PV of the future cash flow  $\text{FV}_N$  equal to the price. It would appear that one might simply solve for  $r$  in the above expression. The convention, however, is to quote the return on a bond as a “yield to maturity” (YTM) on a “bond equivalent basis.” Bond equivalent basis is computed by first finding the semi-annual yield, and then annualizing on a simple interest basis by multiplying by two. In the above equation:

$$r = \text{YTM}/2,$$

$$N = \text{maturity in years} \times 2$$

Or

$$\text{Price} = \frac{\text{Maturity Value}}{(1 + \frac{\text{YTM}}{2})^{2N}}$$

Note that the expression is slightly different than the reading – the reading should use  $2N$ , not  $N$ , in the denominator on p. 66.

- c) By using simple interest to annualize, the bond equivalent basis YTM understates the effective yield because it ignores reinvestment of the dividend over the second half of the year. The effective yield is found as:

$$\text{Effective Annual Yield} = (1 + \frac{\text{YTM}}{2})^2$$

- 3) The price of a coupon bond is also found as the present value of the cash flows. This requires specification of the discount rate(s) to be applied to the cash flows. There are two approaches in use:
- a) The arbitrage-free valuation approach treats each cash flow as if it were a zero-coupon bond. Each cash flow is discounted at the “spot rate” – the return on a zero-coupon bond maturing at the time of the cash flow. Note that this is the equivalent of treating a coupon bond as a portfolio of zeros.
- b) The yield to maturity (YTM) approach applies a single discount rate to all of the cash flows from the bond. This YTM is again the rate that would set the present value of the interest payments equal to the price of the bond.
- c) Note once again that YTM is found as twice the semiannual rate of return, whether the bond is semiannual pay or is annual pay. The discount rate is half the YTM, and the number of periods is twice the number of years. The discount factor applied to any payment is:

$$\text{discount factor} = \frac{1}{(1 + \frac{\text{YTM}}{2})^{2N}},$$

where  $N$  is the time of the payment in years.

**SS 15. 2. a) Computing discount yield, holding period yield, effective annual yield, and money market yield.** (pp.61 – 63).

a) bank discount yield is computed as:

$$r_{BD} = \frac{\text{Discount}}{\text{Face Value}} \times \frac{360}{t}$$

b) holding period yield is computed as:

$$HPY = \frac{P_1 - P_0 + D_1}{P_0}$$

c) effective annual yield is computed as:

$$EAY = (1 + HPY)^{\frac{365}{t}} - 1$$

d) money market yield is computed as:

$$r_{MM} = HPY \times \frac{360}{t}$$

Or as:

$$r_{MM} = \frac{360 \times r_{BD}}{360 - (t \times r_{BD})}$$

**SS 15. 2. b) Holding period yield, money market yield, and equivalent annual yield.** (pp. 61-63) It would be easiest to remember that

- a) HPY is the return over a period.
- b) EAY is HPY annualized on a 365 day year using compound interest.
- c)  $r_{MM}$  is HPY annualized on a 360 day year using simple interest.

And use the appropriate formula. However, for completeness, the formulas are:

- d) HPY => EAY: simply use the given formula for EAY.
- e) EAY => HPY: solving the formula for HPY in terms of EAY:

$$HPY = (1 + EAY)^{\frac{t}{365}} - 1$$

Note that this simply converts an annual rate to a rate over a time period.

- f)  $r_{MM}$  => HPY: use the formula given above. Note that this simply annualizes HPY on a simple interest basis.
- g) HPY =>  $r_{MM}$ : Solving for  $r_{MM}$  we get  $HPY = r_{mm} \times (t/360)$
- h) EAY =>  $r_{MM}$  and  $r_{MM} => eay$  require conversion into HPY as the intermediate step.

**SS 15. 2. c) Price and yield to maturity of a zero-coupon bond.** (pp.65-67). This is easily done on a financial calculator. The price is simply the present value of the final payment at the yield to maturity (YTM), while the yield to maturity is simply the discount rate that sets the present value equal to the price. Note that you must have the yield to maturity to find the price, or you must have the price to find the yield to maturity. There is some difficulty because of the way YTM is measured. YTM is always presented as the semiannual yield annualized on a simple interest basis – i.e., multiplied by two. It is necessary to undue the simple interest calculation and then work with semiannual periods. E.G., convert the YTM to a semiannual yield by dividing YTM by two, and convert to semiannual periods by multiplying the number of annual periods by 2. If you are using a calculator this is straightforward.

*There is some chance that you might need to use the formulas, rather than the calculator:*

$$\text{Price} = \frac{\text{final value}}{\left(1 + \frac{\text{ytm}}{2}\right)^{2N}}$$

*and:*

$$\text{YTM} = \left(\frac{\text{final value}}{\text{price}}\right)^{\frac{1}{2N}}$$

*Note that these formulas are slightly different than those in the reading. The reading is inconsistent between formulas, and by N means the number of semiannual periods.*

**SS 15. 2. d) Zero coupon bonds and spot interest rates.** (pp. 67-68). *An N-period “spot” interest rate is simply the YTM on a zero coupon bond maturing at the end of N periods. Nothing more than that!*

**SS 15. 2. e) Spot interest rates valuation of complex debt instruments?** (p. 68). *The spot rate provides a discount rate that can be applied to any cash flow at that date. The present value of each individual cash flow from the complex instrument at the applicable spot rate, and the present values are summed to find the value of the instrument.*

**SS 15. 2. f) Coupon bonds as a portfolio of zero coupon bonds.** (pp. 68-69). *Each cash flow from a coupon bond has a specific date, and regardless of whether the cash flow comes from interest or principal repayment, each cash flow considered individually is exactly like a coupon bond of principal equal to the cash flow, and maturity at the time of the cash flow – i.e., a portfolio of zeros.*

**SS 15. 2. g) Valuation using the arbitrage-free and yield to maturity approaches.** (pp. 68-72). *The “arbitrage-free” approach uses the approach discussed in f) – e.g., each cash flow from the bond is discounted at the applicable spot rate. The yield to maturity approach uses only a single discount rate.*

**SS 15. 2. h) Overvaluation and undervaluation.** *This is not mentioned directly in the reading. All that would be required is to compute the price of the bond using the yield-to-maturity or the spot rate model and compare the computed price to the market price.*

**SS 15. 2. i) Yield to maturity of a coupon bond.** (p. 71-72). *The YTM is the (constant) discount rate that will set the present value of the cash flow equal to the price. Again, you may be asked to compute the yield given the price, or the price given the yield. Since this requires extensive calculation, it is not likely that you would be required to solve for YTM using formulas, although you might be asked to compute price for a very short bond using formulas. That would be a simple time value exercise. On the other hand, this is computed very quickly and easily using a calculator!*

**STUDY SESSION 16**  
**Asset Valuation - Derivative Securities**

**Study Session 16, Robert W. Kolb, *Futures, Options & Swaps*, 3rd. edition: Ch 1, “Introduction,” pp. 1-7.**

1. A financial derivative is a financial instrument whose payoffs (and hence value) depend on another financial security. There are three basic types of financial derivatives:
  - a) Forward and Futures contracts. Forward Contracts and Futures Contracts are simply an agreement to exchange assets at some future time. The differences between forward and futures contracts are that:
    - Futures contracts always trade on an organized exchange; forward contracts are agreements between individuals.
    - Futures contracts are standardized as to the asset, the quantity, the date, and the mechanism of delivery; the terms of a forward contract are determined by the parties to the contract.
    - Performance of the futures contracts is guaranteed by a clearinghouse; performance of a forward contract depends on the parties to the contract.
    - Futures trading requires a “good faith deposit” or margin; forward contracts may not require any such arrangement.
    - Futures markets are regulated by an identifiable government agency; forward contracts trade in unregulated fashion.
  - b) Options are the right to make a decision about an exchange of assets at a specific time and a specific price:
    - A call option is the right to make a decision to purchase (call in) the asset.
    - A put option is the right to make a decision to sell (put) the asset.
    - The seller of the option, called the option writer, gives up the right to decide to the buyer of the option, the option holder.
  - c) Swaps are an agreement between counterparties to exchange sets of cash flows over a future period.
    - Swaps which involve debt instrument payments are called interest rate swaps.
    - Swaps which involve foreign currency payments are called currency swaps.
2. An academic arbitrage opportunity is the opportunity to earn a riskless profit with no investment:
  - a) This opportunity arises because of comparative mispricing between assets.
    - Note that since there is no investment involved, there is no risk.
  - b) In a well-functioning market such opportunities cannot exist.
    - The assumption that no arbitrage opportunities exist is called the “no-arbitrage principle.”
    - The no-arbitrage principle is applied to imply the prices of derivative securities.
    - Application of the no-arbitrage principle represents an idealized world with no market imperfections. Once understanding of pricing in this simple environment has been achieved, a more realistic world of imperfections will be considered.
3. A complete market is a market in which any and all identifiable payoffs can be obtained by trading the securities available in the market.
  - a) Derivatives help move financial markets closer to completeness because they provide access to identifiable payoff that would not be otherwise available, or would not be available as quickly, as easily, or as cheaply.

4. Uses of derivatives include:

- a) Speculation.
  - While often thought bad, speculation is a useful tool for knowledgeable traders who take risks in search of profits.
- b) Conversely, derivatives are an excellent tool for risk control.
  - Derivatives allow the trader to assume risks which will hedge (cancel) existing risks.
- c) By using one or more derivatives, traders can sometimes recreate positions in the underlying assets more quickly, easily, and cheaper than trading in the underlying instruments themselves.

**SS 16. 1. A. a) Derivative instruments, arbitrage opportunities, forward contracts, futures contracts, options (both a put and a call), options on futures, and swaps.** *A derivative instrument is a security whose payoffs depend on another financial instrument or security. An arbitrage opportunity is a chance to make a profit with no investment and no risk. Forward contracts and futures are both agreements to exchange assets in the future, the difference being that the terms and procedures of futures contract are highly standardized and closely specified. An option is the right to make a decision about whether an exchange of assets will be executed - a call option gives the owner of the option the right to buy (call in) the underlying assets, while a put option gives the owner of the option the right to sell (put the assets) the underlying assets. In addition to options on physical assets (options on physicals), options may have financial assets as the underlying asset. Options on futures, for instance, have a futures position as the underlying asset. A swap is simply the exchange of sets of cash flows over some future period.*

**SS 16. 1. A. b) The no-arbitrage principle.** *The no-arbitrage principle is simply the assumption that academic arbitrage (the opportunity to earn a riskless profit with no investment) does not occur - an idealized assumption of perfect markets used to gain an understanding of basic underlying relationships of derivative pricing.*

**SS 16. 1. A. c) Futures contracts vs. forward contracts** *The differences are:*

- a) *Futures contracts always trade on an organized exchange; forward contracts are agreements between individuals.*
- b) *Futures contracts are standardized as to the asset, the quantity, the date, and the mechanism of delivery; the terms of a forward contract are determined by the parties to the contract..*
- c) *Performance of the futures contracts is guaranteed by the a clearinghouse; performance of a forward contract depends on the parties to the contract.*
- d) *Futures trading requires a “good faith deposit” or margin; forward contracts may not require any such arrangement.*
- e) *Futures markets are regulated by an identifiable government agency; forward contracts trade in unregulated fashion.*

**SS 16. 1. A. d) Option buyers vs. option writers.** *An option is the right to decide whether an exchange of assets will occur. The buyer of the option (sometimes called the owner of the option) is the party who purchases the right to make the decision from the seller of the option. The writer of the option (sometimes called to seller of the option) is the party who has sold the right to make the decision to the buyer of the option.*

**SS 16. 1. A. e) Financial derivatives and market completeness.** *A complete market is a market in which any and all identifiable payoffs can be obtained by trading the securities available in the market. Derivatives help move financial markets closer to completeness because they provide access to identifiable payoff which would not be otherwise available, or would not be available as quickly, as easily, or as cheaply.*

**SS 16. 1. A. f) Major applications of financial derivatives.** *Uses of derivatives include:*

- a) *Speculation. While often thought bad, speculation is a useful tool for knowledgeable traders who take risks in search of profits.*
- b) *Conversely, derivative are an excellent tool for risk control. Derivatives allow the trader to assume risks which will hedge (cancel) existing risks.*
- c) *By using one or more derivatives, traders can sometimes recreate positions in the underlying assets more quickly, easily, and cheaper than trading in the underlying instruments themselves.*

**Self Test Question:** Distinguish the three basic types of derivatives.

**Suggested Answer:** Forward and Futures contracts are agreements to exchange assets at some future date. Options are agreements to exchange assets at some future date if the option holder wishes. A swap is an agreement to exchange future cash flows.

**B. Study Session 16, Robert W Kolb, *Futures, Options & Swaps*, 3rd. edition: Ch 2, “Futures Markets,” pp. 12-28.**

- 1) Futures are traded through a system of open outcry, or publicly announced bids and offers.
  - a) The buyer of a futures contract is said to have a long position, while the seller is said to have a short position.
  - b) Exchange members may trade for their own account, or may act as floor brokers, executing trades for non-members.
  - c) In addition to closely specifying the terms of the exchange, the contract also specifies a minimum price fluctuation, or tick, and a maximum daily price fluctuation or daily price limit.
  - d) Traders deposit funds (cash, bank letter of credit, or U.S. Treasury instruments) with the broker as a good-faith deposit. The deposit is referred to as margin. There are three types of margin:
    - Initial margin - this is a deposit that must be made before futures can be traded, and is typically equal to the daily price limit for the contract.
    - At the end of each trading day the margin is marked-to-market, i.e. it is adjusted to recognize the traders gain or loss.
    - Maintenance margin - a lower limit to the amount of margin, typically 75% of the initial margin. If the mark-to-market process results in margin below this limit, the trader will receive a margin call indicating that more funds must be deposited. **NB:** This is different than the way margin is computed on stock exchanges.
    - Variation margin - the additional amount which must be deposited to return margin to the initial margin level when a margin call is received. This deposit must be in cash.
- 2) Traders may be either speculators or hedgers:
  - a) Speculators enter the futures market in search of profit, and is willing to accept risk.
  - b) Hedgers enter the market to reduce their exposure to some preexisting risk.
- 3) Traders may end, or close, involvement in the contract in three ways:
  - a) Delivery: at the end of the contract the trader may accept or make delivery according to the terms of the contract.
    - Few contracts are closed this way.
    - Some contracts allow cash settlement.

- b) Offset: the trader may cancel the contract using a reversing trade in the same contract.
    - A long position is canceled by entering an offsetting short position, a short position by an offsetting long position.
  - c) Exchange-for-Physicals: a simultaneous canceling of futures contracts and trading in the underlying commodity. The process is similar to an offsetting trade but differs in three ways:
    - The process takes place ex-pit, i.e., not on the exchange. This is an exception to the rule that all trading of a contract must take place on the exchange.
    - The trade was privately negotiated - there is no open outcry.
    - In addition to the trading of canceling positions, the physical goods are also exchanged.
- 4) There are four types of futures contracts.
- a) Futures contracts are defined by the underlying asset:
    - Agricultural and Metallurgical Contracts - these include agricultural products (grains, oil and meal, livestock, forest products, textiles, and foodstuffs), metals, and petroleum products.
    - Interest rate futures - Treasury bills, notes, and bonds, Eurodollar deposits, and municipal bonds.
    - Foreign Currencies - there is also an active forward contract market in foreign currencies.
    - Indexes - such as the S&P 500, the New York Stock Exchange index, the Nikkei index, the Nikkei 225, and others. Note that for index futures delivery is in cash, since actual delivery is impossible.
  - b) The terms of a futures contract are standardized:
    - The quantity and the quality of the underlying good are specified.
    - The contract also specifies a minimum price fluctuation or “tick size.”
    - The contract also specifies a daily price limit, which restrict the price movement in a day.
  - c) Standardization promotes liquidity in the futures markets:
    - Because the good being traded is so highly standardized, all participants in the market know exactly what is being offered for sale.
    - Every trader knows exactly the terms of the transactions.
- 5) Futures markets are thought to serve two main social functions:
- a) Price Discovery - the revealing of information about future cash market prices .
    - This is indicated by the relationship between futures prices and the anticipated price of the underlying asset at contract maturity
    - The improved price estimates lead to improved decisions.
  - b) Hedging - Futures contracts allow the hedger avoid the uncertainty / risk of fluctuations in the cost or sale price of the underlying asset.
    - One form of hedging is against inventory actually held at the present time, reducing inventory risk.
    - Anticipatory hedging is hedging against the risk of assets the hedger will holds or need at some future date.

**SS 16. 1. B. a) Speculators vs. hedgers.** *A speculator is a trader who enters the futures market in pursuit of profit, accepting risk in the endeavor; a hedger trades futures to reduce some preexisting risk exposure.*

**SS 16. 1. B. b) Volume vs. open interest.** *When one trader buys and another sells a contract, the transaction generates one contract of trading volume - volume is thus the number of contracts traded in some period of time. Open interest is the number of futures contracts obligated for delivery. The two differ because:*

- a) *The open interest number depends on past trading.*

- b) *Some trades may actually offset, or cancel, previous trades, and so result in a reduction of the number of contracts outstanding for delivery.*

**SS 16. 1. B. c) Standardization of futures contracts and liquidity.** *Terms of a futures contract are standardized:*

- a) *The quantity and the quality of the underlying good are specified.*  
b) *The contract also specifies a minimum price fluctuation or “tick size.”*  
c) *The contract also specifies a daily price limit, which restrict the price movement in a day.*

*Standardization promotes liquidity in the futures markets:*

- a) *Because the good being traded is so highly standardized, all participants in the market know exactly what is being offered for sale.*  
b) *Every trader knows exactly the terms of the transactions.*

**SS 16. 1. B. d) Role of the clearinghouse.** *The clearinghouse takes no active position in the market, but instead interposes itself between all parties to every transaction. After the initial sale is made, the clearinghouse steps in and acts as the seller to the buyer and acts as the buyer to the seller. Thus, the clearinghouse guarantees the buyer of the futures contract that it will deliver at the initially agree-upon time and price, and guarantees the seller that it will accept delivery at the agreed-upon time and price. Because of the clearinghouse, the two parties do not need to trust each other or even to know each others identity. Note: the clearinghouse actually holds no net position, since each long position is offset by a short position.*

**SS 16. 1. B. e) Initial margin, maintenance margin, variation margin, daily settlement (marking to market), and margin call.** *Initial margin is a good-faith deposit which must be made before trading any futures; maintenance margin is a lower limit to the level of margin as time passes; variation margin is the amount which must be deposited in cash if the trader violates maintenance margin and so receives a “margin call.” Daily settlement simply means that all gains and losses are recognized and settled (paid or collected) at the end of each trading day, and is also sometimes referred to as “marking-to-market.”*

**SS 16. 1. B. f) Price triggering a maintenance margin call.** *Maintenance margin is a lower limit to the amount of margin, typically 75% of the initial margin. If the mark-to-market process results in margin below this limit, the trader will receive a margin call indicating that more funds must be deposited. I.e., if the initial margin is  $\$X$ , and the requirement is 75%, the maintenance margin is  $\$(0.75)X$ . The margin at any time is the initial margin of  $\$X$  plus gains or minus losses. Thus, the trader will receive a maintenance margin call if the contract price falls below the original contract price by  $\$0.25X$  or more. If the margin falls below the maintenance margin, sufficient funds must be deposited to bring the margin back to the original level of  $\$X$ .*

**NB:** *This is not the same as the margin calculations on the stock exchanges!*

**SS 16. 1. B. g) Three ways to close a futures position.** *A futures position can be closed by:*

- a) *accepting delivery at maturity, by entering into an offsetting trade,*  
b) *by entering into an offsetting trade.*  
b) *by an exchange-for-physicals (a simultaneous trade of both offsetting futures contracts and the underlying asset arranged off the exchange).*

**SS 16. 1. B. h) Four types of futures contracts.** *The four types are:*

- a) *Agricultural and Metallurgical Contracts: underlying assets are agricultural products, metals, and petroleum products.*  
b) *Interest-earning assets: underlying assets are interest-bearing financial assets, spanning almost the entire yield curve.*  
c) *Foreign currencies: there is a larger forward market.*  
d) *Indexes: mostly on stock Indexes.*

**SS 16. 1. B. i) Purposes of the futures markets.** *The purposes of futures markets are to provide price discovery (provide information leading to better estimates of prices at contract maturity), and to provide a substitute for cash transactions (provide the opportunity to reduce risk through hedging).*

**Self-Test Question: Distinguish** between speculation and hedging, and **explain** which is a significant social function. **Describe** a further social benefit of futures markets.

**Suggested Answer:** Speculation is the acceptance of risk in pursuit of profit, while hedging is the reduction of an existing risk. Speculation is traditionally not regarded as socially useful by itself, although it may have socially useful by-products). Although the traders themselves receive the major benefits of hedging, the benefits are spread more widely because of the enhanced economic activity. A further benefit is price discovery, which provides information and leads to better economic decisions.

**C. Study Session 16, Robert W Kolb, *Futures, Options & Swaps*, 3rd. edition: Ch. 10, “The Options Market,” pp. 281-292 and pp. 295 - 298.**

- 1) A call option gives its owner the right to purchase the underlying asset at a specific price for a specified time; a put option gives its owner the right to sell the underlying asset for a specified price for a specified time.
  - a) The specified price at which the underlying asset will be bought or sold is the exercise price or strike price of the option.
  - b) The price that the purchaser of the option pays is called the option premium.
- 2) An option is sometimes described in terms of “moneyness.”
  - a) A call option is:
    - In-the-money if the price of the underlying asset is above the exercise price.
    - At-the-money if the price of the underlying asset is equal to the exercise price.
    - Out-of-the-money if the price of the underlying asset is below the exercise price.
  - b) A put option is:
    - In-the-money if the price of the underlying asset is below the exercise price.
    - At-the-money if the price of the underlying asset is equal to the exercise price.
    - Out-of-the-money if the price of the underlying asset is above the exercise price.
- 3) Options may be classified as “American” options or “European” options.
  - a) An American option can be exercised at any time.
  - b) A European option can only be exercised at maturity.
- 4) Option price quotes are the price for an option on a single unit of the underlying assets.
  - a) Closing prices are presented in tabular form classified or divided by time of maturity, strike price, and put/call.
  - b) Since a standard stock option contract is for 100 shares of the underlying stock, the option premium is 100 times the stated amount.
  - c) An “s” (skipped) entry in the quote table indicates that this particular combination of strike price, maturity, and put/call has not been listed for trading.
  - d) An “r” entry in the quote table indicates that this particular combination of strike price, maturity, and put/call has been listed for trading, but was not traded on that particular day.
- 5) Options are available on various underlying assets:
  - a) Individual stocks - stock options.
  - b) Various stock price indexes -index options.

- c) Foreign Currency - foreign currency options.
- d) Various types of futures - options on futures.
  - Most options on futures trading is in futures on financial instruments, options on other types of futures are also available.
- 6) Purchase or sale of an option can result in either opening a position or closing a position.
  - a) Purchase of an option in which the trader has no previous position is clearly opening a position. If, however, the trader has an existing short position in the option, the purchase cancels or offsets the previous position and actually closes the position.
  - b) Sale of an option in which the trader has no previous position is clearly opening a position. If, however, the trader has an existing long position in the option, the purchase cancels or offsets the previous position and actually closes the position.
- 7) The clearinghouse essentially guarantees that the options contract will be honored.
  - a) The clearinghouse provides this guarantee by actually interposing itself between the buyer and the seller, in effect becoming the buyer for each seller and the seller for each buyer.
  - b) The clearinghouse also imposes certain margin requirements.
    - Margin is an amount which must be deposited with the clearinghouse, and which will be kept by the clearinghouse if the party to the contract fails to perform.
    - The purpose of these requirements is to:
      - Motivate the parties to the option to meet their obligations, which reduces the nonperformance risk faced by the clearinghouse and helping to ensure that it will be able to perform its guarantee function.
      - Provide at least partial compensation should a party fail to perform, again reducing the nonperformance risk faced by the clearinghouse and helping to ensure that it will be able to perform its guarantee function.

**SS 16. 1. C. a) Rights and obligations of put and call buyers and writers.** *The buyer of a call has the right to decide whether or not to purchase the specified amount of the underlying asset at the strike price. The writer of a call has the obligation to sell the specified amount of the underlying asset at the strike price if so required. The buyer of a put has the right to decide whether or not to sell the specified amount of the underlying asset at the strike price. The writer of a put has the obligation to buy the specified amount of the underlying asset at the strike price if so required.*

**SS 16. 1. C. b) “In-the-money,” “out-of-the-money,” and “at-the-money” for both puts and calls.**

**Find the amount by which an option is in or out of the money.** *An option is “in-the-money” when immediate exercise would lead to a profit - i.e., when the market price of the underlying asset is above the strike price for a call and below the strike price for a put. The amount “in-the-money” is simply the difference between the value of the underlying asset and the strike price (on a per-unit basis). An option is “out-of-the-money” when immediate exercise would lead to a loss - i.e., when the market price of the underlying asset is below the strike price for a call, and above the strike price for a put. The amount “out-of-the-money” is again simply the difference between the underlying asset and the strike price (on a per-unit basis). An option, put or call, is “at-the-money” when the market price equals the strike price.*

**SS 16. 1. C. c) European vs. American call or put options.** *The only difference between a European option and an American option is that the American option may be exercised at any time, but the European option can only be exercised at expiration.*

**SS 16. 1. C. d) Valuation of American options vs. European options.** *Since the only difference between American and European options is the right to early exercise of the American option, the American option is exactly the same as the European option if the owner decides not to exercise the*

*option before expiration. Since the American option can be made exactly the same as the European option, it must be worth at least as much as the European option.*

**SS 16. 1. C. e) Opening and closing a position.** *Purchase or sale of an option can result in either opening a position or closing a position. The four possibilities are:*

- a) Open a position with a purchase.*
- b) Open a position with a sale.*
- c) Close a position with a purchase*
- d) Close a position with a sale*

*Purchase of an option in which the trader has no previous position is clearly opening a position. If, however, the trader has an existing short position in the option, the purchase cancels or offsets the previous position and actually closes the position.*

*Sale of an option in which the trader has no previous position is clearly opening a position. If, however, the trader has an existing long position in the option, the purchase cancels or offsets the previous position and actually closes the position.*

**SS 16. 1. C. f) Role of the options clearinghouse.** *The clearinghouse essentially guarantees that the options contract will be honored.*

- a) The clearinghouse provides this guarantee by actually interposing itself between the buyer and the seller, in effect becoming the buyer for each seller and the seller for each buyer.*
- b) The clearinghouse also imposes certain margin requirements.*
  - Margin is an amount which must be deposited with the clearinghouse, and which will be kept by the clearinghouse if the party to the contract fails to perform.*
  - The purpose of these requirements is to:*
    - Motivate the parties to the option to meet their obligations, which reduces the nonperformance risk faced by the clearinghouse and helping to ensure that it will be able to perform its guarantee function.*
    - Provide at least partial compensation should a party fail to perform, again reducing the nonperformance risk faced by the clearinghouse and helping to ensure that it will be able to perform its guarantee function.*

**SS 16. 1. C. g) Margin for uncovered (naked) options.** *The intent of margin is to reduce the risk of nonperformance faced by the clearinghouse and by extension by all of the market participants. A “covered” call option is one in which the trader holds the underlying asset and puts it on deposit at initiation of the call - effectively guaranteeing performance. A “naked” option is one in which the trader does not deposit the underlying asset. This “naked” trader is required to post margin as a guarantee of performance.*

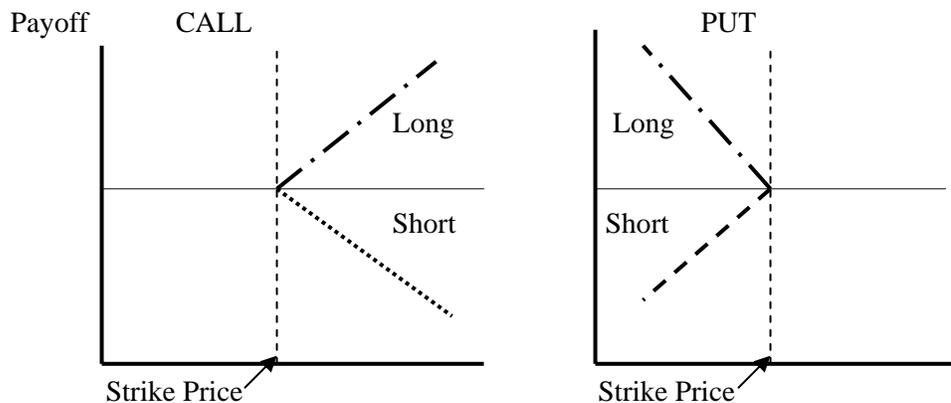
**Self-Test Question: Define** the following terms: a) “exercise (or strike) price,” b) “in-the-money, at-the-money, out-of-the-money,” c) “European” option.

**Suggested Answer:** The “exercise (or strike) price” is the amount that will be exchanged for one unit of the underlying asset if the option is exercised. An option is “in-the-money” if immediate exercise would result in

a profit, “at-the-money” if immediate exercise would result in neither profit nor loss, and “out-of-the-money” if immediate exercise would result in a loss. A “European” option is an option which is exercisable only at expiration.

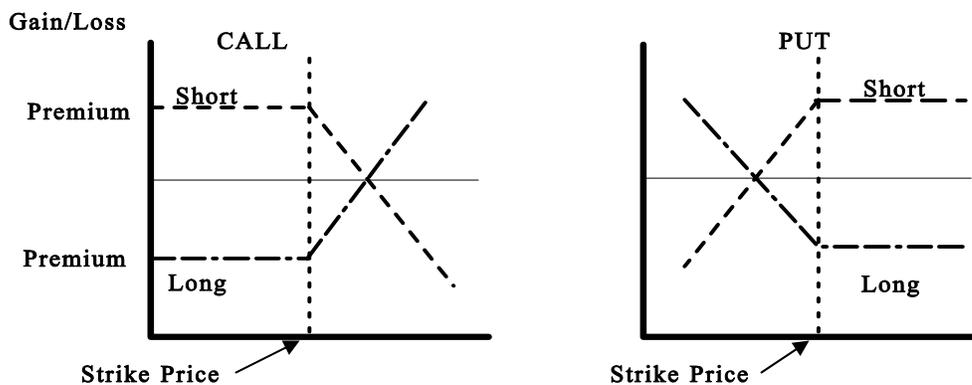
**D. Study Session 16, Robert W Kolb, *Futures, Options & Swaps*, 3rd. edition: Ch 11, “Option Payoffs and Option Strategies,” pp. 304-316 and pp. 335-341.**

- 1) The intrinsic value or exercise value is the value of a long option position if exercised immediately.
  - a) The buyer, if faced with a loss, will choose to let the option expire unexercised, so that the value of the option will be the greater of the intrinsic value or zero.
  - b) At expiration:
    - The intrinsic value of a call is the greater of the stock price  $S_t$ , minus the exercise price  $X$ , or zero:  $C_t = \text{MAX}(0, S_t - X)$ .
    - The intrinsic value of a put is the greater of the exercise price  $X$ , minus the stock price  $S_t$ , or zero:  $P_t = \text{MAX}(0, X - S_t)$ .
    - The intrinsic value of a short position is the negative of the intrinsic value of a long position.
  - c) A call option:
    - Is “in-the-money” and has positive intrinsic value when  $S_T > X$ .
    - Is “at-the-money” and has zero intrinsic value when  $S_T = X$ .
    - Is “out-of-the-money” and has negative intrinsic value when  $S_T < X$ .
  - d) A put option:
    - Is “out-of-the-money” and has negative intrinsic value when  $S_T > X$ .
    - Is “at-the-money” and has zero intrinsic value when  $S_T = X$ .
    - Is “in-the-money” and has positive intrinsic value when  $S_T < X$ .
- 2) The payoffs to put and call positions at expiration, can be diagrammed as:

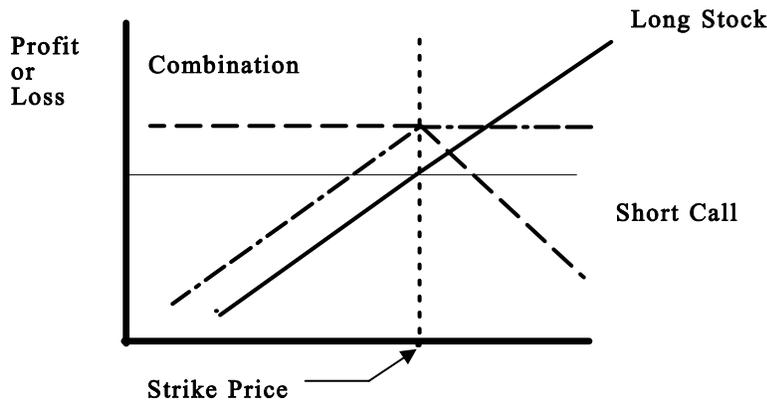


- 3) The profit or loss on the long or short position differs from the payoffs because it includes the premium paid to acquire the position. It is the difference between the purchase price at time  $t$ ,  $C_t$ , and the value at expiration,  $C_T$ .
  - a) For the long call position, the profit/loss is  $C_T - C_t = \text{MAX}\{0, S_t - X\} - C_t$ .
    - The maximum loss for the buyer is the price of the call  $C_t$ .
    - The maximum profit for the buyer is theoretically unlimited, depending on the price of the underlying asset.
    - The call option holder will exercise the call only if the market price of the underlying asset is above the exercise price.
  - b) For the short call position, the profit/loss is  $C_t - C_T = C_t - \text{MAX}\{0, S_t - X\}$ .

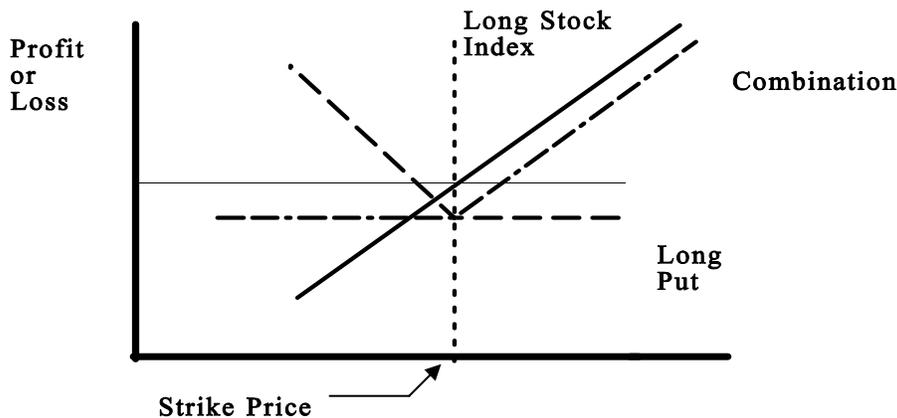
- The maximum profit for the seller is the price of the call  $C_t$ .
  - The seller's loss is theoretically unlimited, depending on the price of the underlying asset.
  - The put option holder will exercise the put only if the market price of the underlying asset is below the exercise price.
- c) The profit/loss of the call buyer is the negative of the profit/loss of the call seller.  
 •This implies that the options market is a zero-sum game.
- d) The profit/loss for the long (buyer) and short (seller) positions can be diagrammed as:



- 4) A “covered call” position is the combination of a short position in the call option and a long position in the underlying asset. the underlying stock.
- a) This strategy is generally undertaken as an income enhancement technique.
- The income is in the form of the premium received for the sale of the option.
  - The intention is to gain the premium without the call being exercised.
  - Stocks with prices far below the strike price are candidates for this strategy.
- b) There is still the chance that the price will increase, causing the option to be exercised.
- Actually, the writer (seller) of the call is trading the chance for large capital gains for the income (the premium) received.
- c) At expiration, the profit/loss to the covered call is the sum of the premium plus any loss on the short call plus the profit/loss on the long stock:
- If the market price of the stock is below the strike price, the short call is not exercised and the profit/loss is the premium plus the profit/loss on the long stock position.
  - If the market price of the stock is above the strike price, the loss on the short call is canceled by the gain on the long stock and the profit is the premium.
- d) The profit or loss to a covered call can be diagrammed as:



- 5) “Portfolio Insurance” is a technique designed to protect against severe drops in the value of a stock portfolio.
- The essence of the technique is the purchase of a put option on an index which is similar to the portfolio.
    - It is assumed that the portfolio is a well-diversified portfolio so that a put on an index will be appropriate.
  - At expiration of the put, the value of the position (portfolio + put) will be:
 
$$S_T + P_T = S_T + \text{MAX}(0, X - S_T)$$
    - The insured portfolio has superior performance when:
 
$$\text{MAX}(0, X - S_t) - P_t - S_t > 0$$
  - The profit or loss to an insured portfolio (portfolio + put) can be diagrammed as:



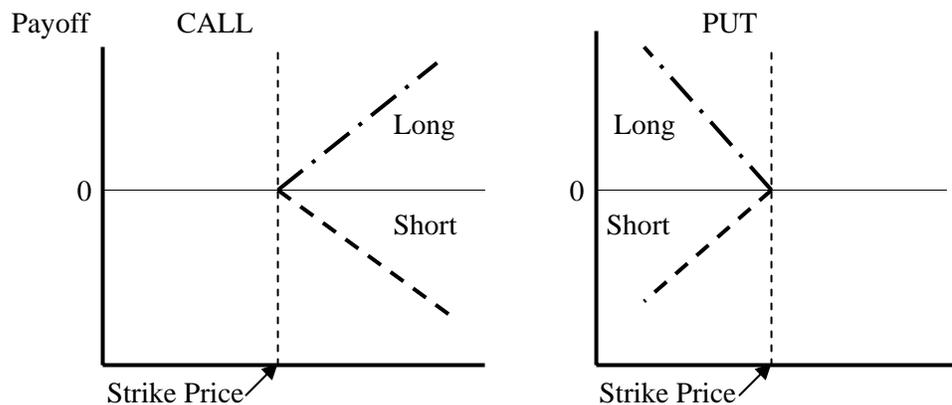
**SS 16. 1. D. a) Intrinsic value and “moneyness” of a put or a call option.** *The intrinsic value of a put or a call option position is the value of the option if exercised immediately. For a call, the intrinsic value is  $S_t - X$ , for a put the intrinsic value is  $X - S_t$ . If the intrinsic value of the option is positive, the option is “in-the-money,” if zero the option is “at-the-money,” if negative the option is “out-of-the-money.”*

**SS 16. 1. D. b) Expiration-day value of a put or a call.** *The expiration-day value of a put or a call is:*

|      |              |              |
|------|--------------|--------------|
|      | $S_t \geq X$ | $S_t \leq X$ |
| Call | $S_t - X$    | 0            |
| Put  | 0            | $X - S_t$    |

**SS 16. 1. D. c) Short vs. long option positions.** *A long position is a position in which a claim to the asset is held or acquired - a buyer is said to assume a long position, and actual possession of an asset is said to be a long position in the asset. A short position is a position in which a claim to the asset is sold or owed - a seller is said to assume a short position, and owing the asset is said to be a short position in the asset. In the case of options, the “asset” being claimed is the right to decide whether or not to exercise. The buyer of the option buys the right to decide, and is said to have a long position, regardless of whether the option is a call or a put. The seller of the option sells the right to decide, and is said to have a short position regardless of whether the option is a call or a put.*

**SS 16. 1. D. d) Expiration-day value diagrams for long call, short call, long put, and short put strategies.** *The values of a put and a call can be diagrammed as:*



*These diagrams indicate that at expiration: a) the payoff to a long position will never be less than zero, the payoff to a short position will never be greater than zero; b) the payoff to a call will be zero when the market price is below the strike price, the payoff to a put will be zero when the market price is above the strike price; the payoffs of long and short positions sum to zero.*

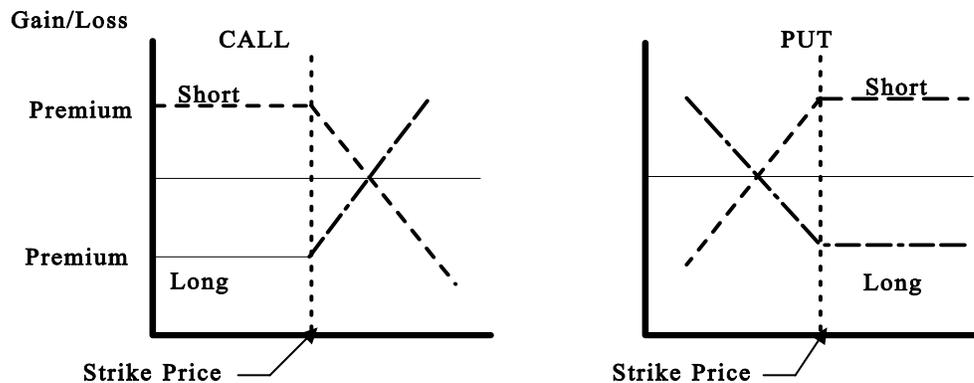
**SS 16. 1. D. e) Expiration-day values of the long call, short call, long put, and short put.** *The expiration-day value of long and short puts and calls are:*

|            |              |              |
|------------|--------------|--------------|
|            | $S_t \geq X$ | $S_t \leq X$ |
| Long Call  | $S_t - X$    | 0            |
| Short Call | $-(S_t - X)$ | 0            |
| Long Put   | 0            | $X - S_t$    |
| Short Put  | 0            | $-(X - S_t)$ |

*Note that the long and short positions are mirror-image.*

**SS 16. 1. D. f) Profit / loss diagrams for long call, short call, long put, and short put strategies.**

Profit / loss diagrams, as opposed to payoff diagrams, include the cost of the premium paid to acquire the option or received to sell the option. The profit/loss for the long (buyer) and short (seller) positions can be diagrammed as:



**SS 16. 1. D. g) Expiration profit / loss for long call, short call, long put, and short put strategies.** The profit on the long or short position is the difference between the purchase price at time  $t$ ,  $C_t$ , and the value at expiration,  $C_T$ .

- a) For the long call position, the profit/loss is  $C_T - C_t = \text{MAX}\{0, S_t - X\} - C_t$ .
  - The maximum loss for the buyer is the price of the call  $C_t$ .
  - The maximum profit for the buyer is theoretically unlimited.
  - The call option holder will exercise the call only if the market price of the underlying asset is above the exercise price.
- b) For the short call position, the profit/loss is  $C_t - C_T = C_t - \text{MAX}\{0, S_t - X\}$ .
  - The maximum profit for the seller is the price of the call  $C_t$ .
  - The seller's loss is theoretically unlimited, depending on the price of the underlying asset.
  - The put option holder will exercise the put only if the market price of the underlying asset is below the exercise price.

**SS 16. 1. D. h) Exercise price of an option from premium and breakeven value. Exercise price of an option, given the breakeven value.** In order for there to be zero profit, the gain per share at expiration must exactly equal the premium per share:

$$\text{gain per share} = \text{premium per share}$$

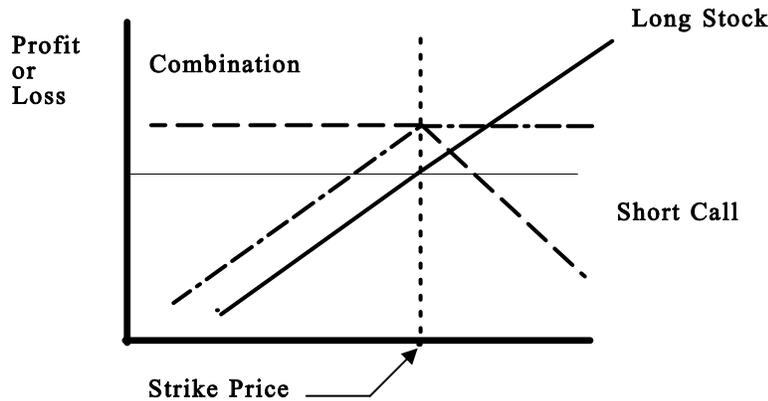
Since gain per share (assuming positive gain) is market price – strike price, we have at breakeven:

$$\text{market price} - \text{strike price} = \text{premium per share}$$

$$\text{strike price} = \text{market price} - \text{premium per share.}$$

**SS 16. 1. D. i) Options market as a zero-sum game.** A zero-sum game is a game in which the sum of the outcomes for winners and losers is always zero - i.e., the outcomes for the winners are the negative of (or mirror image of) the outcomes for the losers. Both the payoff and the profit / loss diagrams for puts and calls indicate that the outcomes do indeed sum to zero.

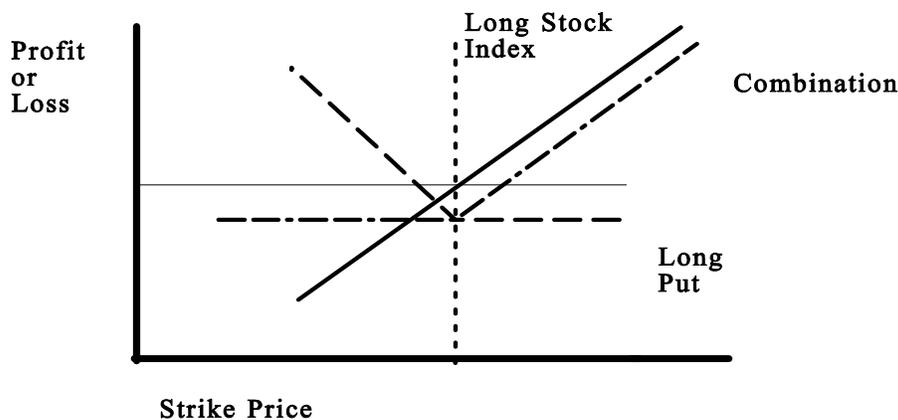
**SS 16. 1. D. j) Profit / loss diagram for a covered call strategy.** A covered call transaction is the sale of a call on an asset held long. The profit / loss for this transaction can be diagrammed as:



- The profit / loss to the covered call strategy is the sum of the profit / loss to the two positions.

**SS 16. 1. D. k) Profit or loss for a covered call strategy.** If the market price of the stock is below the strike price, the short call is not exercised and the profit/loss is the premium plus the profit/loss on the long stock position. If the market price of the stock is above the strike price, the loss on the short call is canceled by the gain on the long stock and the profit is the premium.

**SS 16. 1. D. l) Expiration profit / loss diagram for portfolio insurance.** Portfolio Insurance is a simultaneous holding of a portfolio of stocks and the sale of a put on the portfolio which limits the lower value of the portfolio to the put strike price. The profit/loss to an insured portfolio (portfolio + put) can be diagrammed as:



Portfolio Insurance is designed to protect against severe drops in the value of a stock portfolio.

a) The essence of the technique is the purchase of a put option on an index that is similar to the portfolio.

- It is assumed that the portfolio is a well-diversified portfolio so that a put on an index will be appropriate.

**SS 16. 1. D. m) Profit or loss for an insured portfolio.** At expiration of the put, the value of the position (portfolio + put) will be:

$$S_T + P_T = S_T + \text{MAX}(0, X - S_T)$$

The insured portfolio has superior performance when:

$$\text{MAX}(0, X - S_T) - P_T - S_T > 0$$

**SS 16. 1. D. n) Exercise price of an option, given the breakeven value for a portfolio hedging or covered call strategy.** For the protective put we have:

$$\begin{aligned} \text{Profit} &= \text{profit from put} + \text{gain (or - loss) on long position} - \text{put premium} = 0 \\ &= (X - S_T) + (S_T - S_0) - P = 0 \end{aligned}$$

or:

$$X = -(S_T - S_0) + P + S_T$$

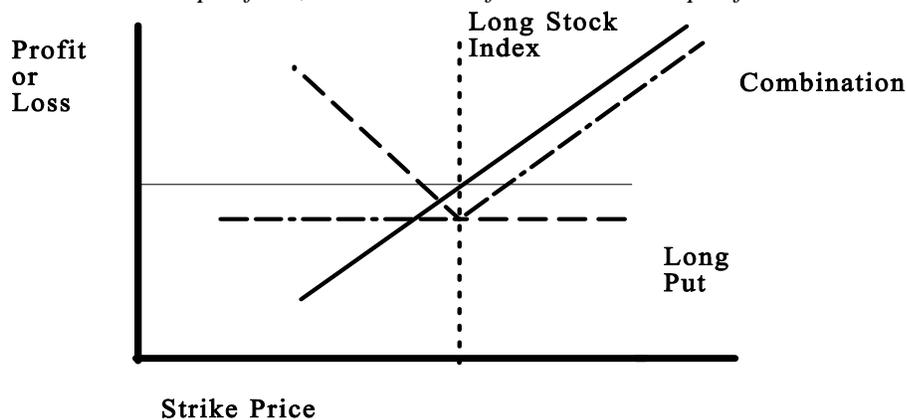
For a covered call:

$$\begin{aligned} \text{Profit} &= \text{profit from call} + \text{gain (or - loss) on long position} + \text{call premium} = 0 \\ &= (S_T - X) + (S_T - S_0) + P = 0 \end{aligned}$$

or:

$$X = (S_T - S_0) + P + S_T$$

**SS 16. 1. D. o) Portfolio insurance and the risk and return of a portfolio.** Portfolio hedging reduces the return to the portfolio, but also sets a floor level to the portfolio:



Note that in the diagram that when the index is above the put strike price, the hedged portfolio (the Combination) has a profit or loss which is less than the return to the unhedged portfolio by the amount of the premium. However, below the strike price the loss to the hedged portfolio does not increase.

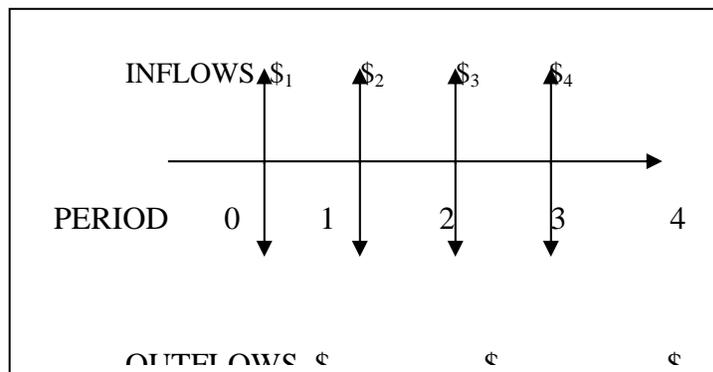
**Self-Test Question:** Explain why the use of portfolio insurance limits losses but allows gains, and why this a portfolio manager might not use this strategy.

**Suggested Answer:** Portfolio insurance limits losses because the put can be exercised at the strike price, guaranteeing a minimum value for the portfolio. A portfolio manager might not want to use this strategy because the premium paid for the put is considered too high in light of the probability of a decrease in portfolio value.

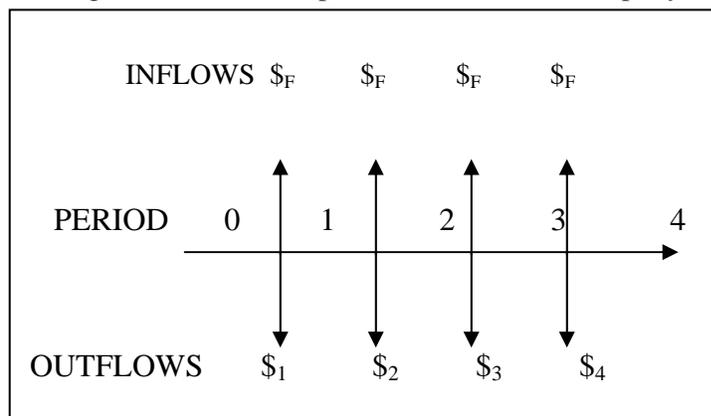
**E. Study Session 16, Robert W Kolb, *Futures, Options & Swaps*, 3rd. edition: Ch. 20, “The Swaps Market: Introduction,” pp. 608 - 619.**

- 1) A swap is an agreement between two or more parties to exchange sets of cash flows over a period in the future.
  - a) The parties that agree to the swap are called the counterparties.
  - b) A swap facilitator is an economic agent who helps the counterparties identify each other and helps the counterparties consummate swap transactions.
  - c) The two basic kinds of swaps are interest rate swaps and currency swaps.
- 2) The swap markets can be contrasted to the option and futures markets across several factors:
  - a) Futures and exchange-traded options have highly specified terms which cannot be altered. Swaps are individually created and are flexible as to terms.
  - b) Futures and exchange-traded options generally have short horizons:
    - Futures contracts are only listed one or two years before expiration, and even where trading longer horizons are available they lack liquidity.
    - The longest maturity on exchange-traded options is generally less than one year.
    - Swaps may have extended lives.
  - c) Major financial institutions trading futures and exchange-traded options are readily identifiable, resulting in a loss of privacy. Swaps are private arrangements which provide greater privacy than the exchanges.
  - d) Futures and options exchanges are subject to considerable government regulation. The swaps market has virtually no government regulation.
    - The International Swaps and Derivatives Association, Inc., is an industry organization which provides standard documentation for swap agreements and keeps records of swap activity.
- 3) The swaps market has some inherent limitations.
  - a) It can be difficult to find a counterparty for a desired swap.
  - b) Because a swap agreement is a contract between two parties, the swap cannot be altered or terminated early without the agreement of both parties.
  - c) Because the swaps market provides no guarantee of performance, parties to a swap must be sure of the creditworthiness of their counterparties.
  - d) Because of the creditworthiness problem, the swaps market is virtually limited to firms and financial institutions.
- 4) In a plain-vanilla interest rate swap:
  - a) The pay-fixed counterparty agrees to pay a sequence of fixed-rate interest payments and to receive a sequence of floating payments.
  - b) The receive-fixed counterparty agrees to pay a sequence of floating-rate interest payments and to receive a sequence of fixed-rate interest payments.
  - c) In practice, only the net cash flows are made.
  - d) The tenor, or time period over which the interest payments will be made, is specified in the swap agreement.
  - e) The amount of the interest payments is a fraction of the notional principal, which is specified as a dollar amount in the swap agreement.
    - The principal in a interest rate swap is referred to as notional because it is only a nominal quantity, and is not actually exchanged.
  - f) The floating interest payments are referenced to some index such as LIBOR, and may include a premium over the index.

- The interest payments are generally paid at the end of the period, at the rate in force at the beginning of the period. If this is the case, the payment is said to be determined in advance and paid in arrears. **NOTE:** This is quite normal - the rate on borrowing the funds over the period would normally be set at the beginning of the period and paid at the end of the period.
  - In some cases the interest payments are made at the beginning of the period at the rate in force at the beginning of the period, but if payment is made in advance the amount is the present value of the amount due at the end of the period, computed at the rate in force.
- g) Cash flow diagrams may appear as either of two types. The first type specifies the cash flows from the viewpoint of the parties. Although the diagrams appear to be the same, the labels and \$ amounts are different:
- The cash flow diagram from the viewpoint of the pay-fixed counterparty is:



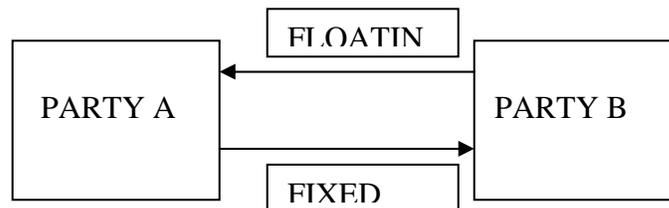
- For this counterparty the *outflows*, represented by the down arrows, are all labeled  $\$F$ , to indicate that they are all the same *fixed* amount = (Fixed Rate) X Notional Principal.
- For this party the *inflows*, represented by the up arrows, are labeled  $\$T$ , to indicate that the *inflows* are varying amounts. In general,  $\$T = (\text{Variable Rate at } T-1) \times \text{Notional Principal}$ .
- The example in the text assumes a Notional Principal of \$1,000,000 a Fixed Rate of 9%, and a Variable Rate of LIBOR.
- As noted previously, in practice only the net cash flow occurs.
- The cash flow diagram from the viewpoint of the receive-fixed party is:



- For this counterparty the *inflows*, represented by the up arrows, are all labeled  $\$F$ , to indicate that they are all the same *fixed* amount = (Fixed Rate) X Notional Principal.

- For this party the *outflows*, represented by the down arrows, are labeled  $\$T$ , to indicate that the *outflows* are *varying* amounts. In general,  $\$T = (\text{Variable Rate at T-1}) \times \text{Notional Principal}$ .
- The example in the text assumes a Notional Principal of \$1,000,000 a Fixed Rate of 9%, and a Variable Rate of LIBOR.
- As noted previously, in practice only the net cash flow occurs.

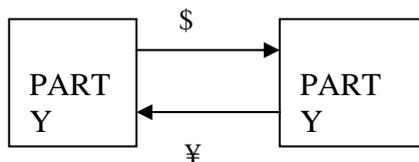
The second type of cash flow diagram specifies the cash flows from the viewpoint of an outside party:



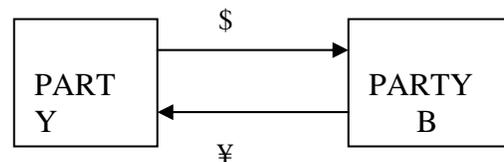
- 5) In a currency swap, one party provides a certain principal to its counterparty in exchange for an equivalent amount of a different currency.
- a) Each party will then pay interest on the currency it receives in a swap (usually at different rates).
- Since the interest rates paid by counterparties A and B can be either fixed or floating, there are four possible combinations:
    - A pays Fixed - B pays Fixed
    - A pays Fixed - B pays Floating
    - A pays Floating - B pays Fixed
    - A pays Floating - B pays Floating
  - If the swap is one in which dollars are swapped for foreign currency, and the interest rate paid on the dollars is floating while the interest rate paid on the foreign currency is fixed (pay floating on dollars / pay fixed on foreign currency), the swap is a plain vanilla swap.
  - Unlike the interest rate swaps, the principal amount is actually exchanged in a currency swap.
  - There are thus three sets of cash flows. The cash flow diagrams are all from the point of view of an outsider. For a Plain Vanilla Dollar-Yen currency swap:
    - Two of the sets of cash flows are exchange of principal - one at the start of the swap (Initial Cash Flow) and one at expiration of the swap (Repayment of Principal):

PRINCIPAL EXCHANGES, DOLLAR – YEN  
 PLAIN VANILLA (FLOATING – FIXED) CURRENCY SWAP

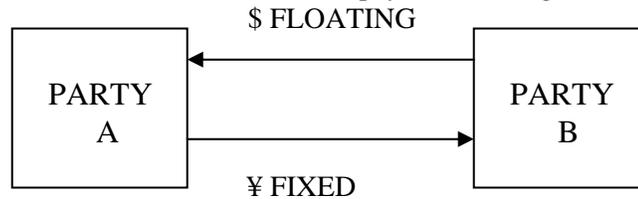
INITIAL CASH FLOW – START



REPAYMENT OF PRINCIPAL -  
 EXPIRATION



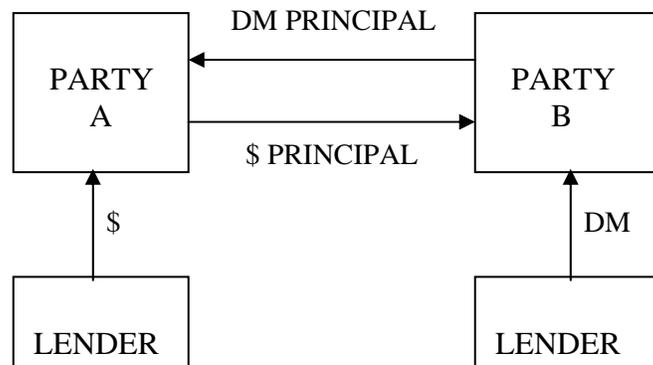
- The third set of cash flows is the interest rate payments during the life of the swap:



- 6) One motivation for swap agreements is to exploit perceived market inefficiencies.
- a) An example of a market inefficiency that could motivate a swap is comparative advantage in borrowing a currency.
- A comparative advantage would occur if firm A can borrow more cheaply than firm B in one market,
  - This is a market inefficiency because the credit risk of the firms is being evaluated differently in the two markets.
  - **EXAMPLE:** Assume that firm A can borrow dollars at a lower rate than firm B, but that firm B can borrow DM at a lower rate than firm A. Firm A has a comparative advantage in borrowing dollars, firm B has a comparative advantage in borrowing DM. Also assume that firm A wishes to borrow DM, and firm B wishes to borrow dollars. In this case, the comparative advantages of firms A and B, which arise from a market inefficiency, can be exploited through a swap. This involves three types of cash flows:
    - Initial cash flows: each firm borrows in its comparative low-cost market and the firms swap the cash flows. Thus, firm B borrows DM, firm A borrows Dollars, and the two swap the proceeds (the example assumes that the original borrowings are equivalent exchangeable amounts):

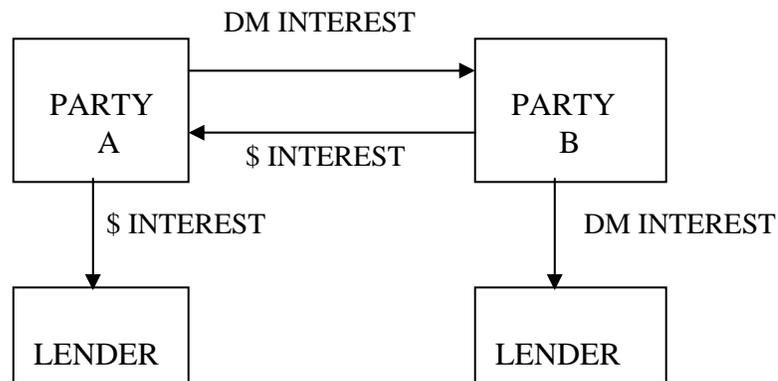
COMPARATIVE ADVANTAGE FIXED-FIXED SWAP  
 PARTY A HAS \$ ADVANTAGE, PARTY B DM ADVANTAGE

INITIAL PRINCIPAL EXCHANGES



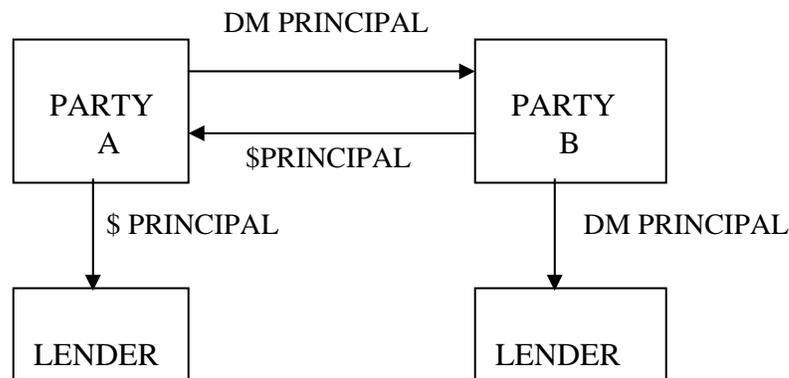
Party A: Pays interest in Dollars on the Dollar principal to the Lender, but receives interest in Dollars on the Dollar principal from Party A.  
 Pays interest in DM on the DM principal to Party B.  
 Party B: Pays interest in DM on the DM principal to the Lender, but receives interest in DM on the DM principal from Party A.  
 Pays interest in Dollars on the Dollar principal to Party A.  
 Note that the total interest paid is less than if A had borrowed DM directly and B had borrowed Dollars directly. **NOTE:** The allocation of the savings will depend on the relative bargaining power of the two parties, and will be reflected by the swap interest rates.

INTEREST EXCHANGES DURING TENOR



The final cash flows at expiration of the swap reverse the initial exchange of principal:

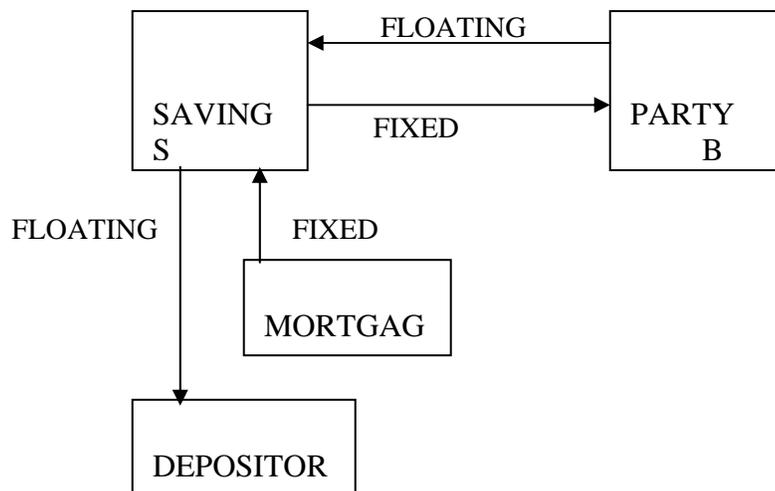
PRINCIPAL EXCHANGES AT EXPIRATION



**NOTE:** The re-exchange of principal is the same amounts originally exchanged!

- 7) A second motivation for currency swaps is to reduce transaction costs, avoid costly regulations, and maintain privacy.
- Given the maturing of the swaps market, and the low probability of finding market inefficiencies, this is the primary motivation behind present-day swaps.
  - An example of this type of motivation for an interest-rate swap is the desire to convert a floating rate obligation to a fixed rate obligation (or vice versa).
    - **EXAMPLE:** A savings and loan association borrows money at a floating rate from depositors and lends that money for fixed-rate mortgages. If interest rates should increase, it would be forced to pay higher rates to depositors, but would not receive higher payments on the mortgages. Given this exposure to interest rate risk, the S&L would like to convert the floating-rate obligation to a fixed-rate obligation, so that the cash flow characteristics of the assets and liabilities matched. This can be accomplished by entering into a pay fixed, receive floating swap. The floating rate payments received from the swap would be used to meet the floating rate payments to the depositors, leaving the fixed rate payments on the swap. The cash flows are shown below (remember, the principal amount is notional, and there is no actual exchange of principal):

CASH FLOWS DURING TENOR  
 CONVERSION OF FIXED OBLIGATION TO FLOATING OBLIGATION



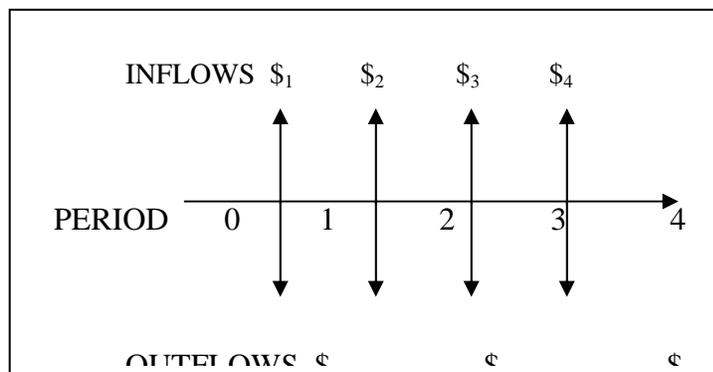
**SS 16. 1. E. a) Motivations for swaps.** *This topic is also discussed in this section in g, h, and l. Essentially, for interest rate swaps, the primary motivation is to change between floating rate and fixed rate obligations. For currency swaps, the primary motivation is to exploit comparative advantage in borrowing in different currencies.*

**SS 16. 1. E. b) Swap counterparties, notional principal, receive fixed, and pay fixed.** *The notional principal is the amount used to compute the cash flows to be exchanged in a swap, using the agreed on rates. The counterparties are the parties who actually exchange the cash flows of the swap. In a plain-vanilla interest rate swap, the pay-fixed counterparty agrees to pay a sequence of fixed-rate interest*

payments and to receive a sequence of floating payments, while The receive-fixed counterparty agrees to pay a sequence of floating-rate interest payments and to receive a sequence of fixed-rate interest payments.

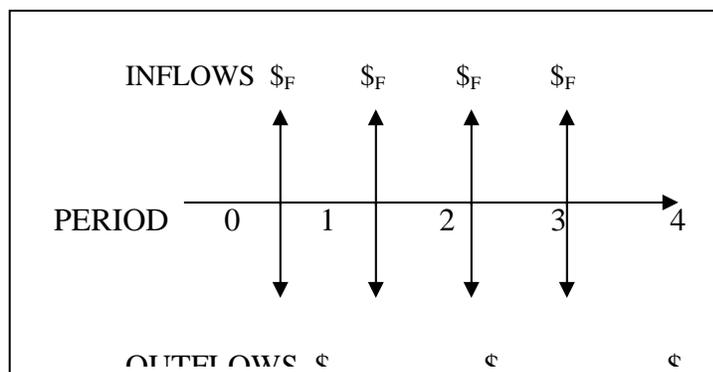
**SS 16. 1. E. c) Cash flow diagram for a “plain-vanilla” interest rate swap and a plain-vanilla currency swap.** *A plain-vanilla interest rate swap is a fixed-floating swap - i.e., the pay-fixed counterparty agrees to pay a sequence of fixed-rate interest payments and to receive a sequence of floating payments, while the receive-fixed counterparty agrees to pay a sequence of floating-rate interest payments and to receive a sequence of fixed-rate interest payments.*

*Cash flow diagrams may appear as either of two types. The first type specifies the cash flows from the viewpoint of the parties. Although the diagrams appear to be the same, the labels and \$ amounts are different. The cash flow diagram from the viewpoint of the pay-fixed counterparty is:*



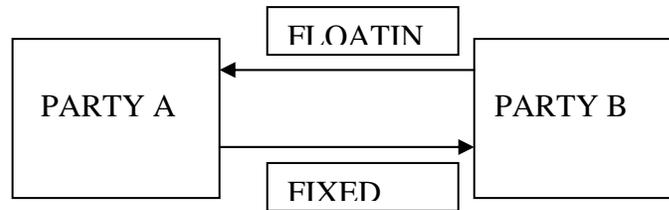
*For this counterparty the outflows, represented by the down arrows, are all labeled  $\$F$ , to indicate that they are all the same fixed amount = (Fixed Rate) X Notional Principal. The inflows, represented by the up arrows, are labeled  $\$T$ , to indicate that the inflows are varying amounts. In general,  $\$T = (\text{Variable Rate at } T-1) \times \text{Notional Principal}$ . In practice only the net cash flow occurs.*

*The cash flow diagram from the viewpoint of the receive-fixed party is:*



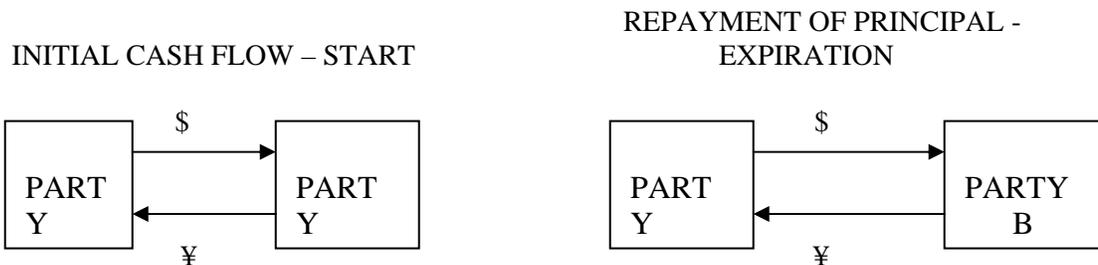
*For this counterparty the inflows, represented by the up arrows, are all labeled  $\$F$ , to indicate that they are all the same fixed amount = (Fixed Rate) X Notional Principal. The outflows, represented by the down arrows, are labeled  $\$T$ , to indicate that the outflows are varying amounts. In general,  $\$T = (\text{Variable Rate at } T-1) \times \text{Notional Principal}$ . Again, in practice only the net cash flow occurs.*

The second type of cash flow diagram specifies the cash flows from the viewpoint of an outside party:

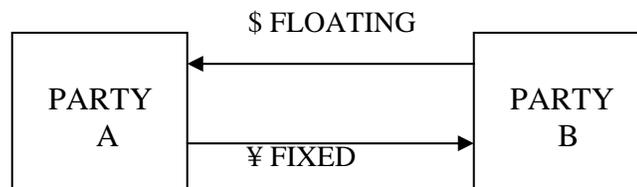


In a currency swap, one party provides a certain principal to its counterparty in exchange for an equivalent amount of a different currency. Each party will then pay interest on the currency it received. A plain-vanilla currency swap is one in which dollars are exchanged for foreign currency, the interest rate paid on the dollars is floating, and the interest rate paid on the foreign currency is fixed (pay floating on dollars / pay fixed on foreign currency). Unlike the interest rate swaps, the principal amount is actually exchanged in a currency swap, so that there are three sets of cash flows, all of which are from the point of view of an outsider. For a plain vanilla Dollar-Yen currency swap, two of the sets of cash flows are exchange of principal - one at the start of the swap (Initial Cash Flow) and one at expiration of the swap (Repayment of Principal):

PRINCIPAL EXCHANGES, DOLLAR – YEN  
 PLAIN VANILLA (FLOATING – FIXED) CURRENCY SWAP



The third set of cash flows is the interest rate payments during the life of the swap:



**SS 16. 1. E. d) Net payments.** This topic draws directly on the preceding topic for the directions of the cash flows, but additional rules must be applied to compute the actual cash flows. In an interest rate swap the notional principal is not exchanged. The basic amounts underlying the cash flows during the tenor of the swap are computed as the agreed upon swap rates times the notional principal. In an interest rate swap, however, the payments are netted. Thus, only one party actually makes a payment, and only one party actually receives a payment.

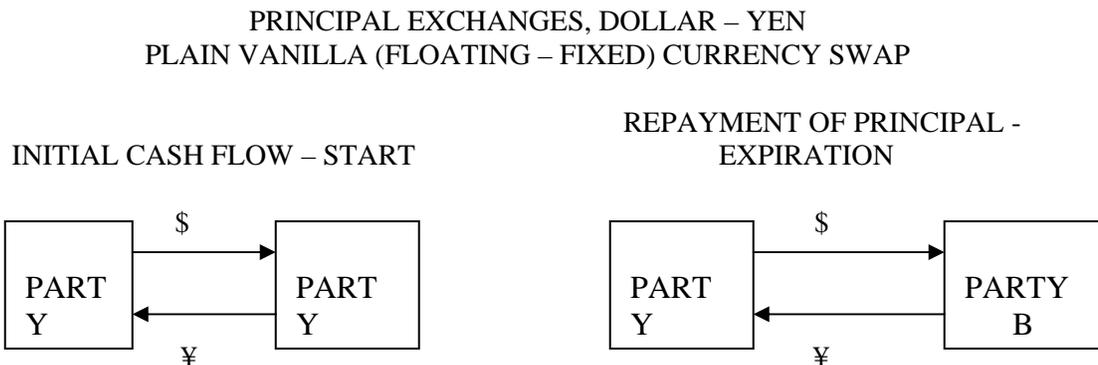
**SS 16. 1. E. e) Appropriate interest rate swap agreements.** *The appropriate arrangement would depend on the motivation (discussed below). It is most likely that this topic is intended to require choosing the proper arrangement to convert fixed to floating or floating to fixed. This is easily done using the box-and-arrow approach.*

**SS 16. 1. E. f) Payments in a currency swap.** *In a currency swap the notional principal is exchanged at the start and finish of the swap. It is important to note that the exchange at the finish is in amounts equal to the original amounts - i.e., the exchanges are not affected by changes in exchange rates. In a currency swap, the payments are in different currencies and because of this are not netted but exchanged in full. Both parties make and receive payments.*

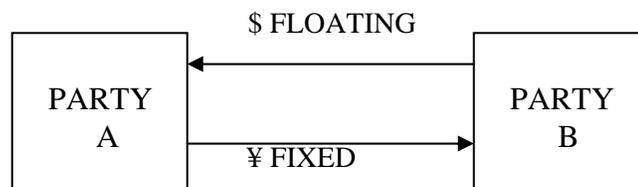
**SS 16. 1. E. g) Motivations for interest rate swaps.** *The primary motivation for interest rate swaps is to reduce transaction costs, avoid costly regulations, and maintain privacy. Given the maturing of the swaps market, and the low probability of finding market inefficiencies, this is the primary motivation behind present-day swaps. An example of this type of motivation for an interest-rate swap is the desire to convert a floating rate obligation to a fixed rate obligation (or vice versa).*

**SS 16. 1. E. h) Motivations for currency swaps.** *The motivations for a currency swap include those for entering an interest rate swap, but also include the possible exploitation of comparative advantage in different currencies.*

**SS 16. 1. D. i) Diagram for a plain vanilla currency swap.** *A plain-vanilla currency swap is one in which dollars are exchanged for foreign currency, the interest rate paid on the dollars is floating, and the interest rate paid on the foreign currency is fixed (pay floating on dollars / pay fixed on foreign currency). Unlike the interest rate swaps, the principal amount is actually exchanged in a currency swap, so that there are three sets of cash flows, all of which are from the point of view of an outsider. For a plain vanilla Dollar-Yen currency swap, two of the sets of cash flows are exchange of principal - one at the start of the swap (Initial Cash Flow) and one at expiration of the swap (Repayment of Principal):*



*The third set of cash flows is the interest rate payments during the life of the swap:*



**SS 16. 1. E. j) Comparative advantage in borrowing a currency.** *The firm with the comparative advantage in borrowing a currency is the firm that has the lower borrowing rate in that currency. The candidate should be warned that this is different than the “comparative advantage” usually encountered in international trade arguments. In that context “comparative advantage” applies to the relative ability to produce various goods from given inputs, and the ability to produce more of a single good from given inputs is termed “absolute advantage.*

**SS. 16. 1. E. k) Appropriate currency swaps.** *As in the previous similar LOS, the appropriate arrangement would depend on the motivation. It is most likely that this LOS is intended to require identification of the party having a comparative advantage, and the design of a swap to exploit the comparative advantage. This is easily done using the box-and-arrow approach.*

**SS. 16. 1. E. l) Motivations for swaps?** *See SS. 16. 1. E. a. In this case the topic seems to be currency swaps, which are motivated by the desire to avoid exchange rate risk or to exploit comparative advantage in borrowing a currency.*

**Self Test Question: Explain** how an interest rate swap differs from a currency swap in terms of cash flows.

**Suggested Answer:** The cash flows differ in two ways: a) The cash flows in an interest rate swap are netted, the cash flows in a currency swap are not netted but directly exchanged; b) The principal amount is exchanged at the start and finish of a currency swap, while the principal amount of an interest rate swap is not exchanged.



### Practice Exam #1

The following information is to be used for Questions 1 - 6

SUBJECT BOND: a \$1,000, 15-year, semiannual pay bond with a coupon rate of 15%, priced at 93.75. The bond is callable after 5 years at 115.

| FORWARD RATE CURVE: | PERIOD       | YIELD |
|---------------------|--------------|-------|
|                     | 0-6 months   | 12%   |
|                     | 6-12 months  | 12.5% |
|                     | 12-18 months | 13.2% |

- 1) The current yield on the subject bond is :
  - a. 8%
  - b. 13%
  - c. 15%
  - d. 16%
  
- 2) The promised yield to maturity for the subject bond, is:
  - a. 15%
  - b. 15.9%
  - c. 16%
  - d. 16.12%
  
- 3) The promised yield to call for the subject bond, is:
  - a. 16%
  - b. 18.44%
  - c. 18.92%
  - d. None of the above.
  
- 4) Suppose that you buy the above bond and hold it for 18 months. When you sell it, it has a yield of 16% . What is the price of the bond at that time?
  - a. \$1150.00
  - b. \$945.32
  - c. \$943.71
  - d. \$937.50
  
- 5) Given the conditions in question 4), and assuming that the forward rates are the actual rates, what was your realized yield?
  - a. 12.42%
  - b. 16%
  - c. 19.51%
  - d. none of the above

- 6) From the given forward rates - what is the spot rate for a one-year bond/  
a. 12.25%  
b. 12.625%  
c. 13.02%  
d. 19.8%
- 7) Which of the following statements is **correct**?  
a. The value of a call (put) is positively (negatively) related to the volatility of the underlying asset.  
b. The value of a call (put) is positively (negatively) related to the level of short-term interest rates.  
c. The value of a call and a put are both positively related to the dividend rate on an underlying stock.  
d. The value of a call (put) is negatively (positively) related to the value of the underlying stock.
- 8) A fixed rate obligation can be converted to a floating rate obligation by:  
a) Purchasing puts on a bond market index.  
b) Purchasing interest-rate futures.  
c) Entering into a swap as the receive-fixed party.  
d) None of the above.
- 9) The nominal rate on a 25 year, semiannual pay bond priced at \$817.44 to have a yield of 10% is:  
a) 8%  
b) 10%  
c) 10.9%  
d) insufficient information provided.
- 10) An “Inverse Floater”:  
a) is a fixed income instrument whose principal is adjusted for (inversely related to) inflation.  
b) will increase in value when yields increase because the coupon rate is adjusted upward..  
c) is an equity that has a negative beta.  
d) is a fixed income instrument whose coupon rate moves in the opposite direction of the change in a reference rate
- 11) Which of the following is *incorrect*?  
a) An embedded call option benefits the issuer of a bond.  
b) An embedded put option benefits the bondholder.  
c) An accelerated sinking fund provision benefits the bondholder.  
d) “Nonrefundable” offers bondholders more protection than “noncallable.”
- 12) The duration of a bond is (generally) \_\_\_\_\_ related to the years to maturity, \_\_\_\_\_ related to the yield to maturity, and \_\_\_\_\_ related to coupon.  
a. positively, negatively, positively  
b. positively, positively, positively  
c. positively, negatively, negatively  
d. negatively, negatively, negatively

- 13) The two-year Treasury bill spot rate is 4.0 percent, and the three-year Treasury bill spot rate is 5.0 percent. The implied one-year forward rate two years from now is:
- 4.50%
  - 6.00%
  - 7.03%
  - 9.62%
- 14) The coupon rate on a tax-exempt bond is 5.6 percent, and the rate on a taxable bond is 8 percent. For an investor with a 33% marginal tax rate, the equivalent taxable yield on the tax-exempt bond is:
- 11.94%
  - 8.36%
  - 30%
  - none of the above.
- 15) A put on XYZ stock with a strike price of \$40 is priced at \$2.00 per share, while a call with a strike price of \$40 is priced at \$3.50. What is the maximum per share loss to the writer of a naked put and the maximum per share gain to the writer of a naked call?
- | Maximum Loss<br>to Put Writer | Maximum Gain<br>to Call Writer |
|-------------------------------|--------------------------------|
| a. \$38.00                    | \$ 3.50                        |
| b. \$38.00                    | \$36.50                        |
| c. \$40.00                    | \$ 3.50                        |
| d. \$40.00                    | \$40.00                        |
- 16) Which is the *most risky* transaction to undertake in the stock index option markets if the stock market is expected to increase substantially after the transaction is completed?
- Write an uncovered call option.
  - Write an uncovered put option
  - Buy a call option.
  - Buy a put option.
- 17) Party A is the pay-fixed party and party B is the pay floating party in an interest-rate swap with a principal of \$100 million. Payments are quarterly, with the fixed rate at 9%, while the floating rate at LIBOR + 1.5%. It is the end of a quarter, and LIBOR is presently at 8%, down 0.5% from the start of the quarter.
- Party A pays Party B \$2.25 million, Party B pays Party A \$2.375 million.
  - Party B pays Party A \$125,000.
  - Party B pays Party A \$250,000.
  - Party B pays Party A \$1 million.

- 18) Your analysis had indicated that a call option was overvalued. Now, you realize that you overlooked the dividend that the stock will pay before the expiration of the options.
- The dividend is irrelevant
  - The may change the result in this case, depending on the size of the dividend.
  - The dividend is not irrelevant, but in this case the action would be the same because including the dividend would only increase the overvaluation. relative to the other securities.
  - None of the above.
- 19) Valuation models use forward contracts instead of futures contracts. This is because:
- The nonstandard nature of futures does not permit general models.
  - Clearinghouse regulations do not permit valuation from private information generated on the exchanges.
  - Margin requirements cannot be included.
  - The mark-to-market payment convention of futures causes unpredictability in the cash flows.
- 20) If a bond is priced above par, the promised yield to maturity on the bond is:
- Equal to the current yield.
  - Below the coupon rate of the bond.
  - Equal to the current rate.
  - Above the nominal yield.
- 21) A manager who was concerned about a large market decline might:
- Buy puts on the index
  - Sell puts on the index
  - Buy calls on the index
  - Sell calls on the index
- I only.
  - I and III only.
  - I and IV only.
  - None of the above.
- 22) For a given change in bond yield, the price change:
- Is smaller for higher coupon bonds.
  - Is positively related to the yield change.
  - Is greater for increases in yield than for decreases in yield.
  - Is always greater for longer bonds.
- 23) Which bond has the longest duration:
- 8-year maturity, 6% coupon
  - 8-year maturity, 8% coupon
  - 15-year maturity, 8% coupon
  - 15-year maturity, zero

- 24) You have a \$1 million investment in commodity X. You would like to hedge this position, but there is no derivative based on commodity X. You decide on a cross-hedge, and gather the following information on three other commodities, A, B, and C, which do serve as a basis for derivatives:

| Commodity | Variance | Correlation with X |
|-----------|----------|--------------------|
| X         | 1.3      | 1.00               |
| A         | 1.6      | 0.9                |
| B         | 0.9      | 0.8                |
| C         | 1.3      | 0.85               |

Which of these two commodity indexes would be most attractive as a cross-hedge for commodity X?

- Index on commodity A due to the higher correlation.
  - Index on commodity B due to the lower variance.
  - Index C because of variance matching.
  - Insufficient information is provided to decide which is attractive.
- 25) You think that interest rates are going to increase. Which of the following bonds would you **most** like to hold?
- Duration = 5 years, Convexity = 65 years
  - Duration = 5 years, Convexity = 97 years
  - Duration = 10 years, Convexity = 65 years
  - Duration = 10 years, Convexity = 97 years
- 26) If you observe an unusually narrow spread between AA bonds and BB bonds, the indicated action is:
- Sell AA, buy BB
  - Sell BB, buy AA
  - Increase Duration
  - Insufficient information
- 27) Yield-to-maturity assumes that:
- All cash flows can be reinvested at the growth rate of the economy
  - The bond will be held until maturity
  - Both of the above
  - None of the above
- 28) An annual pay 8% bond is priced at par. What is the Bond Equivalent Yield on this bond?
- 4.0%
  - 7.85%
  - 8.0%
  - 8.168%

**For questions 29 and 30:** A semiannual pay, 25 year, 11% bond is quoted at 105

- 29) What is the promised yield to maturity on this bond?  
a) 10.705%  
b) 10.536%  
c) 10.434%  
d) 10.431%
- 30) What is the True Annual Yield on this bond?  
a) 10.705%  
b) 10.536%  
c) 10.434%  
d) 10.431%
- 31) If you buy a protective put on 100 shares at a premium of \$200, and your breakeven price is \$33.00 per share, what is the strike price of the option?  
a) \$31.00  
b) \$33.00  
c) \$35.00  
d) none of the above
- 32) “Increasing government spending, cutting taxes, and borrowing to finance the deficit will lead to a multiple increase in output.” This argument is identified with the:  
a) Keynesian model.  
b) crowding-out model.  
c) new classical model.  
d) supply-side effects.
- 33) Which of the following is ***not*** included in M1?  
a) currency in circulation,  
b) demand deposits,  
c) traveler’s checks.,  
d) money market deposit accounts.
- 34) If the reserve requirement is 10%, a \$1 million increase in reserves would increase the money supply by:  
a) \$ 1 million  
b) less than \$100 million  
c) \$100 million  
d) \$1 billion.
- 35) The short and long run effect of an unanticipated increase in the rate of growth of the money supply will be:  
a) decrease the real interest rate; increase the real interest rate.  
b) small increase in inflation, larger increase in inflation.  
c) probable small decline in nominal interest rates, increase in nominal interest rates.  
d) none of the above.

- 36) "The money supply has been growing at 1% per year, but the new administration thinks that monetary policy works and wishes to expand the economy. I would predict an increase in the rate of growth of the money supply." This statement is an example of:
- a) supply-side economics.
  - b) adaptive expectations.
  - c) Friedman economics.
  - d) rational expectations.
- 37) The income effect:
- a) indicates that consumer indifference curves cannot cross.
  - b) indicates the change in amount consumed, holding utility constant.
  - c) reflects movement along a given consumer indifference curve.
  - d) reflects the change in consumption due to the effective change in income.
- 38) If the long-run average cost curve of an industry is U-shaped but has a flat bottom:
- a) both economies and diseconomies of scale are present.
  - b) only diseconomies of scale are present.
  - c) plant sizes will be uniform in the industry.
  - d) there will be many small plants in the industry.
- 39) over longer periods of time, the elasticity of supply will be:
- a) less because of technological innovation.
  - b) greater because production facilities can be changed.
  - c) less due to the aging of production facilities.
  - d) unchanged – time has no effect here.
- 40) "Increasing government spending, cutting taxes, and borrowing to finance the deficit will lead to a multiple increase in output." This argument is identified with the:
- a) Keynesian model.
  - b) crowding-out model.
  - c) new classical model.
  - d) supply-side effects.
- 41) Which of the following is ***not*** included in M1?
- a) currency in circulation,
  - b) demand deposits,
  - c) traveler's checks.,
  - d) money market deposit accounts.
- 42) If the reserve requirement is 10%, a \$1 million increase in reserves would increase the money supply by:
- a) \$ 1 million
  - b) less than \$100 million
  - c) \$100 million
  - d) \$1 billion.

- 43) The short and long run effect of an unanticipated increase in the rate of growth of the money supply will be:
- a) decrease the real interest rate; increase the real interest rate.
  - b) small increase in inflation, larger increase in inflation.
  - c) probable small decline in nominal interest rates, increase in nominal interest rates.
  - d) none of the above.
- 44) “The money supply has been growing at 1% per year, but the new administration thinks that monetary policy works and wishes to expand the economy. I would predict an increase in the rate of growth of the money supply.” This statement is an example of:
- a) supply-side economics.
  - b) adaptive expectations.
  - c) Friedman economics.
  - d) rational expectations.
- 45) The income effect:
- a) indicates that consumer indifference curves cannot cross.
  - b) indicates the change in amount consumed, holding utility constant.
  - c) reflects movement along a given consumer indifference curve.
  - d) reflects the change in consumption due to the effective change in income.
- 46) If the long-run average cost curve of an industry is U-shaped but has a flat bottom:
- a) both economies and diseconomies of scale are present.
  - b) only diseconomies of scale are present.
  - c) plant sizes will be uniform in the industry.
  - d) there will be many small plants in the industry.
- 47) over longer periods of time, the elasticity of supply will be:
- a) less because of technological innovation.
  - b) greater because production facilities can be changed.
  - b) less due to the aging of production facilities.
  - c) unchanged – time has no effect here.
- 48) The current view of price discrimination is:
- a) it reduces allocative efficiency.
  - b) it becomes a barrier to entry in price-taker markets.
  - c) on balance it increases production and increases allocative efficiency.
  - d) it leads to reduced output because some consumers are overcharged

49) Which of the following are characteristics of oligopolies?

- I Interdependence exists among the firms;
- II Substantial economies of scale exist;
- III Significant barriers to entry;
- IV There are many substitutes for the product.

- a) I and II.
- b) I, II, and III.
- c) II, III, and IV.
- d) I, III, and IV.

50) Trade restrictions:

- a) do not provide any benefits.
- b) generally lead to higher domestic employment.
- c) benefit domestic producers at the expense of consumers.
- d) are useful in exploiting competitive advantages.

51) Which of the following is correct?

- a) A fixed exchange rate allows an independent monetary policy.
- b) A pegged exchange rate sets the exchange rate at a constant level.
- c) A pegged exchange does not affect domestic monetary policy.
- d) None of the above is correct.

The following conditions apply to questions 13 - 16. The following exchange rates are observed:

| Currency X | to Currency Y | Rate, X/Y |
|------------|---------------|-----------|
| A          | B             | 2/1       |
| B          | C             | 1/3       |
| B          | D             | 1/2       |
| A          | C             | 2/3       |
| A          | D             | 4/3       |

52) What is the cross rate from A to C (A/C)?

- a) 1/1
- b) 2/3
- c) 3/2
- d) 1/3

53) Identify the triangular arbitrage opportunity, starting from currency A.

- a) A to B to C
- b) A to B to D
- c) A to C to B
- d) none of the above

54) Calculate the profit of the arbitrage.

- a) 33%
- b) 1/4
- c) 25%
- d) 5/4

55) Which of the following is correct?

- I) .Economics is called “The Dismal Science.”
- II)Economics is the art of stating the obvious in incomprehensible terms
- III)An economist is a person who is good with numbers but lacks the personality to be an accountant
- IV)If all of the economists in the world were placed end to end, they would still all point in different directions.

- a) I and II
- b) II and III
- c) I, II, and IV
- d) all of them.

## Practice Exam #2

- 1) A 6 percent coupon bond paying interest semi-annually has a duration of 10, sells for \$800, and is priced at a yield to maturity (YTM) of 8 percent. If the YTM increases to 8.8 percent, the predicted change in price, using only duration, is:
  - a. \$ 32.00
  - b. \$ 64.00
  - c. \$ 80.00
  - d. \$128.00
  
- 2) A 6 percent coupon bond with semi-annual coupons has a convexity of 120, sells for 80 percent of par, and is priced at a yield to maturity (YTM) of 8 percent. If YTM increases to 9 percent, the predicted contribution to the percentage change in price, due to convexity, would be:
  - a. 0.3 percent.
  - b. 1.2 percent.
  - c. 4.8 percent.
  - d. 12 percent.
  
- 3) Convexity of bonds is more important when interest rates are:
  - a. high.
  - b. low.
  - c. expected to change very little.
  - d. less than the coupon rate on the bond.
  
- 4) Positive convexity on a bond implies that:
  - a. the direction of change in yield is directly related to the change in price.
  - b. prices increase at a faster rate as yields drop, than they decrease as yields rise.
  - c. price changes are the same for both increases and decreases in yields.
  - d. prices increase and decrease at a faster rate than change in yield.
  
- 5) The minimum data required to calculate the implied forward rate for 5 years beginning 2 years from now would be;
  - a. spot rates at 6-month intervals for the 7-year period.
  - b. spot rates at 1-year intervals for the 7 year period.
  - c. the 2-year and 7-year spot rates.
  - d. spot rates at 6-month intervals for 2 years and the 7-year spot rate.
  
- 6) The concepts of spot and forward rates are most closely associated with which one of the following explanations of the term structure of interest rates?
  - a. Pure expectations.
  - b. Liquidity premium.
  - c. Preferred habitat.
  - d. Segmented market.

- 7) The best action for a portfolio manager to take to preserve capital in a declining stock market is to:
- buy call options.
  - buy stock index futures.
  - sell stock index futures.
  - sell call options.
- 8) Futures contracts differ from forward contracts in the following ways:
- Futures contracts are standardized.
  - For Futures, the presence of the clearinghouse guarantees performance.
  - Futures contracts require a daily settling of any gains or losses.
- I and II only
  - I and III only
  - II and III only
  - I, II, and III
- 9) In the options markets, the purpose of the clearinghouse is to:
- Issue certificates of ownership
  - Ensure contract performance
  - Match up the option buyer who exercises with the original option writer
- II only
  - II and III only
  - III only
  - I, II, and III
- 10) An investor in the common stock of companies in a foreign country may wish to hedge against the \_\_\_\_\_ of the investor's home country currency and can do so by \_\_\_\_\_ the foreign currency in the forward market.
- depreciation, selling
  - appreciation, selling
  - appreciation, purchasing
  - depreciation, purchasing
- 11) A put option has a strike price of \$35/share and a premium of \$2/share. The maximum profit and maximum loss to the buyer of the put is:
- \$35/share, \$2/share
  - \$2/share, \$33/share
  - \$33/share, \$2/share
  - none of the above.

- 12) The yield to maturity on a bond is:
- below the coupon rate when the bond sells at a discount and above the coupon when the bond sells at a premium.
  - the interest rate that makes the present value of the payments equal to the bond price.
  - based on the assumption that all future payments received are reinvested at the coupon rate.
  - based on the assumption that all future payments received are reinvested at future market rates.
- 13) Yield-to-maturity and current yield on a bond are equal:
- when market interest rates begin to level off.
  - if the bond sells for a price in excess of its par value.
  - when the expected holding period is greater than one year.
  - if the coupon and yield are equal.
- 14) If the reinvestment rate for the cash flows from a bond is above (below) the yield-to-maturity, the realized or horizon rate or return will be \_\_\_\_\_ (\_\_\_\_\_) the yield to maturity.
- below (above)
  - below (below)
  - above (below)
  - above (indeterminate)

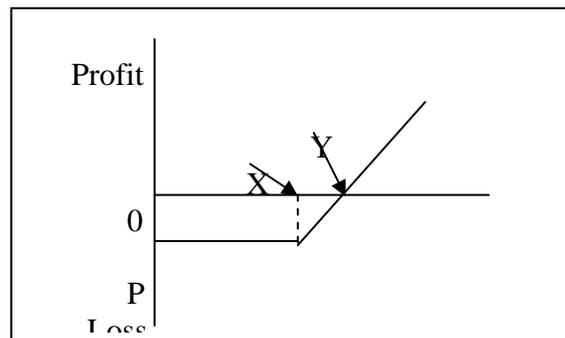
The following information is for questions 15 and 16: You observe the following bond prices and yields:

|       |        |        |        |
|-------|--------|--------|--------|
| Yield | 8%     | 7.5%   | 7%     |
| Price | \$1000 | \$1051 | \$1107 |

- 15) The effective duration of the bond is:
- 5.9
  - 10.18
  - 20.36
  - none of the above
- 16) The effective convexity of the bond is:
- 0.476
  - 95.15
  - 100
  - 190.3
- 17) Any bond issued by an agency of the U.S. government:
- is exempt from the federal income tax on interest.
  - becomes a direct obligation of the U.S. Treasury in case of default.
  - is secured by assets held by the agency.
  - none of the above.

- 18) Which of the following is **incorrect**?
- The stock of the firm can be conceptualized as a call on the assets of the firm, written by the bondholders.
  - Bondholders can be viewed as holding risk-free debt and writing a call equal in value to the principal of the bonds.
  - Stockholders in a leveraged firm can be viewed as holding a put on the assets of the firm.
  - The option characteristics of stocks and bonds arise from the "limited liability" of stockholders.
- 19) Which *one* of the following statements about the term structure of interest rates is true?
- The expectations hypothesis indicates a flat yield curve if anticipated future short-term rates exceed current short-term rates.
  - The expectations hypothesis contends that the long-term rate is equal to the anticipated short-term rate.
  - The liquidity premium theory indicates that longer maturities will have lower yields.
  - The market segmentation theory contends that individual borrowers and lenders prefer particular segments of the yield curve.
- 20) On the maturity date, stock index futures contracts require delivery of:
- common stock.
  - common stock plus accrued dividends.
  - Treasury bills.
  - cash.
- 21) Which of the following statements is *incorrect*?
- Adding futures to a portfolio has a symmetric effect on the probability distribution of returns.
  - Adding options to a portfolio causes skewness in the probability distribution of returns.
  - Adding futures or options to a portfolio has a similar effect on the shape of the distribution, although the size of the effect is different.
  - Adding options to a portfolio has a non-symmetric effect on the probability distribution of returns.
- 22) A call option has a strike price of \$25/share and was purchased at a premium of \$1.50/share. The price of the underlying stock is \$26/share. The option is:
- In-the-money by \$1.00
  - Out-of-the-money by \$0.50
  - Out-of-the-money by \$1.00
  - In-the-money by \$0.50

- 23) The diagram represents:
- A call buyer with a strike price of X
  - A put buyer with a strike price of Y
  - A put buyer with a strike price of X
  - A call buyer with a strike price of Y



- 24) Which AAA bond will have the least volatility in our present interest rate environment?
- a) 30-year, 15%
  - b) 30-year, 10%
  - c) 15-year, 15%
  - d) 15-year, 10%
- 25) Which bond will have the highest duration?
- a) 20 year, 15%, 15% yield
  - b) 20 year, 15%, 8% yield
  - c) 20 year, 8%, 15% yield
  - d) 20 year, 8%, 8% yield
- 26) Which of the following statements is TRUE?
- a) Ceteris Paribus, a coupon bond with a 7-year duration will, after one year, have a 6-year duration.
  - b) Ceteris Paribus, a coupon bond with a 7-year duration will, after one year, have a duration between 6 and 7 years.
  - c) The duration of a coupon bond is greater than its maturity.
  - d) None of the above are true.
- 27) For a non-callable bond,
- a) convexity indicates that duration underestimates price decreases when yields increase.
  - b) convexity indicates that duration underestimates price increases when yields decrease.
  - c) the less convexity the more attractive the bond.
  - d) none of the above.
- 28) Which of the following is *incorrect*?
- a) duration is the % change in price if yield changes by 1%.
  - b) Key rate duration is a measure of yield curve risk.
  - c) Revenue municipal bonds are paid from the proceeds of a municipal project.
  - d) An on-the-run Treasury is the most recently issued Treasury of that maturity.
- 29) A firm is exposed to commodity price risk if:
- a) The price of the commodity undergoes frequent large changes.
  - b) The firm purchases futures on the commodity.
  - c) The value of the firm is correlated with the commodity price.
  - d) All of the above.
- 30) A semiannual bond with an 8% coupon and a 10% yield has a modified duration of 7 years. The Macauley duration of this bond is:
- a) 6.67 years
  - b) 7.35 years
  - c) 7.56 years
  - d) 7.7 years

- 31) The current view of price discrimination is:
- a) it reduces allocative efficiency.
  - b) it becomes a barrier to entry in price-taker markets.
  - c) on balance it increases production and increases allocative efficiency.
  - d) it leads to reduced output because some consumers are overcharged
- 32) Which of the following are characteristics of oligopolies?
- I Interdependence exists among the firms;
  - II Substantial economies of scale exist;
  - III Significant barriers to entry;
  - IV There are many substitutes for the product.
- a) I and II.
  - b) I, II, and III.
  - c) II, III, and IV.
  - d) I, III, and IV.
- 33) Trade restrictions:
- a) do not provide any benefits.
  - b) generally lead to higher domestic employment.
  - c) benefit domestic producers at the expense of consumers.
  - d) are useful in exploiting competitive advantages.
- 34) Which of the following is correct?
- a) A fixed exchange rate allows an independent monetary policy.
  - b) A pegged exchange rate sets the exchange rate at a constant level.
  - c) A pegged exchange does not affect domestic monetary policy.
  - d) None of the above is correct.

The following conditions apply to questions 35 - 37. The following exchange rates are observed:

| Currency X | to Currency Y | Rate, X/Y |
|------------|---------------|-----------|
| A          | B             | 2/1       |
| B          | C             | 1/3       |
| B          | D             | 1/2       |
| A          | C             | 2/3       |
| A          | D             | 4/3       |

- 35) What is the cross rate from A to C (A/C)?
- a) 1/1
  - b) 2/3
  - c) 3/2
  - d) 1/3

- 36) Identify the triangular arbitrage opportunity, starting from currency A.
- a) A to B to C
  - b) A to B to D
  - c) A to C to B
  - d) none of the above
- 37) Calculate the profit of the arbitrage.
- a) 33%
  - b) 1/4
  - c) 25%
  - d) 5/4
- 38) Which of the following is correct?
- I) .Economics is called “The Dismal Science.”
  - II) Economics is the art of stating the obvious in incomprehensible terms
  - III) An economist is a person who is good with numbers but lacks the personality to be an accountant
  - IV) If all of the economists in the world were placed end to end, they would still all point in different directions.
- a) I and II
  - b) II and III
  - c) I, II, and IV
  - d) all of them.