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CMA

Preparatory Program

Part 2

Financial Decision Making

Risk and Return

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Editorial Notes

Throughout these materials, we have chosen particular language, spellings, structures and grammar in order to be consistent and comprehensible for all readers. HOCK study materials are used by candidates from countries throughout the world, and for many, English is a second language. We are aware that our choices may not always adhere to "formal" standards, but our efforts are focused on making the study process easy for all of our candidates. Nonetheless, we continue to welcome your meaningful corrections and ideas for creating better materials.

This material is designed exclusively to assist people in their exam preparation. No information in the material should be construed as authoritative business, accounting or consulting advice. Appropriate professionals should be consulted for such advice and consulting.

repayment source. Due to the lack of a secondary repayment source, unsecured sources of financing are more expensive than secured sources.

Corporate Restructuring involves business combinations, divestitures, ownership restructuring, and bankruptcy.

In International Finance, foreign direct investment, international buying and selling, foreign currency, foreign financing, and financing for international trade transactions are covered.

Risk and Return

Most investors are assumed to be risk averse. Risk averse investors are willing to accept a lower return in exchange for the reduction of risk in an investment. Because of this risk-aversion of investors, risky investments must usually offer higher expected returns than less risky investments in order to persuade investors to purchase them and hold them. Similarly, an investor must be willing to accept a lower return in order to have lower risk.

Historically, the least risky investment has been U.S. Treasury bills. The return on U.S. Treasury bills is fixed, and the yield does not change regardless of what happens in the stock market. Investments in the stock market are riskier than investments in U.S. Treasury bills. The return on U.S. Treasury bills is called the **risk-free rate**. Because of the greater risk in the stock market, investors require a higher expected return to invest in the stock market. The difference between the expected return on a portfolio of stocks that includes all stocks in the market and the rate of return on U.S. Treasury bills is called the **market risk premium**.

Note: High-risk investments pay high rates of return, but they carry more risk of loss of principal than lower-risk investments do. Lower-risk investments have less risk of principal loss, but they pay lower rates of return.

Return

Return is income received by an investor on an investment. **Rate of return** is expressed as a percentage of the principal amount invested.

The amount of return on an investment is a function of three things: Amount invested, length of time that amount is invested, and the rate of return on the investment. Depending on the type of investment, all of those things can vary.

Rates of return are always quoted as **annual** rates. In other words, what percentage of the amount invested would be earned on this investment if the investment were held for one full year?

$$\text{Annual Rate of Return} = \frac{\text{Return Received for One Year's Investment}}{\text{Average Balance of Amount Invested}}$$

When calculating an annual **rate of return** on an investment, there are three very important rules that must be followed:

1) When the income received is for an investment that was held for less than one full year, the amount of income must be **annualized**. The rate of return answers the question: "If this same amount of principal had been invested for one full year at the same annual rate of return that it earned for the period it was held, what percentage of the principal would the investor have received as income on the investment?" To annualize the income, multiply the income by whatever factor is needed to express it as an annual income. If the income is for six months, multiply it by 2 to annualize it because there are two 6-month periods in a year. If the income is for one month, annualize it by multiplying it by 12 because there are twelve 1-month periods in a year.

2) The "amount invested" used in the calculation must be the **average balance** of the amount invested during whatever period of time the funds were invested, up to one year. The amount invested can vary throughout the period it is invested. When that happens, the amount of income that will be received on that investment will vary. However, an annual rate of return can still be calculated by dividing the total amount of income received (annualized, of course) by the **average balance** of the investment during the period the income was earned.

3) If the funds were invested for less than one full year, assume that the average balance during the period the funds were invested was the average balance for one full year, even though the investment was not held for a full year.

Examples:

#1: An investor invests $10,000 for one year and earns a $500 return on the investment. At the end of one year, the investor receives back $10,500. The investor's rate of return on the investment is the $500 income received divided by the $10,000 invested:

Annual Rate of Return = $500 ÷ $10,000 = 0.05 or **5%**

#2: What if the investor invests $10,000 for only 6 months and earns $250 on the investment? What is the investor's rate of return now? Is it $250 ÷ $10,000 = 0.025 or 2.5%?

No. The $250 that was received for 6 months must be **annualized** by multiplying it by 2 since there are two 6-month periods in one year. The ($250 × 2) is then divided by the amount invested to calculate the annual rate.

Annual Rate of Return = ($250 × 2) ÷ $10,000 = 0.05 or **5%**

#3: Now, suppose the investor invests $10,000 for 3 months, then withdraws $4,000 and leaves the remaining $6,000 on deposit for another 3 months. At the end of 6 months, the investor withdraws the remaining $6,000 along with income received of $200. What is the investor's rate of return?

The **average balance** of the investment over the 6-month term was [($10,000 × 3) + ($6,000 × 3)] ÷ 6 = $8,000. The amount of income received for those 6 months was $200, and that is equal to $400 when it is annualized (multiplied by 2). The annual rate of return is the annualized income for six months multiplied by 2, the result divided by the average balance of $8,000.

Annual Rate of Return = ($200 × 2) ÷ $8,000 = 0.05 or **5%**

Calculation of an annual rate of return is a "what if" scenario. The annual rate of return is the rate that would have been earned if the same amount of money had been invested for one year, on the same terms ($10,000 half of the time and $6,000 half of the time), and income on the investment had been earned at the same rate throughout the year as it was earned during the 6 months the money was actually invested.

Risk

Risk can be classified as either **pure risk** or **speculative risk**. Pure risk is defined as the **chance that an unwanted and detrimental (harmful) event will take place**. Insurance is designed to address pure risk, because pure risk yields **only a loss**.

Because investments have the possibility (or even expectation) of return, pure risk is not the risk involved in investing. In investments, the risk is the second classification of risk—speculative risk. In investing, speculative risk is defined as **the variability of actual returns from expected returns**, and this variability **may be either a gain or a loss.**

Investment risk is analyzed in terms of the probability that the actual return will be different from the expected return, either positively or negatively. It is speculative risk and the management of speculative risk that management must address in all investment decisions.

General Risk Concepts

Any individual investment made by a person or company carries investment risk. For a company, an investment may be an investment in securities, but an investment for a company is also a new project such as a new machine or a new plant or the purchase of another company that it will own and operate, perhaps as a subsidiary. This investment risk may be analyzed and measured from the standpoint of one single investment, or it may be analyzed by looking at all of the investments that are held by the investor. All of an investor's investments are called a **portfolio**. When all of the investments of the company are looked at collectively to determine their collective risk, this collective risk is called **portfolio risk**. The management of portfolio risk will be covered later.

Types of Risk

Various types of risk affect an investment and each one is described below along with how it arises. In many cases the name itself is very descriptive of what the risk is related to.

Interest Rate Risk

Interest rate risk (sometimes called **price risk**) is the risk that the value of an investment will change over time as a result of changes in the market rate of interest. If an investment pays a rate of interest that is lower than the market rate, that investment will be able to be sold only if the price is discounted so that its effective interest rate to the buyer is equal to the market rate of interest. The more time will pass before the investment matures, the greater will be its interest rate risk, as there is a longer investment horizon to be affected by the changes (up or down) in interest rates. Therefore, prices of long-term bonds are more sensitive to interest rate changes than short-term bonds.

The concept of interest rate risk is particularly important with respect to investments in fixed income securities such as bonds that can be sold in the secondary market. The selling price—or market value—of any bond is calculated by determining the **present value of all of the future cash flows of the bond** (each of the interest payments and the repayment of the face amount at maturity), discounted at the **current market rate of interest**. When that current market rate of interest increases and the future cash flows of the bond are discounted at the increased interest rate, the present value of those cash flows will be lower; so the price of the bond on the secondary market will decrease.

Example: A bond was paying 6% interest and was purchased when the market rate of interest was 5%. At the time of purchase this bond provided a return greater than the 5% market rate of interest, and so the price the investor paid for it was greater than the bond's face value (in other words, the investor purchased the bond at a premium) so that the investor's rate of return on the investment would be only the market rate of 5%.

After a number of years, the market rate of interest increases to 8%. Since this bond is paying 6% interest per year on its face value, it is now providing a lower rate of return than the market rate. Because its return is lower than similar investment alternatives, its market price has fallen to below its face value so that a purchaser of the bond would receive the market rate of interest on his investment.

As a result of the increased market interest rates, the bondholder who purchased the bond when the market interest rate was 5% has lost a portion of the principal value of his investment. If the bondholder sells the bond in the secondary market when the market interest rate is 8%, he will receive less than face value for it. In other words, the investor would be selling the bond at a discount and he would have a loss of principal because he purchased the bond at a premium.

(continued)

However, if the bondholder continues to hold the bond until it matures, the bondholder will receive the face value of the bond at maturity (which will be less than the premium the bondholder paid for it). The bondholder will have received 6% of the face value of the bond in interest each interest period during the holding period, but his loss on the principal will have reduced his total annual return. The bondholder's annual return over his full holding period for the bond will be the 5% market rate that was current when the bondholder purchased the bond.

Example: Calculate the market value of a $100,000 face value 5-year, 8% bond paying interest semi-annually, issued on January 1, 20X0. The market rate of interest when the bond was issued was 10%, so the bond was issued at a discount, at a price of $92,288. The market rate of interest increases to 12% on January 1, 20X1. What will the market value of the bond be on January 1, 20X1?

Answer: Use the present value of $1 and present value of an ordinary annuity of $1 factors for 8 interest periods (interest paid semi-annually, four years remaining until maturity) at 6% (1/2 of 12% per interest period) to calculate the present values of both the principal and the interest. The present value factors are available in *Appendix B* to this volume.

Present value of the principal: $100,000 × 0.627	$ 62,700
Present value of the interest payments: $4,000 × 6.210	24,840
Total present value of principal & interest	**$87,540**

The market value of the bond has declined from $92,288 at issuance to $87,540 one year later because the market rate of interest has increased from 10% to 12% per annum, while the bond continues to pay interest at only 8% per annum. The market value of the bond has declined to a point where investors who buy the bond for $87,540 will, in fact, earn a 12% per annum return on their investment of $87,540 if they hold the bond until its maturity.

If an investor chooses to hold the bond until its maturity date, the investor will receive the full $100,000 in principal and will have received interest payments of $4,000 each semi-annual period the bond is held, assuming the bond issuer does not default on its payments.

Note: **Duration** is the measure of how much the price of the bond will change when there is a 1% change in the market interest rate. The price of a bond with a higher duration will be more sensitive to changes in the market interest rate than will the price of a bond with a lower duration.

Duration will be covered in more detail in the discussion on *Bonds*.

Reinvestment Rate Risk

Reinvestment rate risk is the risk that money invested in an instrument that matures cannot be reinvested in another investment that will provide the same, or a higher, level of return. Reinvestment risk impacts short-term bonds more than long-term bonds. As interest rates decline, the funds from the original investment cannot be reinvested upon maturity at the same higher rate as the original investment paid. Obviously, the sooner a bond matures, the sooner this reinvestment must occur, so short-term bonds carry more reinvestment rate risk than do longer-term bonds.

Purchasing Power Risk

Purchasing power risk is the risk that the purchasing power of a fixed amount of money will decline as the result of an increase in the general price level (inflation).

Liquidity Risk

Liquidity risk is the possibility that an investment cannot be sold (converted into cash) for its market value. Whenever an investment must be discounted significantly in order to be sold, the investment has a high level of liquidity risk.

Foreign Exchange Risk

Foreign exchange risk is the risk that a transaction denominated in a foreign currency will be impacted negatively by changes in the exchange rate. The negative impact occurs when the company must spend more of its own currency to settle the transaction as a result of changes in the exchange rate.

Credit, or Default, Risk

Credit risk or default risk is the risk that a borrower of money will not be able to pay the interest and repay the principal on a debt as it becomes due. The higher the credit risk perceived by the lender, the higher will be the interest rate the lender will require in order to lend the money. Credit risk is of particular concern to investors in bonds, because investors in bonds want to know they will receive the interest payments when due and that they will receive their principal back upon the bond's maturity.

Note: Securities that are issued by stable governments will have the lowest level of credit or default risk. U.S. Treasury securities are usually deemed to be default risk-free.

Political Risk

Political risk is the risk that something will happen in a country that will cause an investment's value to change or even to become worthless. For example, the government of a country may change a policy, and the change could affect investments in the country.

Political risks include the obvious risks of government **expropriation** (government seizure of private property with some minimal compensation offered, generally not an adequate amount); and **war** (which can affect employee safety and create additional costs to ensure employees' safety)**.**

Political risks also include **blockage of fund transfers**; **inconvertible currency** (the government of the host country will not allow its currency to be exchanged into other currencies); **government bureaucracy, regulations and taxes**; **corruption** (such as bribery being used by local firms that a firm doing business in that country must compete with to get contracts); and even the **attitude of the consumers** in the host country, if for example they prefer to purchase local products.

Business Risk

Business risk is the variability of a firm's earnings before interest and taxes (EBIT). Business risk depends on many factors such as:

- The variability of demand over time.
- The variability of the sales price over time.
- The variability of the price of inputs to the product over time.
- The degree of operating leverage that the firm has (operating leverage was covered in Section A and will not be repeated here).

Total Risk

Total risk is the risk of a **single asset** taken by itself and not balanced against the risks of any other investments. It is defined as the variability of the asset's relative expected returns. It is also sometimes called **standalone risk.**

Unsystematic Risk

Unsystematic risk is risk that is specific to a particular company or to the industry in which the company operates. An example of unsystematic risk is a strike that halts production at one company or at all the companies that employ members of the striking union. Unsystematic risk can be reduced through appropriate diversification of investments in a portfolio.

Systematic Risk

Systematic risk is risk that all investments are subject to. It is caused by factors that affect all investment assets. Some examples of systematic risk are inflation, macroeconomic instability such as recessions, major political upheavals, and wars. Systematic risk cannot be diversified away, and so it remains even in a fully diversified portfolio.[29]

Market Risk

Market risk is a type of systematic risk. It is the risk inherent in an investment that is traded on a market simply because it is traded on a market and is subject to market movements. As a general rule, an individual stock's price will rise when the market rises, and it will fall when the market falls. Market risk refers to the fluctuations in the price of a stock or option that occur because of fluctuations in the market. Market risk has nothing to do with conditions in the company but only with conditions in the market. Like systematic risk, market risk cannot be diversified away.

Industry Risk

Industry risk is risk that is specific to a particular industry. For example, a few years ago only a few companies were supplying a specific component that was required in solar electricity-generating panels. The component was in high demand, the price was high, and profits were high. Then another, newer, technology emerged, and the demand and the price for the component fell. The prices of the stocks of companies in that industry declined sharply and some of the companies went out of business. All the companies in that particular industry were subject to and affected by the risk of technology changes in the industry.

The Relationship Between Risk and Return

A simple relationship exists between risk and return: the higher the potential return, the higher the level of risk involved. Investors are risk averse. They are willing to undertake additional risk only if they will be adequately compensated for it by the potential for extra return. The opposite is also true. Investors will accept a lower rate of return in exchange for less risk.

If investors must choose between two assets that both offer the same rate of return, they will choose the investment with the lower level of risk. Alternatively, if investors must choose between two assets that both have the same level of risk, they will choose the investment with the higher rate of return. Investors want to maximize their return on investment for a given level of risk and minimize their risk for a given level of return. (The best of both worlds, maximizing return while at the same time minimizing risk, is not an objective that is attainable in the world of investing.)

[29] Diversification in investing is the practice of investing in a variety of securities, so that a failure in one investment will not be disastrous to the portfolio. Diversification can protect against specific company risk, but it cannot protect against systematic, or market, risk that all companies are subject to.

Capital Asset Pricing Model (CAPM)

The capital asset pricing model (CAPM) is frequently used to estimate the investors' required rate of return on a security or a portfolio of securities, given the perceived risk to the investment. The CAPM uses the security or portfolio's risk, the risk-free rate of interest, and the market rate of return to calculate the investors' required return. The theory behind the CAPM is that **investors will price investments so that the expected return on a security or a portfolio will be equal to the risk-free rate plus a risk premium** that is proportional to the security's or portfolio's risk. A security's or a portfolio's risk is expressed in its "beta."

Beta

"Beta," the letter in the Greek alphabet "β," is a measurement of a security's or a portfolio's **systematic risk**. Systematic risk as described above is risk that all investments are subject to. Systematic risk is caused by factors that affect all investment assets such as inflation, macroeconomic instability, major political upheavals, and wars. Systematic risk cannot be diversified away, and so it remains even in a fully diversified portfolio.

However, individual securities or portfolios respond differently to these risks. A security's or portfolio's beta represents how much, historically, the returns for that security or portfolio have increased or decreased in response to these systematic risks relative to how much the returns for the market as a whole have increased or decreased in response to the same risks.

- **Beta = 1.0**: The beta for the market as a whole is 1.0. An individual security or a portfolio with a beta of 1.0 has the same systematic risk as the market as a whole (or as the benchmark index). The returns for an individual security or portfolio with a beta of exactly 1.0 have historically moved in exactly the same direction and in exactly the same amount as the market has moved. That stock's or portfolio's returns are perfectly **correlated** with the returns of the market, meaning that the return of the security or portfolio has historically been the same as the return to the market portfolio.
- **Beta > 1.0**: A beta greater than 1.0 means that the individual security or portfolio has historically been **more volatile**[30] (riskier) than the market as a whole. Historically, when the returns to the market have risen by 1%, the returns to this stock or portfolio have increased on average by more than 1%. For example, if the security's or portfolio's return has historically increased by an average of 10% when the market return increased by 8%, the security has a beta of 1.25 (10% ÷ 8%). Thus, the increase in the return of the individual stock or portfolio of stocks has historically been 125% of the increase in the return to the market portfolio. The opposite is also true: when the market return has historically decreased by 8%, the security's or portfolio's return has historically decreased by 125% of 8%, or by 10%.
- **Beta > 0 < 1.0**: A beta between zero and 1.0 means that the individual security or portfolio of securities has historically been **less volatile** (less risky) than the market as a whole while moving in the same direction as the market. Historically, when the returns to the market have risen by 1%, the returns to the stock or portfolio have increased on average by less than 1%. For example, if the market return has historically increased by 10% and the security's or portfolio's return has increased by an average of only 6%, the security or portfolio has a beta of 0.60 (6% ÷ 10%). Thus, the increase in the return to the stock or portfolio has historically been 60% of the increase in the return to the market. Again, the opposite is also true: when the market return has historically decreased by 10%, the security's or portfolio's return has decreased by only 6%.
- **Beta = 0**: A risk-free security has a beta of zero. However, having a beta of zero does not guarantee that a security or a portfolio of securities is risk-free. A beta of zero may mean only that there is

[30] The market value of a highly volatile stock or portfolio fluctuates greatly, going up and then down by large amounts in response to smaller changes in the market, while the market value of a stock or portfolio with low volatility does not fluctuate as much as the market.

no correlation[31] whatsoever between that security's or portfolio's return and the return of the market.

- **Beta < 0**: A negative beta (less than zero) means the security or portfolio of securities has historically moved counter to (in the opposite direction of) the market. When the returns to the market have increased, the returns to that security or to that portfolio have decreased, and vice versa. For example, some precious metals and precious metal stocks have negative betas. When the market goes down, their market prices go up because investors flock to them as "safer" investments. However, when the market goes up, their market prices go down because the demand for them decreases.

Note: "Beta" can also be described as the **covariance** between a security's or portfolio's returns and the return to the market as a whole. Covariance is a statistical measure of the amount by which two investment returns move together. The covariance between an individual security's or portfolio's returns and the return to the market as a whole is the amount by which the security's or portfolio's returns have historically moved in relation to the market's returns. The definition for covariance is also the meaning of "beta."

The beta coefficient of an individual security or a portfolio of securities quantifies its systematic, or market, risk. An investment's beta describes its sensitivity to changes in the market as measured by some benchmark. For stocks, the benchmark may be any of a number of stock indexes such as the S&P 500. A security's or a portfolio's beta measures the change in the returns for the individual security or portfolio against the change in the returns for the benchmark.

The greater the beta of an individual security or a portfolio is, the more the return on that security or portfolio varies in proportion to the variation in return of the benchmark index that it is compared with.

Note: Securities with betas below 1.0 are **defensive securities**, while securities with betas above 1.0 are **aggressive securities**.

If a stock has a **negative beta**, historically the stock's market price has tended to go down when the market has gone up and has gone up when the market has gone down. Thus, a stock with a negative beta could be an excellent holding to diversify a portfolio of stocks.

The CAPM Formula

The Capital Asset Pricing Model uses a security or portfolio's risk (its beta), the market rate of return and the risk-free rate to determine the investors' required rate of return for the security or portfolio. According to the theory behind the CAPM, investors will price investments so that the expected return on a security or a portfolio will be equal to the risk-free rate plus a risk premium proportional to the risk, or beta, for that security or portfolio.

The CAPM formula is:

$$R = R_F + \beta(R_M - R_F)$$

Where:

- R = Investors' required rate of return
- R_F = Risk-free rate of return
- β = Beta coefficient
- R_M = Market's required rate of return

[31] "Correlation" is the mutual relation of two or more things. For example, two investments are said to be highly correlated with one another if, when one's return changes by a certain percentage, the other's return changes by a proportion of that percentage, and the same thing happens consistently.

The **risk-free rate (R_F)** is the rate of return an investor could receive on an investment in a riskless asset, approximated by the return on very short-term U.S. Treasury bills.

The **market's required rate of return (R_M)** represents the required return on the average stock in the market, approximated by a benchmark index such as the S&P 500.

($R_M - R_F$), or the difference between the market's required rate of return and the risk-free rate, is the **market risk premium**. The market risk premium is included in the required rate of return for a security or portfolio of securities. The market risk premium measures the additional return over and above the risk-free rate that investors demand in order to move investments into the stock market in general (not to any specific security or portfolio of securities).

The **beta coefficient (β)** represents the correlation between the historical returns of a given stock or portfolio vs. the historical return of the market as a whole or the average stock in the market as represented by some index of market activity such as the S&P 500. The beta coefficient of a stock is a measure of the sensitivity of the investment's returns to changes in the market's returns. An individual stock's beta also measures the marginal contribution of the stock to the risk of the market portfolio.

$\beta(R_M - R_F)$, or the beta coefficient for a particular security or portfolio multiplied by the market risk premium, is **the risk premium for that particular security or portfolio**. It is the risk premium that investors require to purchase **that stock** or to invest in **that portfolio** of stocks. The risk premium required by investors to invest in a particular stock or portfolio is proportional to that investment's beta.

Putting it all together, the risk-free rate **(R_F)** plus the individual security's or portfolio's risk premium **($\beta[R_M - R_F]$)** equals the investors' required rate of return for that particular security or portfolio **(R)**.

Example: Assume Company X's common stock has a beta of 0.8, investors demand a market rate of return of 6.5%, and the risk-free rate is 0.5%. The investors' required rate of return on Company X's stock is calculated as follows:

$$R = 0.005 + [0.8 \times (0.065 - 0.005)] = 0.053 \text{ or } \underline{\mathbf{5.3\%}}$$

The required rate of return for Company X's stock is 5.3%. That return is lower than the market's required rate of return because Company X's beta of 0.8 is lower than the market's beta of 1.0.

If Company X's beta had been greater than 1.0, X's required return would have been higher than the market's required return, because the risk to holding Company X's stock would be greater than the risk to the market as a whole. Thus, investors would demand a higher risk premium to hold the investment.

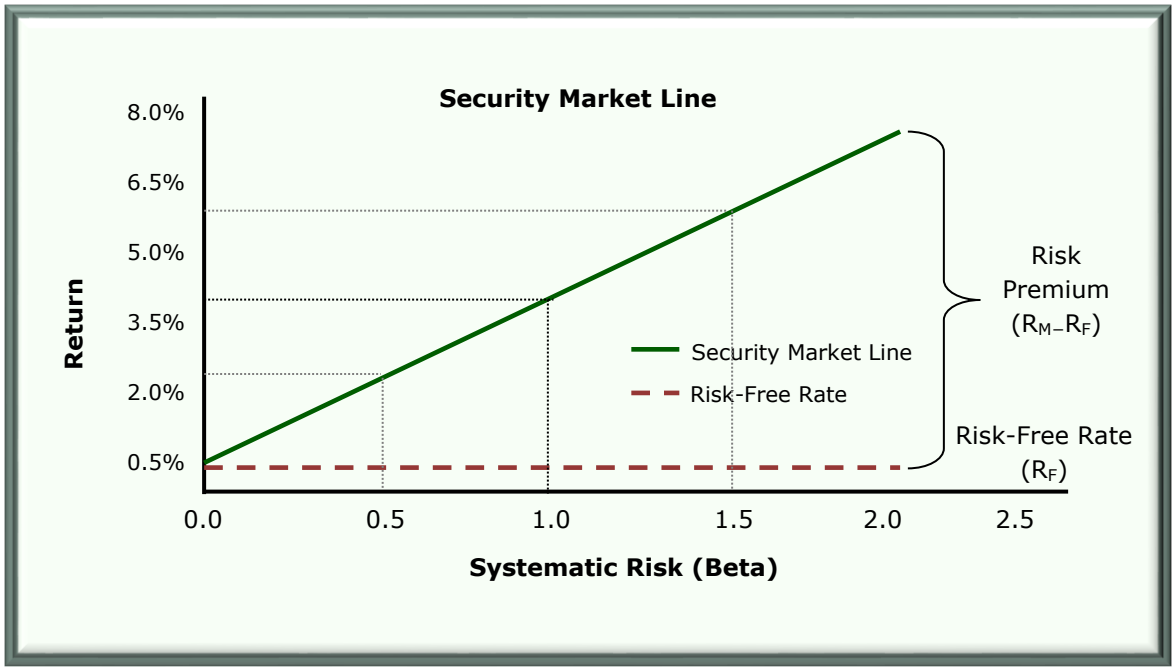
Since Company X's stock's beta is less than 1.0, investors are willing to accept a lower expected return in exchange for getting an investment that is less volatile than the market as a whole.

The Security Market Line

The Security Market Line is a regression line formed by performing regression analysis on investors' historical required rates of return for each level of systematic risk **in the market portfolio**. Also called the **characteristic line**, it summarizes the systematic, or market, risk versus the return of the whole market at a certain point in time, including all securities in the benchmark index (such as the S&P 500) being used to define the "market."

The Security Market Line is the graphical representation of the Capital Asset Pricing Model formula. Beta is on the x-axis, representing the systematic risk, and the required returns are on the y-axis. The slope of the Security Market Line ($R_M - R_F$) illustrates the market risk premium and investors' required rates of return at each level of risk for the market as a whole.

An example of a graph of the Security Market Line follows.



The beta of the market as a whole is always 1.0.

On the above example of a Security Market Line graph, the required rate of return for a risk-free asset is 0.5%. The required rate of return for the market as a whole, at the point on the y-axis where the beta on the x-axis is 1.0, is 4.0%. The required rate of return for a security with a beta of 0.5 is 2.25%, and the required rate of return for a security with a beta of 1.5 is 5.75%.

On the graph of the Security Market Line, ($R_M - R_F$) is the **slope** of the SML. The slope of the Security Market Line is the amount by which the investors' required rate of return (the value on the vertical y-axis) increases for each one unit increase in the beta (the value on the horizontal x-axis). For example, on the above graph when the beta on the x-axis is 0.5, the required return on the y-axis is 2.25%. When the beta is 1.5, the required return is 5.75%. The difference between 5.75% and 2.25% is 3.5%, which is also equal to ($R_M - R_F$), or 4.0% – 0.5%, which equals 3.5%.

The **y-intercept** of the SML, or the point on the y-axis where the Security Market Line crosses the y-axis, is the risk-free rate. If a given security has a risk premium of zero, the investors' required rate of return for that security will be the risk-free rate.

Example: In addition to seeing the required rates at each beta level on the graph of the SML, the required rates for stocks at each beta level can be calculated using the Capital Asset Pricing Model. Using the data from the preceding graph, where the required return to the market is 4.0% and the risk-free rate is 0.5%, the required rates of return for various stocks with different betas are as follows:

Stock A's beta is 0.5. The investors' required rate of return for Stock A is:

$R = R_F + \beta(R_M - R_F)$
$= 0.005 + 0.5(0.04 - 0.005)$
$= 0.0225$ or **2.25%**

Stock B's beta is 1.0, the same as the market's beta. The investors' required rate of return for Stock B is:

$R = R_F + \beta(R_M - R_F)$
$= 0.005 + 1.0(0.04 - 0.005)$
$= 0.04$ or **4.0%**, which is the same as the market's required return.

Stock C's beta is 1.5. The investors' required rate of return for Stock C is:

$R = R_F + \beta(R_M - R_F)$
$= 0.005 + 1.5(0.04 - 0.005)$
$= 0.0575$ or **5.75%**

These three points match the points on the Security Market Line on the preceding graph:

Stock	Beta	Required Return
A	0.5	2.25%
B	1.0	4.00%
C	1.5	5.75%

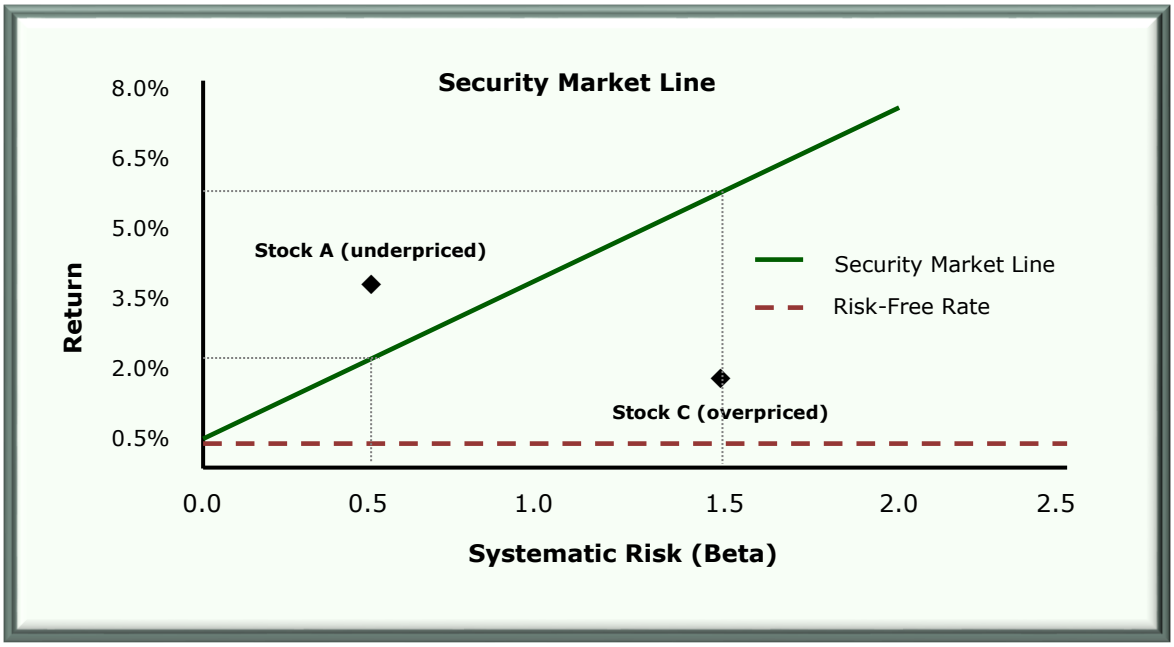
Assuming that the market is efficient, the returns for all correctly-priced securities and portfolios must lie on the Security Market Line, as the stocks in the above example do. However, individual securities can be temporarily mispriced (priced incorrectly). The next topic discusses mispriced securities and illustrates them on the graph.

The Characteristic Line for an Individual Security

The relationship between systematic risk and investors' required rate of return can also be graphed for an individual security. The line formed using regression analysis that relates a particular security or portfolio's systematic risk to investors' required rates of return is called that security's characteristic line.

If the market is in equilibrium and all stocks in the market are fairly priced, the required rate of return on each individual stock will be equal to its expected return. When that occurs, each stock's characteristic line will lie on the Security Market Line.

However, individual stocks can be temporarily mispriced. When that happens, the point on the SML graph where the risk and return of that stock intersect can be above or below the SML. An underpriced stock and an overpriced stock are illustrated on the following graph of the Security Market Line.



On the graph above, Stock A has a beta of 0.5, and according to the SML, its expected return should be 2.25%. However, its expected return is approximately 4.0%. Because Stock A's expected return is higher than investors' required return for the security, Stock A is **underpriced**. Stock A is expected to provide a rate of return that is higher than the rate required by investors, based on its systematic risk. In order for Stock A's return to be on the SML, the stock's price will need to increase to the point where its return will decrease to 2.25%. Investors will make that happen because they will see an opportunity for excess returns in Stock A, and demand for the stock will increase. Because of the increased demand for Stock A, the stock's market price will increase. The increased market price will drive the stock's expected return down. The market price will continue to increase until the intersection of the stock's beta and its expected return lies on the Security Market Line.

Stock C has a beta of 1.5, and according to the SML, its expected return should be 5.75%. However, Stock C's expected return is only 2.0%. Because its return is too low, Stock C is **overpriced**. It is expected to provide a rate of return that is lower than the rate required by investors, based on its systematic risk. In order for Stock C's return to be on the SML, Stock C's price will need to decrease to the point where its return will increase to 5.75%. Again, investors will make that happen because they will see that the stock's expected return is below what investors require from it, based on its systematic risk. Demand for the stock will decrease, and the decreased demand will cause the stock's price to decrease. The stock's decreased market price will result in an increased expected return. The market price of the stock will continue to decrease until the intersection of the stock's beta and its expected return lies on the SML.

After the expected returns for Stocks A and C return to the SML, risk and return for the market and the two stocks will once again be in equilibrium, and the expected returns for the two stocks will again be equal to their required returns. Usually situations where individual stocks are out of equilibrium do not persist for long because their stock prices will quickly adjust to bring them back into equilibrium.

Therefore, in the long term, all stocks' and all portfolios' expected returns should lie on the Security Market Line.

Summary: Assuming the market is efficient, all correctly-priced securities and portfolios must lie on the Security Market Line.

- Any securities or portfolios with expected returns that lie **above** the Security Market Line (their expected returns are higher than their required rates of return) are **undervalued**. Their prices will correct until their expected returns lie on the Security Market Line.
- Any securities or portfolios with expected returns that lie **below** the Security Market Line (their expected returns are **lower** than their required rates of return) are **overvalued**. Their prices will correct until their expected returns lie on the Security Market Line.

Impact of a Change in a Security's Beta on Its Price

The slope of a security's characteristic line determines the risk/return tradeoff for that security. The greater the risk of an investment in the firm, the higher its beta will be. The higher the company's beta is, the higher the return investors will require in order to hold the investment.

The market price of a security is affected by the amount of risk that investors perceive to be inherent in the investment. If investors perceive more risk, they will require a higher return, and that will drive down the market price of the security.

Example: Assume Company X's common stock has a beta of 0.8, investors demand a market rate of return of approximately 4.0%, and the risk-free rate is 0.5%. The investors' required rate of return on Company X's stock is calculated as follows:

$$R = 0.005 + [0.8\ (0.04 - 0.005)] = 0.033 \text{ or } \mathbf{3.3\%}$$

The required rate of return for Company X's stock at 3.3% is below the market rate of return (4.0%) because the security's beta is less than 1.0.

Company X embarks upon an aggressive expansion program, and some of its new projects are riskier than the projects it has done in the past. As a result, Company X's stock price becomes more volatile than the market, reflecting the greater perceived risk in the eyes of its investors. Its beta increases to 1.3. The investors' required rate of return on the stock will change as follows:

$$R = 0.005 + [1.3\ (0.04 - 0.005)] = 0.0505 \text{ or } \mathbf{5.05\%}$$

The investors' required rate of return has increased from 3.3% with a beta of 0.8 to 5.05% with a beta of 1.3. Company X's required rate of return is now above the market rate of return of 4.0% because investors perceive more risk in the stock, and they are requiring a higher rate of return to entice them to hold the stock.

The total **risk premium** that investors are demanding to purchase that security with a beta of 1.3 is [1.3(0.04 – 0.005)], which equals 0.0455 or 4.55%. Previously when the company's beta was only 0.8, the risk premium that investors demanded was [0.8(0.04 – 0.005), which equals only 0.028 or 2.8%. The investors' required risk premium for Company X stock has increased from 2.8% (3.3% – 0.5%) to 4.55% (5.05% – 0.5%) because of the company's increased systematic risk.

Because of the increase in the investors' required rate of return, investors (the market) will now price the stock differently. The market price of the stock must go down in order to create a higher expected rate of return for investors who are considering buying the stock.

Measuring the Market Risk of an Individual Security by Means of its Beta Coefficient

Market risk (also called systematic risk) is the risk that changes in a security's price will result from conditions that affect all firms. **Market or systematic risk is considered to be the important risk, because it cannot be diversified away.** Investors will always be exposed to the uncertainties of the market, no matter how many stocks they hold, though a well-diversified portfolio can reduce unsystematic risk. Diversification will be covered in the topic *Portfolio Theory*.

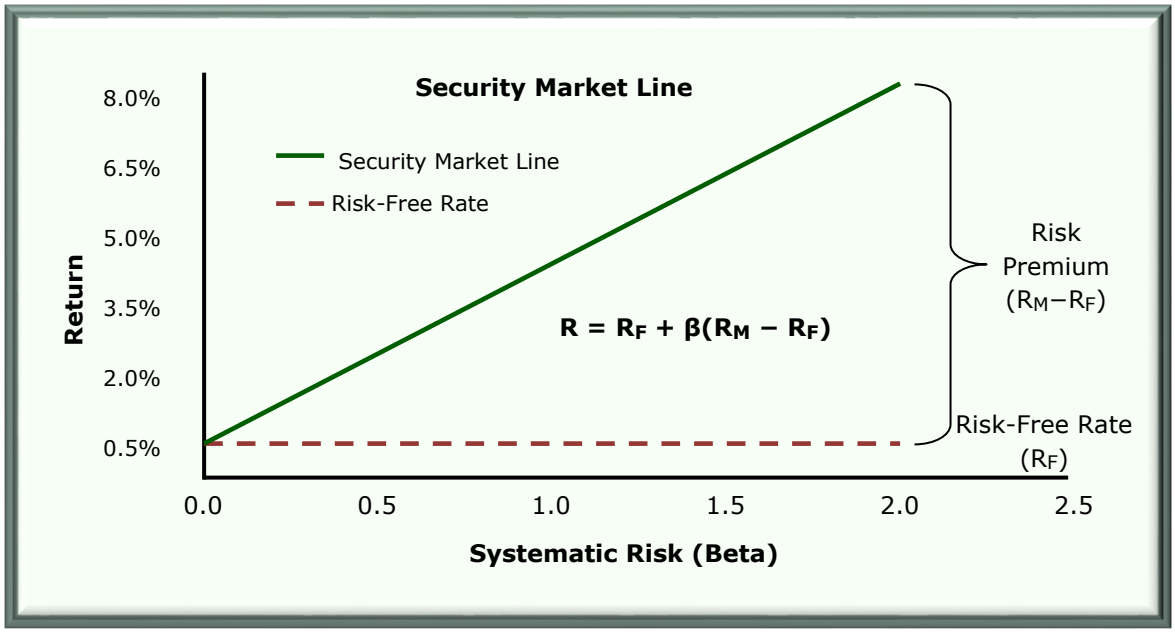
Market risk, or systematic risk, is the risk of an individual security that cannot be reduced through diversification because the risk to the security is common to all securities. Prices of all securities and the values of entire portfolios are correlated to some degree with broad swings in the economy caused by recession, inflation, high interest rates, and so forth because those economic events affect the market and all stocks in the market. However, the **extent** to which each particular investment will be impacted by changes in the market is different. Some investments are very sensitive to changes in the market and other securities do not change much in value as the market as a whole moves.

Investors can expect compensation in the form of higher expected returns for bearing this systematic risk. However, investors should not expect to be compensated for bearing unsystematic risk, because unsystematic risk is avoidable through diversification.

In a properly diversified portfolio, market risk, or systematic risk, will account for most of the risk. Beta measures this market risk, or the volatility of, an individual security that is held in a diversified portfolio. Mutual funds and portfolios of securities will also have betas.

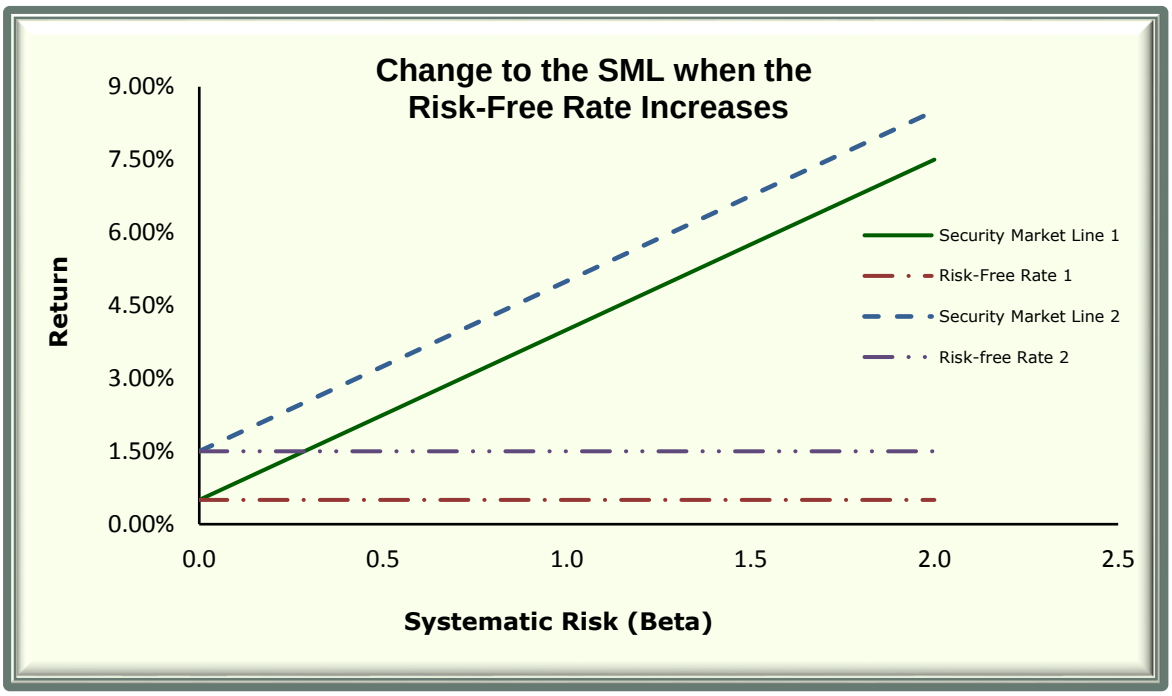
Impact of Changing Market Conditions on the Security Market Line

The Security Market Line illustrates the linear relationship between the beta coefficient for individual investments (or portfolios of investments) and the required rate of return for individual investments (or portfolios of investments). Recall that the slope of the Security Market Line is the market risk premium, or $(R_M - R_F)$, and the y-intercept is the risk free rate:



A Change in the Risk-Free Rate

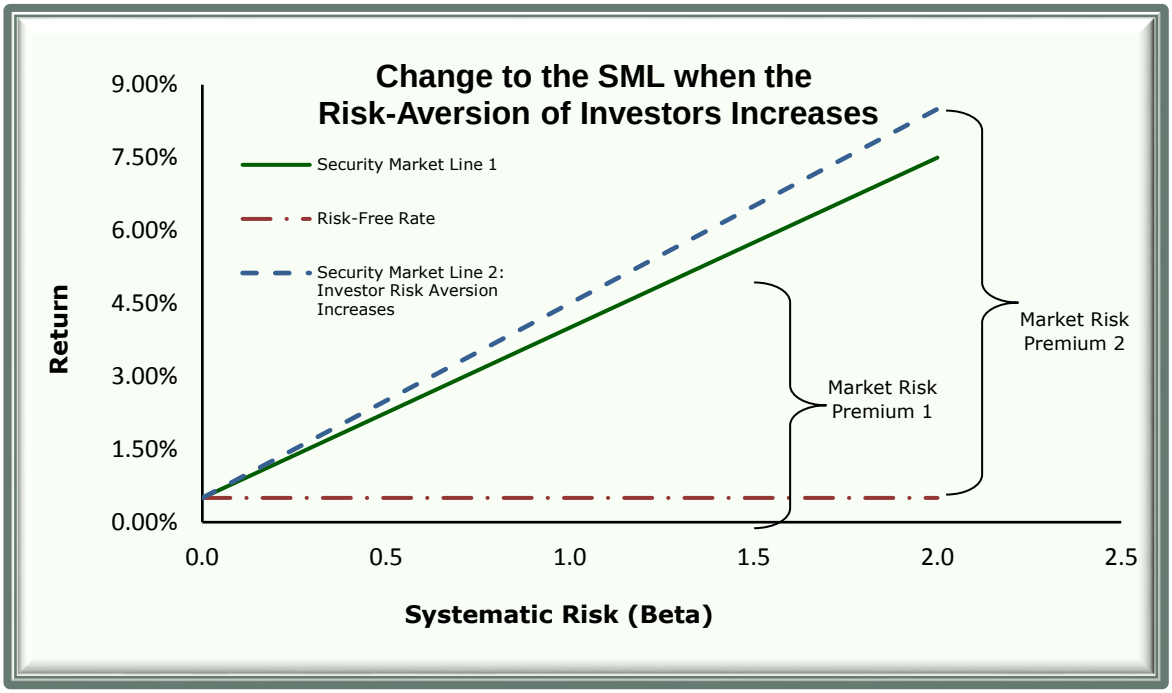
If the risk-free rate changes from 0.5% to 1.5%, then the y-intercept of the SML will change from 0.5% to 1.5% and the location of the Security Market Line will move upward, though its slope will not change. The slope of the SML will not change because the market risk premium will not change. Thus, when the risk-free rate increases by 1%, the investors' required rate of return for each level of risk will also increase by 1%. The investors' required rate of return for the market as a whole will change from 4% to 5%.



A Change in Investors' Risk-Aversion

If the risk-aversion of investors changes, the slope of the Security Market Line will change. When the risk-aversion of investors increases, the market risk premium increases, and the investors' required rate of return at each beta level increases. The more risk averse the investors, the steeper (more vertical) the SML will be.

In the following graph, investors have become more risk averse and they are requiring a higher rate of return for the same amount of risk (as identified from the various betas).



Question 38: The term "beta" can **best** be described as the

a) variability or standard deviation of the investment returns.

b) investment return's sensitivity to changes in the market's returns.

c) investment return's sensitivity to changes in interest rates.

d) weighted-average return of an investment portfolio.

(ICMA 2013-2)

Question 39: A stock has an expected return of 16% using the capital asset pricing model (CAPM). If the expected rate of return on the market is 12%, and the risk-free rate of return is 4%, what is the beta (β) coefficient of this stock?

a) 0.75

b) 1.50

c) 2.00

d) 3.00

(ICMA 2013-2)

Portfolio Risk and Return

A portfolio is a collection of assets that are managed as a group. For an individual investor, a portfolio would probably consist of a group of stocks and other liquid investments. For a company, a portfolio could consist of stocks and other liquid investments; but it could just as well consist of a group of companies managed as subsidiaries, a group of capital investment projects, or any other group of investments.

Portfolio Theory

Portfolio theory, also called **modern portfolio theory**, is an investment philosophy that seeks to construct an optimal portfolio of securities according to risk and return. According to portfolio theory, a particular security should not be evaluated as a standalone investment. Instead, each individual security should be evaluated according to how its market value is expected to vary in relation to the market values of the other securities in the portfolio.

Given an investor's preferred level of risk, a portfolio can be constructed that maximizes expected return for that preferred level of risk. Or, given an investor's preferred level of expected return, a portfolio can be constructed that minimizes risk for that level of expected return.

The key to constructing a portfolio is **diversification.** The idea of diversification is to **combine securities in such a way so as to reduce risk**. Different types of investments often change in market value in opposite directions, so when one asset's market price decreases, another asset's market price might increase and offset the loss. For example, an investment in a company that is cyclical (its returns move with the economy in general) can be combined with an investment in a company that is counter-cyclical (its returns move in the opposite direction of the economy). Diversification is investing in a variety of securities so that a loss affecting one of the securities will have minimal effect on the whole portfolio. Risk reduction can be achieved in a portfolio when the securities held are **not** correlated with one another. By properly diversifying the investments in a portfolio, an investor can minimize risk for a given level of return or maximize return for a given level of risk.

Asset allocation is the process of selecting assets to combine in a portfolio to achieve the best risk/return tradeoff possible. The assets can include bonds, stock, real estate, high-risk, low-risk, long-term, short-term and other types of investments in order to achieve the correct balance of risk and return. When a sufficient number of assets have been combined to achieve the full benefits of diversification, the portfolio is called a "fully diversified" or "efficient" portfolio. A fully diversified, efficient portfolio provides the highest possible rate of return for a particular level of risk or the lowest possible level of risk for a particular rate of return. It does not mean that risk has been eliminated. Risk has only been minimized for a particular level of return.

Note: An **efficient portfolio** is one that gives the highest possible rate of return for a given level of risk or the lowest possible level of risk for a given rate of return.

The portion of an individual asset's risk that can be minimized in a diversified portfolio is called **diversifiable**, **unsystematic** or **non-market risk**. Non-market risk can be minimized because it is caused by factors that are unique to each security, not things that affect the market as a whole. Examples of diversifiable, unsystematic risk are a labor strike, a fire in a firm's manufacturing plant, or a competitor's patent on a new technology that makes other technology obsolete.

Some risk cannot be diversified away. **Market risk**, or **systematic risk**, cannot be diversified away and is called **undiversifiable risk.** Market, systematic, undiversifiable risk is created by the fact that economic cycles affect all businesses, and publicly-held investments are traded in a market that can go up and down with economic news. In addition, market risk includes a certain amount of risk caused by imperfect correlations between and among securities that are intended to offset one another. Market risk cannot be diversified away, and all stocks are subject to it.

Portfolio theory deals with the balancing of the risk and the rate of return of investments and the selection of the investments that form the portfolio. The portfolio attempts to manage this balance of risk and return through proper asset allocation. Individual investments selected for inclusion in a portfolio should have characteristics that balance each other. If the portfolio is put together correctly, the risks of the individual securities will be different from one security to another and will therefore offset each other to some extent when the securities are combined in a portfolio. As a result, **the risk of the whole is less than (or at least should be less than) the risks of the individual securities in the portfolio.**

Note: The risk of a properly diversified portfolio will be lower than the risk of the individual securities within it if the securities' returns are not perfectly correlated, that is, if they behave differently. This risk reduction is the effect of diversification.

The table below shows the most common types of investments, ranked according to their levels of risk. The item listed as #1 has the lowest risk and #8 the highest risk. Knowing where the different investments are relative to each other in respect to risk will be helpful on the exam.

Note: The table that follows is general in nature. For example, all income bonds are not necessarily more risky than all subordinated debentures. An income bond pays interest only if the company has earnings enough to pay it, and if the interest is not paid, the company has no obligation to make it up, so the holder of an income bond could potentially receive no interest at all throughout the life of the bond. In the event of a bankruptcy, the priority of a subordinated debenture would be behind the issue it is subordinate to, but the company's obligation would include both principal and interest. Any determination of which specific bond would be riskier would depend upon the specific terms of each bond, particularly whether the bond is collateralized by any company assets. Therefore, in any given situation, the riskiness of one bond over another might not follow this table.

Lower Risk ⟵ ⟶ **Higher Risk**

1. U.S. Treasury Bonds	**3. Second Mortgage Bonds**	**5. Income Bonds**	**7. Convertible Preferred Stock**
2. First Mortgage Bonds	**4. Subordinated Debentures**	**6. Preferred Stock**	**8. Common Stock**

In general, an unsecured investment (meaning there is no collateral to serve as a secondary repayment source) is more risky than an investment that is secured (with collateral).

The Coefficient of Correlation (*r*) in Portfolio Theory

The **coefficient of correlation** measures the relationship between two variables. The coefficient of correlation is a number that expresses how closely connected, or correlated, the two variables are and the extent to which a change in one variable has historically resulted in a change in the other. In portfolio theory, the coefficient of correlation can be used to determine how closely two investments' returns have historically been correlated with one another. The coefficient of correlation for two securities' returns is calculated on a computer or on a financial calculator using the historical returns as inputs.

Mathematically, the coefficient of correlation, represented by ***r*** (or ***R***), is a numerical measure that expresses both the **direction** (positive or negative) and the **strength** of the linear association between the two variables. This amount of correlation, or **coefficient of correlation (*r*),** is expressed as a number between −1 and +1.

- A correlation coefficient of **+1** means there is a perfect **positive** (upsloping) linear relationship between the two securities' historical returns. When one security's returns have historically increased or decreased by a given percentage, the returns for the other security have historically increased or decreased by the same percentage.
- If the correlation coefficient is between zero and +1, there is a positive relationship between the two securities' returns, though not a perfect one. If the number is high, for example 0.80, it indicates a high degree of correlation. If the number is moderate, generally between 0.30 and 0.49, the correlation is not as strong.
- A correlation coefficient of **−1** means there is a perfect **negative** (downsloping) linear relationship between the two securities' historical returns. When one security's returns have historically increased by a given percentage, the returns for the other security have historically decreased by the same percentage.

- If the correlation coefficient is between zero and −1, there is a negative relationship between the two securities' returns, though not a perfect one. If the number is a high negative number such as −.90, there is a high degree of correlation. If the number is moderate, the correlation is not as strong.
- A coefficient of correlation that is **close to zero**, for example +0.10 or −0.10, usually means there is very little or no relationship between the two securities' historical returns.

The coefficient of correlation between two securities' historical returns can be used to identify securities that can be used effectively to diversify a portfolio. The key is to look for securities that have a low correlation to each other. Of course, there is no guarantee that future returns for the two securities will be as closely correlated or not correlated as they have been in the past. However, the past can be used to give the investor an idea of what the future might hold.

Long-Term Financial Management

Long-term financial management concerns the way a firm finances its assets over the long term. "Long term" is defined as more than one year.

The issues involved in long-term financial management include the proper balance between debt and equity financing, the cost of capital, and types of financial instruments.

A financial instrument is a document that represents a legal agreement involving some sort of monetary value or that represents a legally enforceable agreement between two or more parties regarding the right to a payment of money. Examples of financial instruments are bonds, stock certificates, futures and options contracts, and checks.

Capital Structure

Every firm has the need to raise capital (funds) in order to finance the necessary purchase of assets (such as inventories and manufacturing plants) to run its business. While smaller amounts of financing are available from short-term sources for business operating needs (such as inventory or short-term working capital needs), larger amounts of capital are of a more permanent or long-term nature. The permanent/long-term sources of financing that a company uses are referred to as the company's **capital structure**.

The capital structure of a firm includes the **long-term liabilities** and **equity** sections of its balance sheet. Long-term liabilities and equity indicate how the company obtained the necessary money to buy the assets the company holds. In contrast to the working capital area, a firm's capital structure relates to the firm's permanent and long-term financing.

The sources of permanent and long-term financing may be broken down into external and internal sources.

External Funds

External funds may be raised through the issuance of debt securities, equity securities (common or preferred stock), long-term bank financing or other types of financing such as leasing.

The money raised from long-term debt is a loan from the bank, money raised from a debt issue is a loan from the bondholders, and the money raised from a stock offering is an investment from the stockholders. The company will need to pay for the use of the funds raised. The company's payment may be in the form of interest or dividends, depending on the source of the funds.

- **Long-term debt**. Most companies that borrow long-term will pay the interest as it is due and refinance (or "roll over") the principal to pay off the existing debt when it matures. For a bond issue the refinancing takes place by selling more debt to pay off the maturing issue. For a bank loan, the refinancing takes place by obtaining another bank loan. Despite the fact that in reality long-term

the income statement as part of continuing operations. Conversion from the euro (the functional currency) to U.S. dollars (the reporting currency) is by translation, and the $800,000 gain goes to Accumulated Other Comprehensive Income in the Equity section of the balance sheet. Thus, only the $950,000 loss from the remeasurement is reported on the income statement, reducing net income. The gain from the translation goes to Accumulated Other Comprehensive Income, increasing Equity on the balance sheet, but is not reported in net income.

33 a – A change from one inventory cost flow assumption to another inventory cost flow assumption is a change of accounting principle and it is accounted for retrospectively.

34 b – A change in the useful life of an asset that is being depreciated is a change in estimate. Changes in estimates are accounted for in income from continuing operations prospectively in the period of the change and in future periods if the change will affect future periods.

35 c – Until May 2005, APB Opinion 20 required that most voluntary changes in accounting principle be recognized by including in net income of the period of the change the **cumulative effect** of changing to the new accounting principle. SFAS 154, issued by the FASB in May 2005, required retrospective application to prior periods' financial statements of changes in accounting principle, unless it is impracticable to determine either the period-specific effects or the cumulative effect of the change. That guidance was carried over to the FASB's Accounting Standards Codification when the Codification was introduced in 2009. Thus cumulative effect—reporting the cumulative effect of the accounting change in the current year's income statement as a special item and not restating prior period financial statements being presented for comparison purposes—is no longer an acceptable method of accounting for a change in accounting principle, **unless it is prescribed as the proper accounting treatment of the transition to a new standard issued by the FASB**.

When accounting standards are changed, the Accounting Standards Update issued by the FASB includes provisions for the proper accounting treatment of the transition to the new standard. An Accounting Standard Update may provide for adoption using cumulative effect adjustments (reporting the cumulative effect of the accounting change in the current year's income statement as a special item and not adjusting prior period financial statements). If cumulative effect transition treatment is required under a new standard, then it should be used for transitioning to that new standard. However, if a new accounting standard does not include specific transition provisions, retrospective application is the default procedure for transitioning to a new accounting standard. A cumulative effect adjustment is used **only** in the event a new accounting standard requires it to be used.

36 b – Determinants of a company's earnings quality include (1) the company's business environment, (2) its selection and application of accounting principles, and (3) the character of its management. Offering the sales staff financial incentives for increasing year-end sales does not fall into one of these classifications, so it is not likely to impact the company's quality of earnings either negatively or positively. However, purchasing inventory of an obsolete product to avoid a LIFO liquidation, estimating uncollectable accounts too low, and recording a sale before the revenue is eligible for recognition under generally accepted accounting principles all reflect upon the character of the company's management. Thus all those activities **would** negatively impact the quality of the company's earnings.

37 c – The determinants of earnings quality are (1) the company's business environment, (2) its selection and application of accounting principles, and (3) the character of its management. A change of accounting estimate is a change in application of an accounting principle. Changes in accounting estimates are accounted for prospectively, meaning no changes are made to prior period financial statements or to beginning retained earnings. The entire change in accounting estimate is accounted for in the current period and going forward. Frequent changes in accounting estimates result in financial statements that may not be comparable from one year to the next because the same accounting principle has not been applied consistently. In addition, frequent changes in accounting estimates raise questions as to the company's purpose in changing the estimates. An accounting estimate should be changed only if doing so will result in financial statements that more fairly depict the financial condition of the company. The company may have been changing its estimates in order to make its financial statements look better, and that is not an acceptable reason for changing an accounting estimate. Therefore, frequent changes in accounting estimates will negatively impact the company's earnings quality.

38 b – The beta of a security represents the correlation between the expected return of that security vs. the expected return of the average stock in the market as represented by some index of market activity such as the S&P 500. Thus it is an indication of the sensitivity of the investment's returns to changes in the market's returns.

39 b – The formula for the CAPM is $R = R_F + \beta(R_M - R_F)$. Since the problem gives all of these except the beta, the numbers that are known can be plugged into the formula and the formula can then be solved for the unknown, beta, as follows:

$0.16 = 0.04 + \beta(0.12 - 0.04)$

$0.16 = 0.04 + 0.08\beta$

$0.12 = 0.08\beta$

β = 1.5

40 d – Income bonds pay interest only when the issuer has sufficient earnings to pay the interest.

41 d – All four of the restrictions or requirements are likely to be contained in the indenture.

Receiving the trustee's permission before selling the property is important because the property is the collateral for the bond.

The requirement to maintain the property in good condition is important also because the property is the collateral for the bond. If the issuer were to default and the property were sold to satisfy the investors in the bond, the investors want to be certain the property will be worth enough to cover their investment. If the property has not been maintained properly, its market value will decrease and it might not be able to be sold for enough to satisfy the investors in case of a default.

Insuring the plant and equipment at certain minimum levels would also be required, because if a fire or other disaster were to occur and destroy the assets securing the mortgage bond, the investors would have no collateral to back up their investment.

Inclusion of a negative pledge clause would also be likely, because a negative pledge clause is a covenant in an indenture that states that the corporation will not pledge any of its assets for other debt if doing so would give the investors in these bonds less security.

42 c – A call provision is detrimental to the investor. A company would issue bonds with a call provision so that if interest rates go down during the term of the bond, the company can buy back the bonds at its option. The investor has the reinvestment risk of not being able to find suitable reinvestment opportunities.

43 c – The key feature of serial bonds is that individual bonds in the issue mature at different times, so investors can choose the maturity that suits their financial needs.

44 b – Bond A's nominal interest rate (coupon rate) of 6% is below the market rate of 7%, and therefore Bond A will sell at a discount to its face value. Bond B's nominal interest rate of 8% is above the market rate of 7%, and therefore Bond B will sell at a premium to its face value. Only options a) and b) meet those requirements. To determine which one is correct, calculate the market value of at least one of the bonds.

The market price of a bond is the present value of its future cash flows, both interest and return of principal. Since this bond pays interest annually, the present value factors for a discount rate of 7 percent for two years can be used to find the present values of the interest payments and the principal repayment.

When using factors to discount future cash flows, the result will be affected by the number of decimal places used in the factor. The more decimal places used, the more accurate will be the present value. Regardless of how many decimals are used in the factors, though, the calculated bond prices in this question do not exactly match any of the answer choices given, so the answer will be, as the problem says, the prices that are **closest to** the calculated prices.

The market price of Bond A, using the present value factor for an annuity for the interest and the present value factor for $1 for the principal, both at a discount rate of 7% for two years, is as follows:

PV of interest: $6,000 × 1.808 =	$10,848
PV of principal: $100,000 × 0.873 =	87,300
Price of Bond A	$98,148

The market price of Bond B, using the present value factor for an annuity for the interest and the present value factor for $1 for the principal, both at a discount rate of 7% for two years:

PV of interest: $8,000 × 1.808 =	$ 14,464
PV of principal: $100,000 × 0.873 =	87,300
Price of Bond A	$101,764

The answer choice with the values that are closest to $98,148 and $101,764 is b: **$98,184** and **$101,800**.

45 a – This problem does not give the expected rate of growth in the dividend. In this case, an adapted form of the Dividend Growth Model incorporating the expected stock price at the end of one year along with the expected dividend for the next year can be used to value the stock. The adapted formula, which calculates the present value of the future cash flows, is:

$$P_0 = \frac{D_1 + P_1}{1 + R}$$

Where:

P_0 = the fair value today of a share of stock;

