Level I of the CFA® 2025 Exam

Study Notes - Portfolio Management

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Learning Module 1: Portfolio Risk & Return: Part I

LOS 1a: describe characteristics of the major asset classes that investors consider in forming portfolios

All asset classes have risk and return characteristics. Historical returns are neither forward-looking nor expected returns. Nevertheless, it is noteworthy that by examining the performance of the historical returns, we can understand the likely characteristics of a particular asset class.

Returns of Major Asset Classes

The examination of an 83-year period, from 1926 to 2008, provides investors with annual return data. The data is often used to forecast the expected mean return for the asset classes. The major asset classes have produced the following annual nominal returns for the United States:

- US Large Company Stocks: 9.6%.

- US Small Company Stocks: 11.7%.

- US Long-term Corporate Bonds: 5.9%.

- US Long-term Government Bonds: 5.7%.

- US Treasury Bills: 4.0%.

Over this period of 83 years, the US inflation rate has averaged 3.0%. However, inflation has varied widely. Therefore, the use of real, inflation-adjusted returns is more appropriate, particularly when comparing asset class returns globally.

Using data from 1900 to 2008, an examination of nominal versus real returns global asset classes can be made. In nominal terms, world equities returned 8.4%, while world bonds returned 4.8%. The corresponding real returns are 5.2% and 1.8%, respectively.

Risk of Major Asset Classes

We cannot examine returns without examining the associated risk to each asset class. Risk, in this context, is measured by a standard deviation metric. By examining the United States' nominal returns over the period between 1926 to 2008, we observe the following standard deviations:

- US Large Company Stocks: 20.6%.

- US Small Company Stocks: 33.0%.

- US Long-term Corporate Bonds: 8.4%.

- US Long-term Government Bonds: 9.4%.

- US Treasury Bills: 3.1%.

Using nominal world data from 1900 to 2008, we note that the standard deviation for world equities is 17.3% and 8.6% for world bonds.

Risk-Return Tradeoff

A risk-return tradeoff refers to the relationship between risk and return. Ideally, if you want to achieve a higher return, you must accept a higher level of risk. Reviewing the US nominal asset class data, it can be noted that small company stocks delivered the highest return over the period (11.7%) despite bearing the highest risk (33.0%).

Risk Premium

The risk premium is the extra returns investors can expect for assuming additional risk after accounting for the nominal risk-free interest rate. The world equity risk premium over bonds is 3.4%. This is the additional return investors can hope to achieve from equities over bonds due to the additional equity risk.

Other Investment Characteristics

An assumption of a normal distribution of returns is made by making use of a mean and standard deviation when evaluating asset class characteristics. However, within a financial market context, an assumption of normality is flawed since returns are not normally distributed. The probability of extreme events is greater than a normal distribution suggests. An examination of the skewness and kurtosis of a distribution is required.

Skewness

Skewness is a measure of the asymmetry of a return distribution. If more returns are concentrated on the right end of the distribution, the returns are said to be negatively skewed and vice versa. Generally, stock returns tend to be negatively skewed.

Kurtosis

Kurtosis refers to the "fat tails" of the distribution. That is, the greater probability of extreme events than would ordinarily be assumed by a normal distribution.

Liquidity

Although not a function of the return distribution, liquidity is an important market factor that contributes to the risk of an investment. Liquidity tends to excite more concern in emerging markets than in developed markets. This trend is attributable to smaller trading volumes in those markets. It is equally a cause for concern for potentially more risky asset classes such as low-credit quality corporate bonds.

Question

Skewness is *most likely*:

A. A measure of the asymmetry of the probability distribution.

B. A measure of the "tailedness" of the probability distribution.

C. A measure that is used to quantify the amount of variation or dispersion of a set of data values.

Solution

The correct answer is **A**.

Skewness is a measure of the asymmetry of a return distribution.

Option B is incorrect. It is the definition of kurtosis.

Option C is incorrect. It is the definition of standard deviation.

LOS 1b: explain risk aversion and its implications for portfolio selection

Risk aversion is related to investor behavior. Some investors are more comfortable with uncertainty in the outcome than others and are prepared to tolerate more risk in the pursuit of greater portfolio returns.

Risk Seeking

Risk seekers actively pursue risk even when the potential outcome does not justify taking extra risk. This is a gambling instinct: choosing to place money at casinos, knowing the odds of winning are slim or that the expected return is actually negative.

Risk Neutrality

If an investor is indifferent to the outcome, they may be risk-neutral. This means they will likely pursue higher returns even if this comes with higher risk. This is often the case, particularly when the investment represents a small portion of their wealth or portfolio.

Risk Aversion

A risk-averse investor will gravitate towards a guaranteed outcome and shy away from risky investments. A lower, certain return will be preferable to a higher, less certain return. Market data typically represents risk-averse behavior on the part of investors, and risk aversion is, as such, a standard assumption.

Risk Tolerance

Risk tolerance refers to the amount of risk an investor is willing to take in order to achieve their investment goals and objectives. A higher risk tolerance shows a greater willingness to take

risks. This implies that risk tolerance and risk aversion are negatively correlated.

Question

In a choice of a certain $45 versus a 50% chance of $100, an investor chooses the certain $45. What type of risk behavior does the following scenario represent?

A. Risk-seeking behavior.

B. Risk-neutral behavior.

C. Risk-averse behavior.

Solution

The correct answer is **C**.

A risk-averse investor will likely select the guaranteed option instead of the uncertain outcome, even though the uncertain outcome has a higher expected return of $50.

LOS 1c: explain the selection of an optimal portfolio, given an investor's utility (or risk aversion) and the capital allocation line

Risk-free assets are usually government-issued with no risk. When you combine them with risky assets, you create a capital allocation line on a graph. This line connects the best risky portfolio to the risk-free asset.

The Two-fund Separation Theorem

The two-fund separation theorem says all investors, no matter their preferences or wealth, use two funds: a risk-free one and a portfolio of risky assets. This splits portfolio building into two steps: first, we pick the best mix of risky assets based on their characteristics. Then, we decide how much to allocate to the risk-free asset based on the investor's risk preference. Combining the risk-free asset with the risky portfolio makes the capital allocation line (CAL) on a graph.


The Capital Allocation Line (CAL)
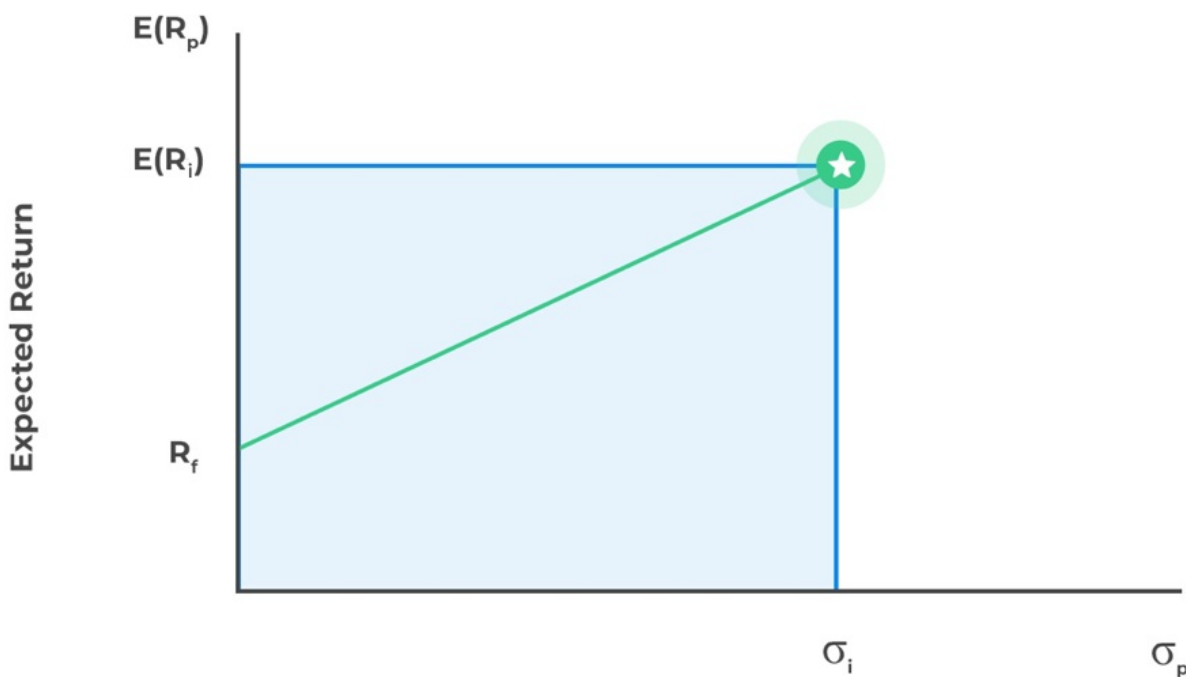
Investor Preferences

A highly risk-averse investor may choose to invest only in a risk-free asset. On the contrary, a less risk-averse investor may have a small portion of their wealth invested in the risk-free asset and a large portion invested in the risky portfolio. An investor with a high-risk tolerance may, in fact, choose to borrow from the risk-free asset and invest in a risky portfolio. This enables the investor to invest more than 100% of their assets and create a leveraged portfolio.
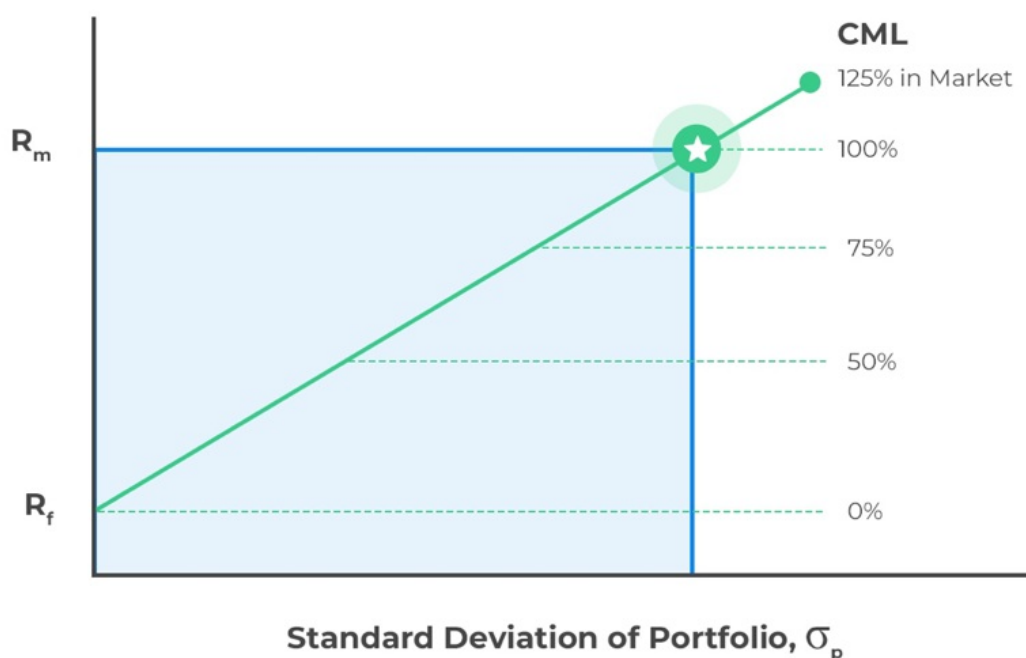
Utility and Indifference Curves

Utility is a measure of relative satisfaction that an investor derives from different portfolios. We can generate a mathematical function to represent this utility that is a function of the portfolio's expected return, the portfolio variance, and a measure of risk aversion.

$$U = E(r) - \frac{1}{2}A\sigma^2$$

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Where:

U = Utility.

E(r) = Portfolio expected return.

A = Risk aversion coefficient.

σ^2 = portfolio variance.

To determine risk aversion (A), we measure the marginal reward an investor needs in order to take more risk. A risk-averse investor will need a high-margin reward for taking more risks. The utility equation shows the following:

- Utility can be positive or negative – it is unbounded.

- High returns add to utility.

- High variance reduces utility.

- Utility does not measure satisfaction but can be used to rank portfolios.

The risk aversion coefficient, A, is positive for risk-averse investors (any increase in risk reduces utility). It is 0 for risk-neutral investors (changes in risk do not affect utility) and negative for risk-seeking investors (additional risk increases utility).

Risk Aversion for Different Types of Investors
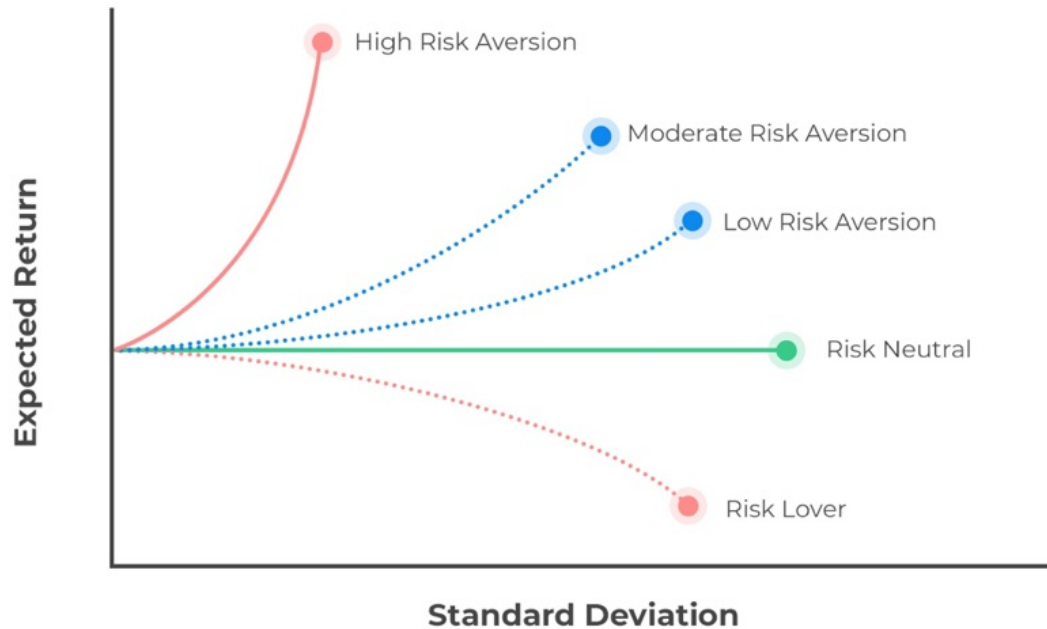
An indifference curve plots the combination of risk and returns that an investor would accept for a given level of utility. For risk-averse investors, indifference curves run "northeast" since an investor must be compensated with higher returns for increasing risk. It has the steepest slope. A more risk-seeking investor has a much flatter indifference curve as their demand for increased returns as risk increases is much less acute.

We can overlay an investor's indifference curve with the capital allocation line to determine their optimal portfolio.

Optimal Portfolio Given Different Utility Functions
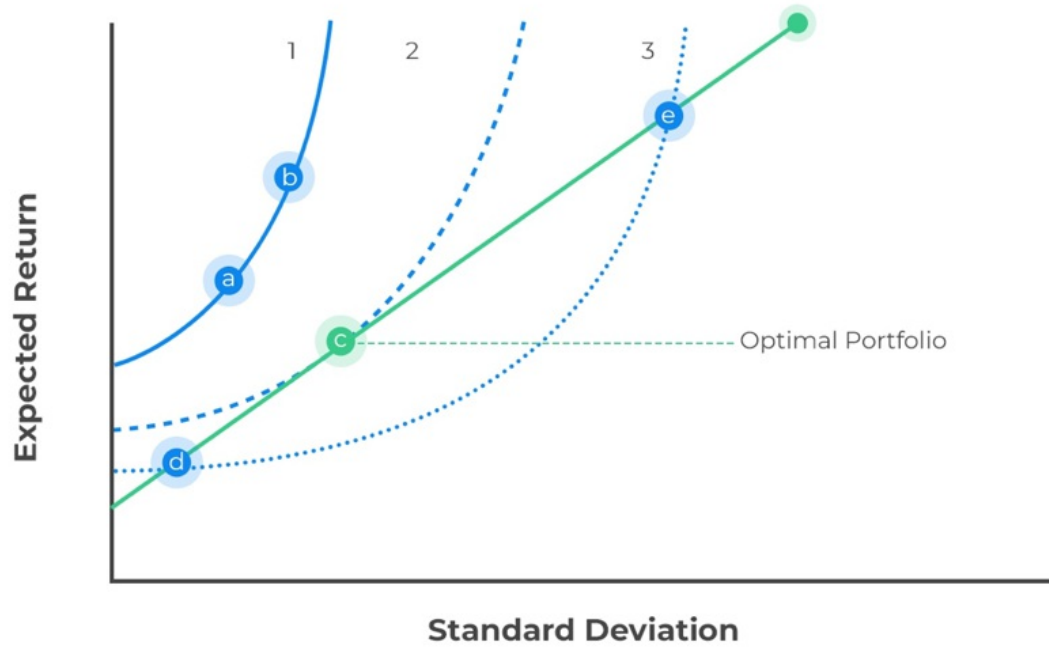
Question

Using the utility function $U = E(r) - \frac{1}{2}A\sigma^2$ and assuming A = -4, which of the following statements best describes the investor's attitude to risk?

A. The investor is risk-neutral.

B. The investor is risk-averse.

C. The investor is risk-seeking.

Solution

The correct answer is **C**.

A negative risk aversion coefficient (A = -4) means the investor receives a higher utility (more satisfaction) for taking more portfolio risk. A risk-averse investor would have a risk aversion coefficient greater than 0, while a risk-neutral investor would have a risk aversion coefficient equal to 0.

LOS 1d: calculate and interpret the mean, variance, and covariance (or correlation) of asset returns based on historical data

Investors seek to manage portfolio risk while maintaining returns. This involves understanding portfolio risk components. Diversification, particularly with assets having low correlations, can mitigate risk without necessarily lowering returns. Portfolio return is the weighted average of individual asset returns. Portfolio risk, however, isn't simply a weighted average due to correlations among assets. Covariance and correlation measures help quantify portfolio risk, simplifying the computation of variance for a two-asset portfolio.

The computation of mean, variance, and covariance statistics allows portfolio managers to compare the underlying securities' return-risk characteristics and potential portfolio impact. These metrics are quantitatively determined and rely on historical price or return data. While we can compute the historical profile, this does not necessarily mean the relationship between assets or their return-risk profile will remain the same in the future.

Mean

The mean of a set of values or measurements is the sum of all the measurements divided by the sum of all the measurements in the set:

$$\text{Mean} = \frac{\sum_{i=1}^{n} x_i}{n}$$

If we compute the population's mean, we call it the parametric or population mean, denoted by ? (read "mu"). If we get the mean of the sample, we call it the sample mean, denoted by the x bar.

Population vs. Sample

A population refers to the summation of all the elements of interest to the researcher.

- Examples: The number of people in a country, the number of hedge funds in the U.S., or even the total number of CFA candidates in a given year.

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A sample is just a set of elements that represent the population as a whole. By analyzing sample data, we are able to make conclusions about the entire population.

- For example, if we sample the returns of 30 hedge funds spread across the U.S., we can use the results to make reasonable conclusions about the market as a whole (well over 10,000 hedge funds).

Variance

Variance is a measure of dispersion around the mean and is statistically defined as the average squared deviation from the mean. It is noted using the symbol σ^2.

$$\sigma^2 = \frac{\sum_{i=1}^{N}(X_i - \mu)^2}{N}$$

Where μ is the population mean, and N is the population size.

The standard deviation, σ, is the square root of the variance and is commonly referred to as the volatility of the asset. Essentially, it is a measure of how far, on average, the observations are from the mean. A population's variance is given by:

The population standard deviation equals the square root of the population variance. The sample variance is given by:

$$S^2 = \frac{\sum_{i=1}^{N}(X_i - \bar{X})^2}{n - 1}$$

Where X-bar is the sample mean, and n is the sample size.

Note that the sample standard deviation equals the square root of the sample variance.

Covariance

Covariance is a measure of how closely two assets move together. In covariance, we focus on the

relationship between the deviations of some two variables rather than the deviation from the mean of one variable.

If the means of random variables X and Y are known, then the covariance between the two random variables can be determined as follows:

$$\hat{\sigma}_{xy} = \frac{1}{n} \sum_{i=1}^{n} (x_i - \mu_x)(y_i - \mu_y)$$

If we do not know the means, then the equation changes to:

$$\hat{\sigma}_{xy} = \frac{1}{n-1} \sum_{i=1}^{n} (x_i - \hat{\mu}_x)(y_i - \hat{\mu}_y)$$

Correlation

Correlation is a concept that is closely related to covariance in the following way:

$$\rho_{xy} = \frac{\sigma_{xy}}{\sigma_x \sigma_y}$$

Correlation ranges between +1 and -1 and is much easier to interpret than covariance. Two variables are perfectly correlated if their correlation is equal to +1. Note that they are uncorrelated if their correlation equals 0 and move in perfectly opposite directions if their correlation equals -1.

Question

In a two-asset portfolio, which combination of assets would result in the most diversified portfolio?

A. Correlation coefficient = 0.75.

B. Correlation coefficient = -0.2.

C. Correlation coefficient = 0.

Solution

The correct answer is **B**.

A diversified portfolio is produced, and portfolio risk is lowered within a two-asset portfolio by combining negatively correlated assets.

LOS 1e: calculate and interpret portfolio standard deviation

The standard deviation of a portfolio of assets, or portfolio risk, is simply not the sum of the risk of the underlying securities. Due to the correlation between securities, the computation of portfolio risk must incorporate this correlation relationship.

Computing Portfolio Standard Deviation

The portfolio standard deviation and variance are important. They involve the variance of the assets and the covariance between asset pairs. For a portfolio with assets X and Y, the portfolio variance can be calculated as follows:

$$\text{Portfolio variance} = w_X^2 \sigma_X^2 + w_Y^2 \sigma_Y^2 + 2w_X w_Y \sigma_X \sigma_Y \rho_{XY}$$

Therefore,

$$\text{Portfolio standard deviaton} = \sqrt{w_X^2 \sigma_X^2 + w_Y^2 \sigma_Y^2 + 2w_X w_Y \sigma_X \sigma_Y \rho_{XY}}$$

Where:

w = Weight of the asset within the portfolio.

σ = Standard deviation.

ρ = Correlation coefficient.

Note that $\sigma_X \sigma_Y \rho_{XY} = \text{Covariance}_{XY}$

Question

Consider two assets in a portfolio. Asset A has an allocation of 80% and a standard deviation of 16%. Asset B has an allocation of 20% and a standard deviation of 25%. The correlation coefficient between asset A and asset B is 0.6. In this case, the portfolio standard deviation is *closest to*:

A. 16.3%.

B. 2.7%.

C. 22%.

Solution

The correct answer is **A**.

We determine the portfolio variance as follows:

Portfolio variance = $(0.8)^2 \times (0.16)^2 + (0.2)^2 \times (0.25)^2 + 2(0.8)(0.2)(0.16)(0.25)(0.6)$

Then, we use the square root of the variance to get the standard deviation:

Portfolio standard deviation = $\sqrt{2.66\%} = 16.3\%$

LOS 1f: describe the effect on a portfolio's risk of investing in assets that are less than perfectly correlated

The portfolio standard deviation, or risk, is not simply the addition of the risk of each portfolio holding. The interaction between portfolio holdings contributes to the overall portfolio risk.

Correlation

Correlation is a statistical measure of the relationship between two series. The series need not pertain to financial assets. In the context of a portfolio, the series will consist of the historical returns of two potential portfolio constituents.

When the returns move in "lockstep" with one another, they are said to be perfectly correlated and have a correlation coefficient of +1. The converse implies a correlation coefficient of -1.

When you put assets together in a portfolio with correlation coefficients less than +1 (they don't have to be negatively correlated), it reduces the overall risk of the portfolio. Having uncorrelated assets means they don't move together in the same direction all the time. This risk diversification leads to a portfolio with less volatility, and different assets contribute to the portfolio's return at various times.

Correlation plays a crucial role in risk diversification. Assets with negative correlations, like Beachwear and DVD rental, move in opposite directions, providing a hedge against risk. Lower correlations generally mean lower risk, but finding assets with significantly low correlations can be challenging.

Historical returns may not always predict future returns accurately, but historical risk tends to remain relatively stable. Correlations among assets within the same country are consistent, while intercountry correlations have risen due to globalization.

Diversification across asset classes, countries, and industries is key to mitigating risk. Index funds offer a cost-effective way to diversify, especially for small portfolios. Investing in foreign countries and avoiding over-investment in one's employer's stock are also recommended

diversification strategies.

Insurance and investments with negative correlations, like gold, can further reduce portfolio risk. Options such as put options provide protection against significant losses, albeit with associated costs. Overall, diversification is vital for a resilient portfolio that can weather market fluctuations.

Question

Given the following correlation coefficients, which two-asset portfolio combination is likely to exhibit the lowest risk?

- Asset A - Asset B correlation = 0.7.

- Asset A - Asset C correlation = 0.3.

- Asset B - Asset C correlation = 0.5.

A. Portfolio AB.

B. Portfolio AC.

C. Portfolio BC.

Solution

The correct answer is **B**.

The portfolio with the lowest correlation between underlying assets is likely to have the lowest portfolio risk. An understanding of the standard deviations of the underlying assets, as well as the allocation to those assets, would be required to give a definite answer.

LOS 1g: describe and interpret the minimum-variance and efficient frontiers of risky assets and the global minimum-variance portfolio

In theory, we could form a portfolio made up of all investable assets. However, this is not practical, and we must find a way to filter the investable universe. A risk-averse investor wants to find a combination of portfolio assets that minimizes risk for a given level of return.

Minimum-variance Frontier

When constructing a portfolio, it's important to consider both the expected return and the level of risk involved. These portfolio characteristics depend on the assets included and how they interact with each other, which is measured through correlation. To explore various investment opportunities, we adjust the allocation to each asset. Different allocations create portfolios with distinct risk and return profiles. These profiles can be visually represented on a graph, with the expected return on one axis and the standard deviation on the other. This visualization helps investors make informed decisions about their portfolios.

For each level of return, the portfolio with the minimum risk will be selected by a risk-averse investor. This minimization of risk for each level of return creates a minimum-variance frontier – a collection of all the minimum-variance (minimum-standard deviation) portfolios. At a point along this minimum-variance frontier curve, there exists a minimum-variance portfolio that produces the highest returns per unit of risk.

Global Minimum-variance Portfolio

Along the minimum-variance frontier, the left-most point is a portfolio with minimum variance when compared to all possible portfolios of risky assets. This is known as the global minimum-variance portfolio. An investor cannot hold a portfolio of risky (note: risk-free assets are excluded at this point) assets with a lower risk than the global minimum-variance portfolio.

Efficient Frontier

The portion of the minimum-variance curve that lies above and to the right of the global minimum variance portfolio is known as the Markowitz efficient frontier. It contains all portfolios that rational, risk-averse investors would choose. We can also monitor the slope of the efficient frontier, the change in units of return per unit of risk. As we move to higher levels of risk, the resulting increase in return begins to diminish. The slope begins to flatten. This means we cannot achieve ever-increasing returns as we take on more risk, quite the opposite. Investors experience a diminishing increase in potential returns as portfolio risk increases.

Global Minimum Variance Portfolio
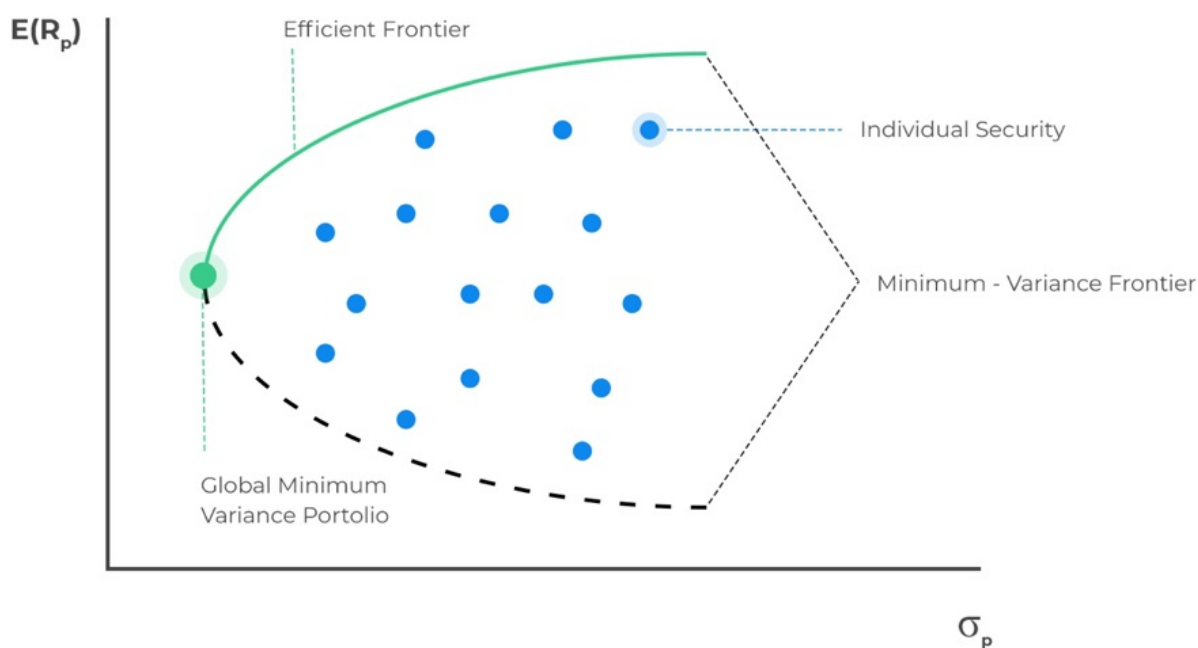
Question

Which statement *best describes* the global minimum-variance portfolio?

A. The global minimum variance portfolio gives investors the highest levels of returns.

B. The global minimum variance portfolio gives investors the lowest risk portfolio made up of risky assets.

C. The global minimum variance portfolio lies to the right of the efficient frontier.

Solution

The correct answer is **B**.

The global minimum variance portfolio lies to the far left of the efficient frontier. It is made up of a portfolio of risky assets that produces the minimum risk for an investor.

Learning Module 2: Portfolio Risk & Return: Part II

LOS 2i: calculate and interpret the Sharpe ratio, Treynor ratio, M2, and Jensen's alpha

Sharpe Ratio

The Sharpe Ratio is the portfolio risk premium divided by the portfolio risk.

$$\text{Sharpe ratio} = \frac{E(R_p) - R_f}{\sigma_p}$$

The Sharpe ratio, or reward-to-variability ratio, is the slope of the capital allocation line (CAL). The greater the slope (higher number), the better the asset. Note that the risk being used is the total risk of the portfolio, not its systematic risk, which is a limitation of the measure. The portfolio with the highest Sharpe ratio has the best performance, but the Sharpe ratio is not informative. In order to rank portfolios, the Sharpe ratio for each portfolio must be computed.

Further limitation occurs when the numerators are negative. In this instance, the Sharpe ratio will be less negative for a riskier portfolio, resulting in incorrect rankings.

Treynor Ratio

The Treynor ratio is an extension of the Sharpe ratio. Instead of using total risk, Treynor uses beta or systematic risk in the denominator.

$$\text{Treynor ratio} = \frac{E(R_p) - R_f}{\beta_p}$$

As with the Sharpe ratio, the Treynor ratio requires positive numerators to give meaningful comparative results. Apart from this, the Treynor ratio does not work for negative beta assets. Also, while both the Sharpe and Treynor ratios can rank portfolios, they do not provide information on whether the portfolios are better than the market portfolio. Similarly, they do not offer information about the degree of superiority of a higher ratio portfolio over a lower ratio portfolio.

M-Squared (M²) Ratio

The concept behind the M² ratio is to create a portfolio P' that mimics the risk of the market portfolio by altering the weights of the actual portfolio P and the risk-free asset until portfolio P' has the same total risk as the market. The return on the mimicking portfolio P' is determined and compared with the market return.

The weight in portfolio P (w_p), which sets the portfolio risk equal to the market risk, can be written as:

$$w_p = \frac{\sigma_m}{\sigma_p}$$

With the balance (1 - w_p) invested in the risk-free asset.

The return for the mimicking portfolio P' is as follows:

$$R_{p'} = w_p R_p + (1 - w_p) R_f$$

Which we can reformulate as:

$$R_{p'} = \frac{\sigma_m}{\sigma_p} \times R_p + (1 - \frac{\sigma_m}{\sigma_p}) \times R_f$$

Therefore,

$$R_{p'} = R_f + \sigma_m \frac{[R_p - R_f]}{\sigma_p}$$

The difference in return between the mimicking portfolio and the market return is M² which is expressed as:

$$M^2 = [R_p - R_f] \frac{\sigma_m}{\sigma_p} + R_f = SR \times \sigma_m + R_f$$

A portfolio that matches the market's return will have an M² value equal to zero, while a portfolio that outperforms will have a positive value. By using the M² measure, it is possible to rank

portfolios and also determine which portfolios beat the market on a risk-adjusted basis.

Jensen's Alpha

Jensen's alpha is based on systematic risk. The daily returns of the portfolio are regressed against the daily returns of the market. Essentially, this is done in order to compute a measure of this systematic risk in the same manner as the CAPM. The difference between the actual return of the portfolio and the calculated or modeled risk-adjusted return is a gauge of performance relative to the market.

$$\text{Jensen's alpha} = \alpha_p = R_p - [R_f + \beta_p(R_m - R_f)]$$

If α_p is positive, the portfolio has outperformed the market, while a negative value indicates underperformance. The alpha values can also be used to rank portfolios or the managers of those portfolios, with the alpha being a representation of the maximum amount an investor should pay for the active management of that portfolio.

Question

A client has three portfolio choices, each with the following characteristics:

	Expected Return	Volatility	Beta
Portfolio A	15%	12%	10%
Portfolio B	18%	14%	11%
Portfolio C	12%	9%	5%

The efficient market portfolio has an expected return of 20%, a standard deviation of 12%, and a risk-free interest rate of 5%.

Based on the Sharpe ratio for each portfolio, the client should choose:

1. Portfolio A.

2. Portfolio B.

3. Portfolio C.

Solution

The correct answer is portfolio **B**.

$$\text{Sharpe ratio} = \frac{R_p - R_f}{\sigma_p}$$

The portfolio with the highest Sharpe ratio has the best performance.

|	Calculation	Sharpe Measure
Portfolio A	(15% − 5%)/12%	0.83
Portfolio B	(18% − 5%)/14%	0.93
Portfolio C	(12% − 5%)/9%	0.77

Note: The Sharpe ratio uses total risk, not just the systematic risk of a portfolio (as represented by beta). Further, note that the information about the efficient market portfolio is useless in this case.

LOS 2a: describe the implications of combining a risk-free asset with a portfolio of risky assets

By combining a portfolio of risky assets with a risk-free asset, we can improve the return-risk characteristics of the portfolio and realize a better trade-off. This combination is called the capital allocation line (CAL). The proportion of allocation to risky assets versus allocation to risk-free assets will be dependent on the risk preferences of the investor.

Capital Allocation Line (CAL) Given Investor Preferences
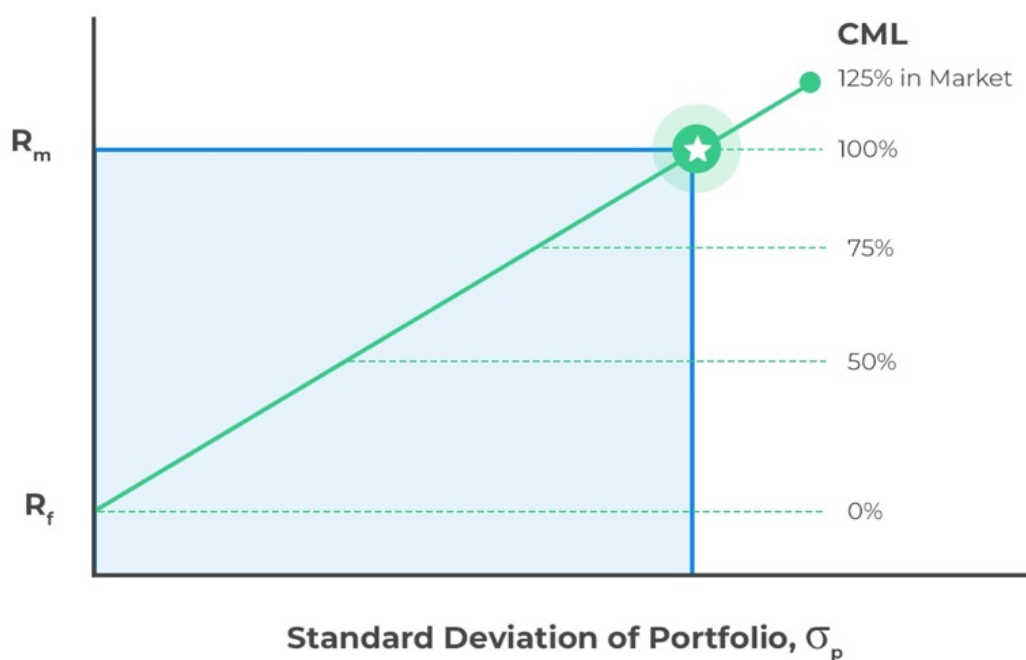
Combined Portfolios

We calculate the expected return of a mixed portfolio by adding up the expected returns of its components. To assess the portfolio's risk, we need the allocation to each component, the standard deviation of each, and the correlation between them. When the assets aren't perfectly correlated, the portfolio's variance will be lower than that of its individual assets.

Each investor will have their own risky portfolio, dependent on the assumptions they make on the likely performance of the underlying assets. Since every investor makes their own unique assumptions about the underlying assets, there is no one optimal risk portfolio. We need to make a simplifying assumption that investor expectations are homogenous in order to derive what would be the optimal market portfolio.

Question

If two underlying assets are negatively correlated, combining them to form a portfolio will make the portfolio risk:

A. Increase.

B. Decrease.

C. Remain constant.

Solution

The correct answer is **B**.

When uncorrelated assets are combined to form a portfolio, a lack of correlation will reduce the overall portfolio volatility.

LOS 2b: explain the capital allocation line (CAL) and the capital market line (CML)

We form a capital allocation line when we combine a risky asset portfolio with a risk-free asset. This represents the allocation between risk-free and risky assets based on investor risk preferences. The capital market line is a special case of the CAL, where the portfolio of risky assets is the market portfolio.

Passive and Active Portfolios

A market can be informationally efficient. In such a case, the quoted security price in the market is an unbiased estimate of all the future discounted cash flows and reflects all publicly known information about the security. If all security prices reflect all publicly available information, then, in theory, there is no way to outperform the market. If this is the investor's belief, then investing in a passive portfolio is the simplest and most convenient approach. A passive portfolio will track and replicate the market.

Many investors do not believe the market price accurately reflects valuations. They have confidence in their ability to determine these mispricings based on their evaluation models. Such investors take an active approach to investing and overweighting undervalued assets and underweighting (or shorting, if allowed) overvalued assets. This style of investing is called active management.

The Market

The market includes all risky assets or anything that has value – stocks, bonds, real estate, human capital, and commodities. These assets are all defined in "the market." Not all market assets are tradable or investable. If global assets are considered, hundreds of thousands of individual securities make up the market and are considered tradable and investable. A typical investor is likely to rely on their local or regional stock market as a measure of "the market".

The Capital Market Line (CML)

The Capital Market Line (CML) is a special case of the CAL, that is, the line that makes up the allocation between a risk-free asset and a risky portfolio for an investor. In the case of the CML, the risk portfolio is the market portfolio. Where an investor has defined "the market" to be their domestic stock market index, the expected return of the market is expressed as the expected return of that index. The risk-return characteristics for the potential risk asset portfolios can be plotted to generate a Markowitz efficient frontier. The point at which the line from the risk-free asset touches or is tangential to the Markowitz portfolio is defined as the market portfolio. The line connecting the risk-free asset with the market portfolio is the CML.

The expected return and variance for the portfolio can be represented as follows:

$$\text{Expected return} = E(R_P) = wR_f + (1-w)E(R_m)$$

$$\text{Variance} = \sigma_P^2 = w^2\sigma_f^2 + (1-w)^2\sigma_m^2 + 2w(1-w)Cov(R_f, R_m)$$

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Where:

R_f is the return on the risk-free asset.

R_m is the return on the market.

w is the weight of the risk-free asset in the portfolio.

$1 - w$ is the weight of the market asset in the portfolio.

Theoretically, the standard deviation of the risk-free asset is zero, and the term, $w^2\sigma_f^2$ falls out of the equation. Equally, the risk-free asset is assumed to have no covariance with the market portfolio. This means that the portfolio standard deviation is written as:

$$\sigma_p = (1 - w)\sigma_m$$

By substitution, we can write:

$$E(R_p) = R_f + \frac{E(R_m) - R_f}{\sigma_m} \times \sigma_p$$

This is in the form of an equation of a straight line where the intercept is R_f, and the slope is $\frac{E(R_m) - R_f}{\sigma_m}$. This is the CML line which has a positive slope as the market return is greater than the risk-free return.

Question

What happens to the portfolio risk and return, respectively, as an investor moves up the CML?

A. Risk decreases, return decreases.

B. Risk increases, return decreases.

C. Risk increases, return increases.

Solution

The correct answer is **C**.

The overall portfolio risk and return increase as an investor moves up the CML.

LOS 2c: explain systematic and nonsystematic risk, including why an investor should not expect to receive additional return for bearing nonsystematic risk

Systematic risk is inherent in the overall market and cannot be avoided. Non-systematic risk is limited to a particular asset class or security and can be avoided through appropriate portfolio diversification.

Systematic Risk

When you invest in a market, you face systematic risk. This risk is tied to market conditions like interest rates, inflation, and politics, among others. You can't escape systematic risk, but if you use leverage, it can make it even riskier.

Non-systematic Risk

Non-systematic risk is limited to a particular asset class or security and is a function of the "idiosyncrasies" of a particular asset. Investors can avoid non-systematic risk through portfolio diversification. A diversified portfolio reduces exposure or reliance on any one underlying security or asset class.

Pricing of Risk

When an asset has both systematic and non-systematic risk, and we expect to be compensated for both, it makes sense to diversify. Diversification means spreading your investments across different assets that don't move together. This way, you can reduce or eliminate the non-systematic risk, leaving you with only the systematic risk.

Even if an investor eliminates non-systematic risk, they wouldn't be compensated. If they kept adding more non-systematic risk, they'd eventually get zero expected return. So, we can't

assume investors will be rewarded for non-systematic, diversifiable risk. In an efficient market, there's no extra reward for taking this kind of risk.

Therefore, only the systematic risk is priced and compensated for, while non-systematic risk does not generate any return. It is, therefore, an investor's interest to diversify the non-systematic risk element within a portfolio.

Question

Which statement *best* describes systematic risk?

A. Systematic risk can be diversified, and investors are not compensated for this risk.

B. Systematic risk cannot be diversified, and investors are compensated for this risk.

C. Systematic risk can be diversified, and investors are not compensated for this risk.

Solution

The correct answer is **B**.

You can't diversify systematic risk because it's market-related. Investors get rewards for taking systematic risks. However, they don't get compensated for non-systematic, diversifiable risk, which they should spread across various assets in their portfolios.

LOS 2d: explain return generating models (including the market model) and their uses

A return-generating model can provide investors with an estimate of the return of a particular security given certain input parameters. The most general form of a return-generating model is a multi-factor model. In its simplest form, the multi-factor model is the single index model, a common implementation that gives the market model.

Multi-factor Models

A multi-factor model is a financial model that employs multiple factors in its calculations to explain asset prices. These models introduce uncertainty stemming from multiple sources. CAPM, on the other hand, limits risk to one source – covariance with the market portfolio. Multi-factor models can be used to calculate the required rate of return for portfolios as well as individual stocks.

CAPM uses one factor, the market factor, to determine the required return. However, the market factor can further be split into different macroeconomic factors. These may include inflation, interest rates, business cycle uncertainty, etc.

A factor can be defined as a variable that explains the expected return of an asset.

A factor beta is a measure of the sensitivity of a given asset to a specific factor. The bigger the factor, the more sensitive the asset is to that factor.

A multi-factor appears as follows:

$$R_i = E(R_i) + \beta_{i1}F_1 + \beta_{i2}F_2 + \cdots + \beta_{ik}F_k + e_i$$

Where:

R_i= Rate of return on stock i.

$E(R_i)$= Expected return on stock i.

β_{ik} = Sensitivity of the stock's return to a one unit change in factor k.

F_k = Macroeconomic factor k.

e_i = The firm-specific return or portion of the stock's return unexplained by macro factors.

The expected value of the firm-specific return is always zero.

Calculating the Expected Return of an Asset Using a Multi-factor Model

Assume that the common stock of BRL is examined using a multi-factor model based on two factors: unexpected percentage change in GDP and unexpected percentage change in interest rates. Further, assume that the following data is provided:

- Expected return for BRL = 10%.

- GDP factor beta = 1.50.

- Interest rate factor beta = 2.0.

- Expected GDP growth = 2%.

- Expected growth in interest rates = 1%.

Compute the required rate of return on BRL stock, assuming there's no new information regarding firm-specific events.

$$R_i = E(R_i) + \beta_{i1}F_1 + \beta_{i2}F_2$$

$$= 10\% + 1.5 \times 2\% + 2.0 \times 1\%$$

$$= 15\%$$

Three and Four-factor Models

One widely used multi-factor model that has been developed in recent times is the Fama and French three-factor model. A major weakness of the multi-factor model is that it is silent on the

issue of the appropriate risk factors for use. The FF three-factor model puts three factors forward:

- Size of firms.

- Book-to-market values.

- Excess return on the market.

The firm size factor, also known as SMB (small minus big), is equal to the difference in returns between portfolios of small and big firms ($R_s - R_b$).

The book-to-market value factor, also known as HML (high minus low), is equal to the difference in returns between portfolios of high and low book-to-market firms ($R_H - R_L$).

Note: book-to-market value is book value per share divided by the stock price.

This begs the question: Why SMB and HML?

Fama and French put forth the argument that returns are higher on small versus big firms as well as on high versus low book-to-market firms. This argument has indeed been validated through historical analysis. Fama and French contend that small firms are inherently riskier than big ones, and high book-to-market firms are inherently riskier than low book-to-market firms.

The equation for the Fama-French three-factor model is:

$$R_i - R_F = \alpha_i + \beta_{i,M}(R_M - R_F) + \beta_{i,SMB}SMB + \beta_{i,HML}HML + e_i$$

The intercept term, α_i, equals the abnormal performance of the asset after controlling for its exposure to the market, firm size, and book-to-market factors. As long as the market is in equilibrium, the intercept should be equal to zero, assuming the three factors adequately capture all systematic risks.

Exam tip: SMB is a hedging strategy – long small firms, and short big firms. HML is also a hedging strategy – long high book-to-market firms and short low book-to-market firms.

The Single Index Model

The simplest return-generating model contains a single factor – the market factor. It looks much like the Capital Market Line.

$$E(R_i) - R_f = \frac{\sigma_i}{\sigma_m} \times [E(R_m) - R_f]$$

The factor weight $\frac{\sigma_i}{\sigma_m}$ reflects the ratio of the security risk to the market risk.

The Market Model

The market model is a common implementation of the single index model. The market or index return is used as the single factor. The market model is constructed as follows:

$$R_i = \alpha_i + \beta_i R_m + e_i$$

Where $\alpha_i = R_f(1 - \beta)$

The historical relationship between security returns and market returns is used to estimate the beta or slope coefficient.

Decomposition of Risk

The systematic and non-systematic risk can be decomposed using a single index model.

$$E(R_i) - R_f = \beta_i [E(R_m) - R_f]$$

Instead of using the expected returns of the market, $E(R_m)$, we can use realized returns. The difference between the expected return and the realized return is attributable to non-market changes and is represented as an error term e_i.

$$R_i - R_f = \beta_i [R_m - R_f] + e_i$$

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The variance of realized returns is expressed as follows:

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_e^2 + 2\text{Cov}(R_m, e_i)$$

We can drop the term $2\text{Cov}(R_m, e_i)$ because any non-market return is by definition, uncorrelated with the market. In fact, this leaves:

$$\sigma_i^2 = \beta_i^2 \sigma_m^2 + \sigma_e^2$$

Which states that total variance (σ_i^2) is equal to systematic variance ($\beta_i^2 \sigma_m^2$) and non-systematic variance (σ_e^2).

Question

If the beta of a security is 1.3, the risk-free rate is 2%, and the market expected return is 8%, use the market model to calculate the expected return for the security. (Ignore error terms.)

A. 8.4%.

B. 12.4%.

C. 9.8%.

Solution

The correct answer is **C**.

The market model is given as follows:

$$R_i = \alpha_i + \beta_i R_m + e_i$$

Where: $\alpha_i = R_f(1 - \beta)$

$$R_i = 2\%(1 - 1.3) + 1.3(8\%) = -0.6\% + 10.4\%$$
$$= 9.8\%$$

LOS 2e: calculate and interpret beta

Beta is a measure of systematic risk. Statistically, it depends on the degree of correlation between a security and the market.

Calculating Beta

We begin with the single index model using realized returns constructed as follows:

$$R_i - R_f = \beta_i[R_i - R_f] + e_i$$

Which we can also formulate as:

$$R_i = (1 - \beta_i)R_f + \beta_i \times R_m + e_i$$

Systematic risk depends on the correlation between the asset and the market. Therefore, beta can be measured by examining the covariance between R_i and R_m:

$$Cov(R_i, R_m) = Cov(\beta_i \times R_m + e_i, R_m)$$

$$Cov(R_i, R_m) = \beta_i Cov(R_m, R_m) + Cov(e_i, R_m)$$

$$Cov(R_i, R_m) = \beta_i \sigma_m^2 + 0$$

Note: $Cov(e_i, R_m) = 0$ because the error term is uncorrelated with the market. By rearranging the equation to solve beta, we have:

$$\beta_i = \frac{Cov(R_i, R_m)}{\sigma_m^2}$$

Where $Cov(R_i, R_m) = \rho_{i,m}\sigma_i\sigma_m$ which, when substituted into the equation, simplifies it to $\beta_i = \frac{\rho_{i,m}\sigma_i}{\sigma_m}$.

Beta provides a measurement of the sensitivity of the asset returns to the market as a whole. Aside from this, it captures the portion of the asset risk that cannot be diversified.

Estimating Beta

The variances and correlations required to calculate beta are usually determined using the historical returns for the asset and market. A regression analysis can be performed. The analysis essentially plots the market returns on the x-axis and the security returns on the y-axis and then finds the "best fit" straight line through these points. The slope of the regression line is the measure of beta. Using return data over the prior 12 months tends to represent the security's current level of systematic risk. However, this approach may be less accurate than a beta measured over 3 to 5 years, given that a short-term event may impact the data.

It is important to recognize that irrespective of the data period, beta is an estimate of systematic risk based on historical data and may not represent future systematic risk.

Interpreting Beta

A positive beta indicates that the asset moves in the same direction as the market, whereas a negative beta indicates the opposite.

The beta of a risk-free asset is zero because the covariance of the risk-free asset and the market is zero. The market's beta is, by definition, 1, and most developed market stocks tend to exhibit high, positive betas.

Question

If the correlation between an asset and the market is 0.6, the standard deviation of the asset is 18%, and the standard deviation of the market is 14%, what is the asset beta?

A. 0.77.

B. 0.47.

C. 0.99.

Solution

The correct answer is **A**.

$$\beta_i = \frac{\rho_{i,m}\sigma_i}{\sigma_m}$$

$$\beta_i = \frac{0.6 \times 0.18}{0.14}$$

$$\beta_i = 0.77$$

LOS 2f: explain the capital asset pricing model (CAPM), including its assumptions, and the security market line (SML)

The Capital Asset Pricing Model (CAPM) provides a linear relationship between the expected return for an asset and the beta. The Security Market Line (SML) represents CAPM on a graph. As opposed to the Capital Market Line (CML), where the X-axis was the standard deviation, we're now using beta – systematic risk – to approximate the expected return.

The Security Market Line (SML)
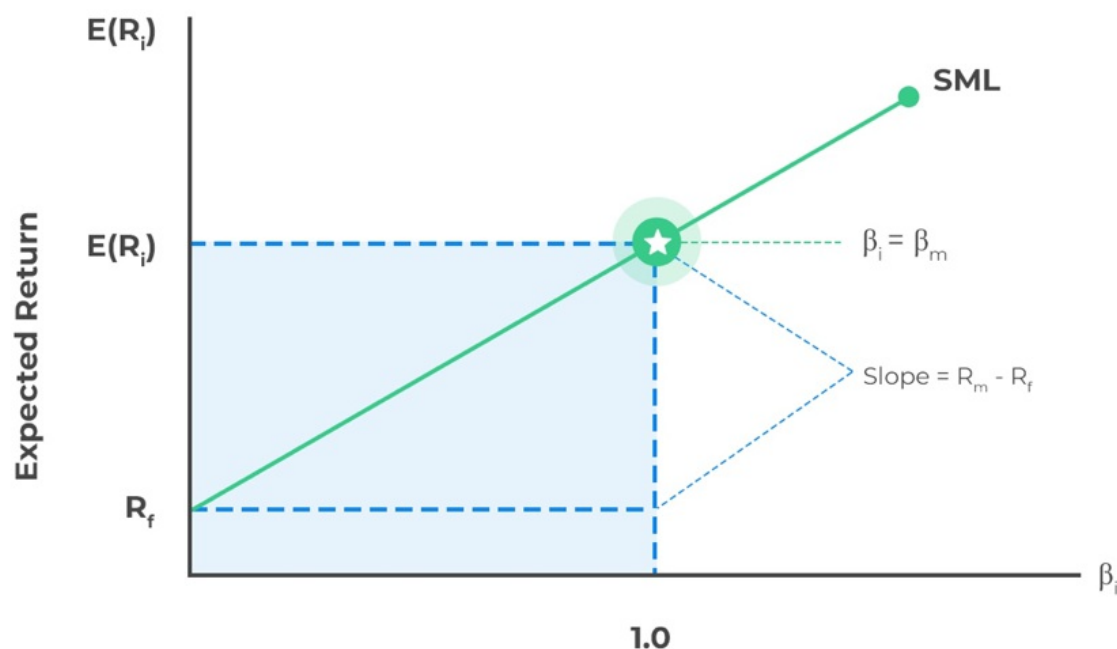
As with many financial models, it relies on a number of assumptions in order to simplify some of the complexities of the financial markets.

CAPM Assumptions

As with many financial models, not all the complexities of the financial markets are accounted for. CAPM makes the following assumptions:

Investors are Risk-averse, Utility-maximizing, Rational Individuals

This assumption does not require all investors to have the same degree of risk aversion. Instead, it requires investors to be risk-averse as opposed to risk-neutral or risk-seeking. Investors are assumed to be rational if they correctly evaluate all available information to arrive at well-informed decisions. The rationality of investors has been criticized because personal bias can result in irrational decision-making. However, this behavior does not affect the model outcome.

Markets are Frictionless, Devoid of Transaction Costs and Taxes

In addition to indifference to transaction costs, the model also assumes that investors can borrow and lend at a risk-free rate. The transaction costs of many large institutions are negligible, and many investors do not pay taxes. The practical inability to borrow or lend at risk does not materially affect the CAPM results. In spite of this, costs and restrictions on short-selling can introduce an upward bias on asset prices. It is noteworthy that the prices do not affect the CAPM conclusions.

Investors Plan for the Same, Single Holding Period

The assumption of a single holding period is convenient since multi-period models have become very difficult. A single-period assumption has shortcomings. It, however, does not severely limit the applicability of the CAPM.

Investors have Homogenous Expectations or Beliefs

This is the assumption that all investors analyze securities the same way, and using the same probability distributions and inputs for future cash flows. This then means that all asset valuations are identical, and the same optimal portfolio of risky assets is generated – the market portfolio. This assumption can be relaxed as long as the generated optimal risky portfolios are not significantly different.

All Investments are Infinitely Divisible

This is the assumption that investors can hold fractions of assets. It is deemed convenient from a modeling perspective, considering that it allows for continuous rather than discrete jump functions.

Investors are Price Takers

If investors are price takers, no investor can single-handedly influence prices through their trades. This assumption is generally true in practice.

The Security Market Line (SML)

The Security Market Line (SML) is the graphical representation of the CAPM with beta reflecting systematic risk on the x-axis and expected return on the y-axis. The SML intersects the y-axis at the risk-free rate, and the slope of the line is the market risk premium, R_m - R_f.

The SML is formulated as follows:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$$

Where $\beta_i = \frac{\rho_{i,m}\sigma_i}{\sigma m}$

The Capital Market Line (CML) and SML are similar. Despite their similarity, the CML only applies to portfolios on the efficient frontier providing optimal combinations of risk and return. The SML, on the other hand, applies to any security, regardless of whether it is efficient or not. Total risk and systematic risk are equal for an efficient portfolio because the non-systematic risk has been diversified.

Question

Which statement does not identify assumptions of the capital asset pricing model?

A. Investors are price takers, investors are rational, and transaction costs are ignored.

B. Investors are risk-seeking, fractional ownership is possible, and investors are price takers.

C. Investors have the same holding period, investors value securities identically, and taxes can be ignored.

Solution

The correct answer is **B**.

CAPM assumes all investors are risk-averse, utility-maximizing, and rational individuals.

## LOS 2g: calculate and interpret the expected return of an asset using the CAPM

Given as asset systematic risk, the expected return can be computed using the capital asset pricing model. The CAPM result is usually used as a first estimate of return. In addition, it is used in capital budgeting and the determination of economic feasibility. Besides providing security expected returns, CAPM can be used for estimating the cost of capital and setting insurance premiums.

Calculating Expected Returns

The Security Market Line (SML) is the graphical representation of the CAPM with beta reflecting systematic risk on the x-axis and expected return on the y-axis. The SML intersects the y-axis at the risk-free rate, and the slope of the line is the market risk premium, R_m - R_f.

The Security Market Line (SML)
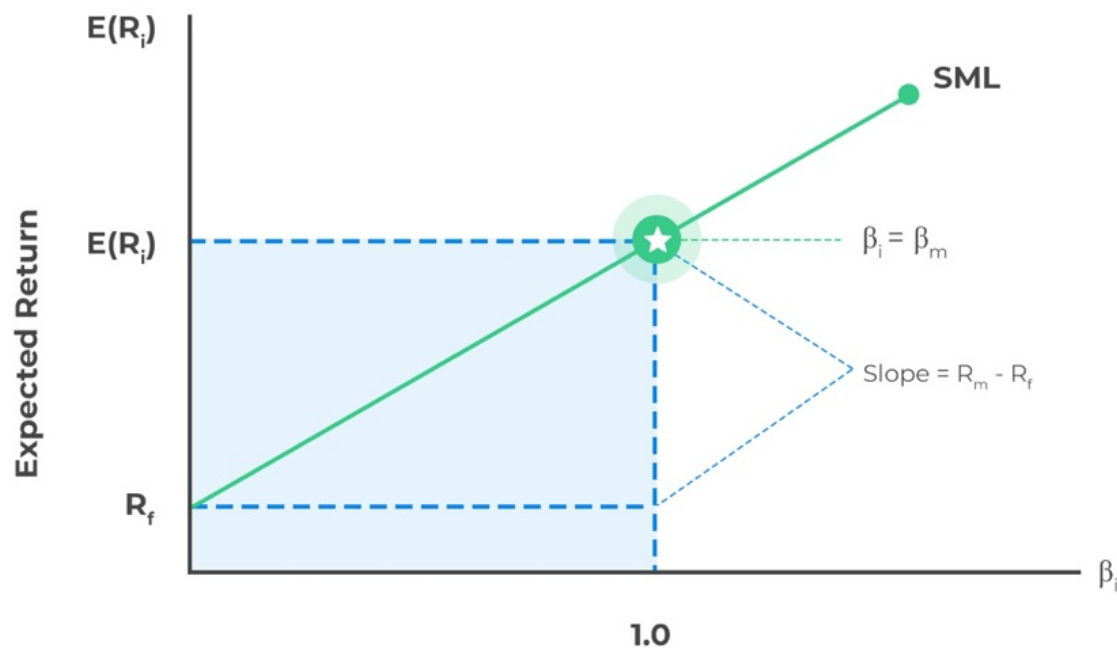
The SML is formulated as follows:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$$

Where $\beta_i = \frac{\rho_{i,m}\sigma_i}{\sigma m}$

With data for the risk-free rate, the market expected return, the beta of a security (or its correlation with the market), and the standard deviations of the security and the market, we can calculate the expected return using CAPM.

Question

Assume the risk-free rate is 2%, a security has a correlation of 0.8 with the market index and a standard deviation of 16%, while the standard deviation of the market is 12%. If the market expected return is 8%, what is the security's expected return?

A. 10.56%.

B. 5.60%.

C. 8.42%.

Solution

The correct answer is **C**.

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$$

Where $\beta_i = \frac{\rho_{i,m}\sigma_i}{\sigma_m}$

Step 1: Find the Beta

$\beta_i = (0.8 \times 0.16) / 0.12 = 1.07$

Step 2: Find the expected return

$E(R_i) = 2\% + 1.07 \times (8\% - 2\%) = 8.42\%$

LOS 2h: describe and demonstrate applications of the CAPM and the SML

CAPM can be extended to a number of areas. It provides additional applications beyond the estimation of security returns. A key area is in performance evaluation, where a number of commonly used metrics are employed.

Performance Evaluation

Various computable performance metrics are extensions of CAPM. These metrics allow for the assessment of portfolio performance and evaluation. Active managers are expected to perform better than their passive counterparts or to, at least, cover the costs of active management. There are four ratios commonly used in performance evaluation. All measures assume that the benchmark market portfolio is the correct one, and if it is not, it may make results inaccurate. The benchmark should be appropriate for the portfolio being measured. Besides, it should exhibit similar characteristics. We shall see these performance measures in detail in the next LOS.

Security Selection

The CAPM assumes that investors have homogeneous expectations, are rational and risk-averse, and assign the same value to all assets to create the same risky market portfolio. If investors are heterogeneous, their different beliefs could result in a valuation or price for a security that is different from the CAPM-calculated price. The CAPM-calculated price is the current market price because it reflects the beliefs of all other investors in the market. An investor's estimated price can sometimes be higher than the current market price. Such a circumstance should inform the investor's decision to buy the asset because it is considered undervalued by the market.

A Jensen's alpha for individual securities can also be computed with positive values. This indicates that the security is likely to outperform the market on a risk-adjusted basis.

A Security Market Line (SML) can present similar information on a graph. The expected return and beta for security can be assessed against the SML with undervalued securities relative to market consensus appearing above the SML. The securities overvalued relative to market consensus will appear below the SML.
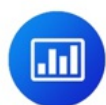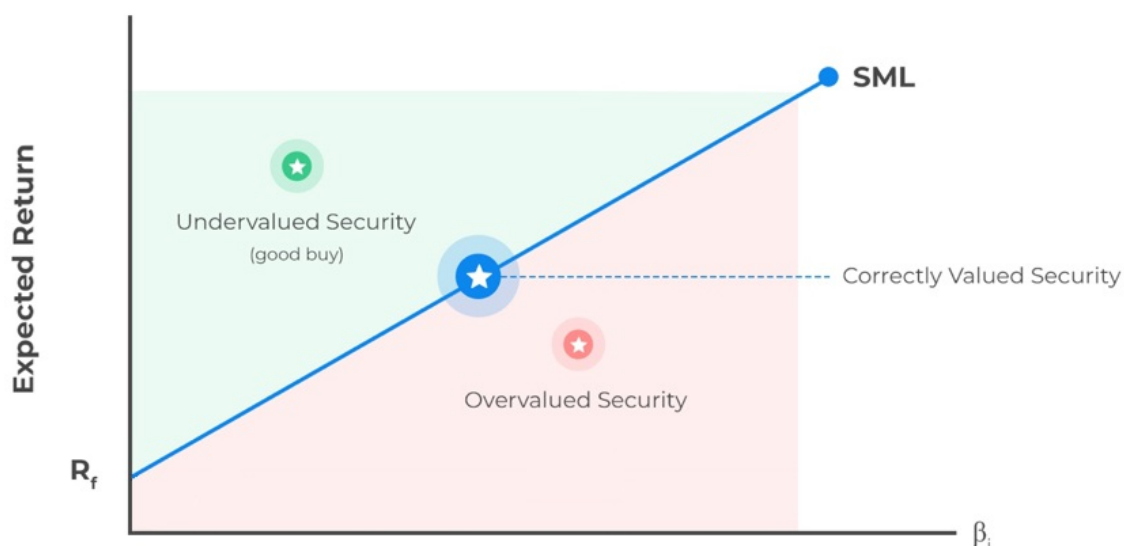
Portfolio Construction

CAPM suggests that investors should hold a market portfolio and a risk-free asset. The true market portfolio consists of a large number of securities, and it may not be practical for an investor to own them all. Much of the non-systematic risk can be diversified by holding 30 or more individual securities. However, these securities should be randomly selected from multiple asset classes. An index may serve as the best method of creating diversification.

It is important to note that only non-systematic risk can be eliminated through the addition of

different securities into the portfolio. Systematic risk – the risk inherent to the entire market – cannot be diversified.
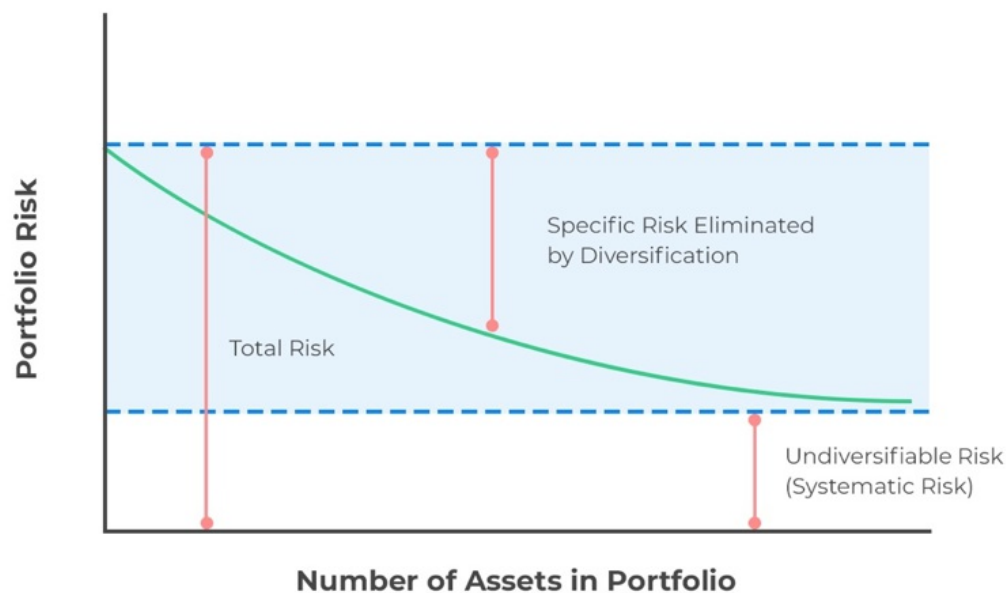
Securities not included within the index can be evaluated relative to the index to determine their suitability for portfolio inclusion. The alpha and beta of the security can be estimated relative to the index, and those with a positive alpha should be included. The same exercise can be conducted for securities within the index – those with negative alphas relative to the index should be excluded or sold short.

To determine the weight of each security within a portfolio, those securities with higher alpha should be given more weight. Nonetheless, this weight should be proportional to the alpha divided by the security's non-systematic variance (risk).

Limitations of CAPM

The CAPM is subject to theoretical and practical implications. From a theoretical perspective, it

is both a single-factor and single-period model. There may be other factors over multi-time periods that would be more appropriate in modeling expected returns. Practically, the following are the limitations:

- **Market portfolio**: The true market portfolio includes all assets, financial and non-financial, which may not be investable or tradeable.

- **Proxy for market portfolio**: A proxy for the market portfolio is used, but different analysts tend to use different proxies.

- **Estimation of beta risk**: A long history is required to estimate beta. However, the history may not be an accurate representation of the future beta. Indeed, different historical periods (3 years versus 5 years) and different data frequencies (daily versus monthly) are likely to produce different betas.

- **Poor returns prediction**: The empirical support for CAPM is weak – the model is not good at predicting future returns. This, in turn, indicates that asset returns cannot be determined solely by systematic risk.

- **Homogeneity in investor expectations**: In reality, investors are unlikely to have homogeneous expectations. There will be many optimal risky portfolios and numerous Security Market Lines (SMLs).

Question

An overvalued security would *most likely* plot:

A. Below the Security Market Line (SML).

B. On the Security Market Line (SML).

C. Above the Security Market Line (SML).

Solution

The correct answer is **A**.

Securities overvalued, relative to market consensus, will appear below the SML. On the other hand, securities undervalued, relative to market consensus, will appear above the SML. Securities correctly priced will appear directly on the SML.

<u>**Learning Module 3: Portfolio Management: An Overview**</u>

LOS 3a: describe the portfolio approach to investing

Investors have to ensure their investments **achieve their future needs**. A **portfolio approach** to investment decision-making is important regardless of future financial goals. It enables an investor to create a **diversified** investment portfolio.

Portfolio Diversification

The benefits of a diversified portfolio are best summarized by the anecdotal wisdom of "don't put all your eggs in one basket." If a portfolio is too heavily allocated to one individual security, and that security fails for some reason, an investment portfolio can be reduced to zero. Diversification allows investors to spread some of the downside risk associated with any one investment position without necessarily decreasing the expected rate of return.

Reducing Risk

Diversified portfolios have a lower portfolio risk or volatility (as measured by standard deviation) than any individual position within the portfolio. Due to the statistical relationship or interactions between individual portfolio positions (correlation), the overall volatility is lowered by including multiple positions within a portfolio.

Composition Matters

Each security has a historical risk and return profile. By combining securities within a portfolio, we can produce a risk and return profile for the portfolio itself. Through examination of different portfolios – allocating different percentages to the underlying securities – we can determine the portfolio composition that produces the best risk-return profile.

Downside Protection

Portfolio diversification is not an absolute failsafe for investors. A diversified portfolio may not protect an investor from losses during market turmoil. The reduction in risk as a result of portfolio diversification comes about due to the uncorrelated nature of individual portfolio holdings. However, this correlation is not fixed. As was the case during the 2007-2008 financial crisis, previously uncorrelated assets can become correlated when markets are stressed. This is known as contagion, and in 2008, global assets experienced price declines. This proved that portfolio diversification is not as effective as the mathematical models had previously suggested.

The Modern Portfolio Theory

Although adopting a portfolio approach to investing seems intuitive, there is a theory behind it. The diversification concept follows the work of Harry Markowitz's 1952 publication and is known as Modern Portfolio Theory (MPT). The principle concept is that investors should not only hold portfolios but also focus on the relationship among the individual securities within the portfolio. MPT has its limitation but continues to be a cornerstone for portfolio managers.

Question

A portfolio approach to investing provides which of the following benefits?

A. The highest investment returns.

B. Protection against investment losses.

C. A reduction in risk during normal market conditions.

Solution

The correct answer is C.

A diversified portfolio reduces risk without compromising investment returns. However, it does not completely protect an investor against investment losses during times of market turmoil.

LOS 3b: describe the steps in the portfolio management process

Upon determining the type of investment client and their financial goals, a portfolio manager takes a series of steps to ensure the client meets their goals and needs.

1. The Planning Step

Once a portfolio manager has established a client's objectives and constraints, they must develop an investment policy statement (IPS). This written document spells out all the investment objectives and constraints that apply to a client's portfolio. It may also contain a reference to a benchmark. A benchmark can be used to assess investment performance and evaluate whether the objectives have, indeed, been achieved.

2. The Execution Step

The execution step has three stages – asset allocation, security analysis, and portfolio construction.

Asset Allocation

The analyst or portfolio manager determines the economic and capital market expectations for various available asset classes. This analysis may be top-down. In this instance, it starts with a consideration of the macroeconomics or industry environment and an evaluation of the asset classes expected to perform well given the environment. Alternatively, the analysis may be bottom-up. Instead of looking at macroeconomics or industry data, this analysis focuses on company-specific factors. A decision will then be taken on the allocation of assets to the available asset classes. Asset classes can include equities, bonds, cash, real estate, commodities, hedge funds, and private equity.

Security Analysis

An analyst can combine top-down and bottom-up views in selecting individual securities to assess the level of returns and risk. This informs the assignment of a valuation to securities being considered for portfolio inclusion.

Portfolio Construction

A diversified portfolio can be constructed using the investment policy statement (IPS), the desired asset allocation, and security analysis. Besides achieving investment performance, risk management is critical in the portfolio construction process. The IPS will outline a client's risk tolerance, and the portfolio manager must ensure the portfolio is aligned with this risk profile. Once the portfolio manager has chosen securities to buy and the quantities in which to buy them, the transactions will be executed. Often, a specialized trade execution team or external stockbroker executes these transactions.

3. The Feedback Step

After a portfolio manager has constructed a portfolio has been constructed, they need to review and monitor it at an appropriate interval.

Portfolio Monitoring and Rebalancing

Portfolio rebalancing occurs when a portfolio has shifted from the targeted asset allocation due to market movements. If the top-down or bottom-up views change, an individual security or asset class may need to be changed. A change in a client's circumstances may prompt a revision of the IPS and the portfolio.

Portfolio Measurement and Reporting

Portfolio performance must be evaluated to establish whether the client's objectives have been met. Portfolio performance may be assessed in relation to the benchmark set out in the IPS. Following analysis of the performance, it may be determined that the client's objectives have changed. This realization will be factored into the planning and execution steps.

Question

Select the correct sequence of portfolio management steps.

A. Equity valuation, portfolio performance assessment, trade execution.

B. IPS creation, portfolio rebalancing, top-down analysis.

C. IPS creation, portfolio construction, monitoring, and rebalancing.

Solution

The correct answer is **C**.

The portfolio management process must begin with the creation of an investment policy statement in the planning step. This is followed by analysis and portfolio construction in the execution step. Finally, rebalance, performance measurement, and monitoring are carried out in the feedback step.

LOS 3c: describe types of investors and distinctive characteristics and needs of each

The needs of investment clients vary widely, but we can group investors into two broad categories – **individual** and **institutional** investors. Different investors will have varying investment time horizons, tolerance for portfolio risk, income, and liquidity needs.

Individual Investors

Individual investors may be investing either for short-term or long-term goals. A short-term investment goal may be their children's education or the purchase of a house. Long-term investment goals revolve around providing income for retirement. The implication is that some investors are focused on capital growth and look for those investments with the potential for capital appreciation, while retirees will want income-producing assets. The structuring of a portfolio for an investor will also be dependent on their financial circumstances, such as home ownership, employment prospects, and other financial obligations.

Institutional Investors

There are many different types of institutional investors. Indeed, institutional assets constitute a major portion of the investment market. Pension funds, endowments, charities, banks, insurance companies, investment funds, and Sovereign Wealth Funds (SWF) are all classified as institutional investors. These institutional investors also have different financial objectives.

Endowments and Foundations

The typical objective of an endowment or foundation is to maintain the real (inflation-adjusted) capital value of the fund in perpetuity as well as generate income to provide financial support for its beneficiaries.

Banks

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Banks hold deposits and make loans which can lead to excess reserves – in this case, a bank holds more deposits than the loans it has extended. Banks can invest these reserves, which typically have to be held in conservative and liquid assets like fixed-income and money market instruments. The bank's objective is to earn a rate of return in excess of the rate of interest it pays on its deposits.

Insurance Companies

Insurance companies receive premiums from the insurance policies they write. They need to invest these premiums to ensure sufficient funds are available to pay for insurance claims when these arise. As such, their investments are also often conservative in nature and cognizant of the investment time frame over which claims may arise.

Investment Companies

Investment companies manage mutual funds, which are pooled investment vehicles. Mutual funds are seen as an efficient way for individual investors to gain access to a diversified portfolio and benefit from the skills of a professional investment manager. Mutual funds are managed according to the limits and restrictions of their investment mandates.

Sovereign Wealth Funds

SWFs are government-owned investment funds. Some governments operate with the objective of investing the revenues from the country's natural resources (e.g., oil) for the benefit of future generations. On the other hand, others manage state assets.

Question

Excess reserves held by banking institutions are usually invested in:

A. Emerging market equities and other high-growth stocks.

B. Money-market and fixed-income instruments.

C. Real estate and other tangible assets.

Solution

The correct answer is **B**.

Banks invest their excess reserves in conservative and liquid assets such as fixed-income and money-market instruments.

LOS 3d: describe defined contribution and defined benefit pension plans

Employees of both private and public companies often save and invest for retirement via defined contribution (DC) pension plans in which they assume the investment risk. In the case of a defined benefit (DB) pension plan, the responsibility and investment risk fall on the employer. It is up to the employer to provide the defined benefits to employees on retirement.

Defined Contribution Pension Plan

A Defined Contribution (DC) pension plan is an investment vehicle in which the amounts invested, or the contributions that the employee makes to the plan, are defined or specified, but the benefits are not predetermined. The objective of the pension plan is to accumulate wealth by investing a portion of wages while working to provide income during retirement. Unlike a Defined Benefit (DB) pension plan, where the retirement benefits are predetermined based on factors such as salary and years of service, a DC plan places the investment risk on the employee. The employee is responsible for ensuring that their contributions and investment growth are sufficient to provide the desired income upon retirement. The final retirement income in a DC plan depends on the contributions made, investment performance, and the choices made by the employee regarding investment options within the plan.

Defined Benefit Pension Plan

In a DB pension plan, the employer has an obligation to provide certain benefits to employees when they retire. The future benefit is specified or defined. The investment management of DB plans has to consider the timing of its future liabilities or cash flows by assessing the age of its plan members. If, for example, a DB pension plan has a lot of young members, the investment time horizon of the plan may be quite long. The plan investment manager may try to match the cash flow requirements of the plan with cash-flow-producing assets such as bonds. This checks the capacity of portfolio assets to offset portfolio liabilities.

Question

Which of the following *best* describes the investment risk of a DB pension plan?

A. The employer assumes the investment risk.

B. The employee assumes the investment risk.

C. The employer and the employee share the investment risk.

Solution

The correct answer is **A**.

In a DB pension plan, the employer must ensure there are sufficient assets to match the future defined benefits payable to employees upon retirement.

LOS 3e: describe aspects of the asset management industry

Buy-Side vs. Sell-side

Asset managers are typically deemed to be on the buy-side. This ideally means that they buy the products of sell-side firms. Buy-side firms include asset managers, hedge funds, institutional investors, and retail investors. On the other hand, sell-side firms include investment and commercial banks, stockbrokers, and market makers.

Types of Asset Managers

Active vs. Passive Managers

Active managers represent around 80% of the asset management industry. Through fundamental and quantitative research, they attempt to outperform benchmarks, such as the S&P 500. On the contrary, passive management simply tries to replicate the returns of a market index.

Traditional vs. Alternative Asset Managers

Traditional management usually focuses on long stocks and bonds to create diversified client portfolios. In contrast, alternative management uses leverage, derivatives, long-short strategies, etc., to either outperform a predetermined index or to create a return that is uncorrelated to the market.

Lately, there has been a blurred line between traditional and alternative management. Many traditional managers have introduced higher-margin alternative products to clients.

Ownership Structure

Most asset managers are privately-owned firms. However, some publicly-traded asset management firms also exist. These often offer services such as insurance and/or banking services.

Asset Management Industry Trends

Growth of Passive Management

Passive management is gaining currency in the asset management industry. The two key reasons for this are the low fees charged for passively-managed funds and the fact that active managers are having a hard time beating indices in increasingly-efficient markets.

Big Data

Nowadays, algorithms are much faster at analyzing earnings and economic news than humans. This opens the door to short-term trading. In fact, many asset managers are now using machine-learning techniques to help process data.

In order to generate alpha, asset managers are trying to discover data with predictive potential faster than fellow market participants.

Robo-Advisors

In 2017, robo-advisers managed an estimated USD 180 billion in assets. The main advantages of robo-advisors are that:

- They seem to attract a **younger crowd** of investors.

- They charge **lower fees** because of the scalability of the technology.

- They provide a **low barrier to entry** to other firms, such as tech firms, to enter the lucrative asset-management industry.

LOS 3f: describe mutual funds and compare them with other pooled investment products

Separately Managed Accounts

SMAs, also referred to as managed accounts, wrap accounts, or individually managed accounts, are portfolios managed exclusively for the investor according to their investment, tax preferences, and requirements. The investor owns the underlying assets directly, unlike a mutual fund. Due to the individually tailored nature of SMAs, the minimum investment amount is significantly higher than that of a mutual fund, and institutional investors use them.

Many investors choose to participate in a pooled investment vehicle rather than assemble a portfolio of securities by themselves. There are several types of pooled investment vehicles. Mutual and exchange-traded funds (ETFs) tend to have low minimums, while hedge funds and private equity funds may require large investment amounts.

Pooled Investments

Mutual Funds

The value of a mutual fund is referred to as the Net Asset Value (NAV). It is computed based on the closing price of the fund's underlying securities. Each investor owns a number of shares in the fund, which represents a pro-rata claim on the value of the mutual fund.

Open-end Fund

An open-end mutual fund will accept new investor inflows and issue new investors shares in the mutual fund priced at the NAV of the fund at the time of investment. Investors can also sell their mutual fund shares at the prevailing NAV. Therefore, the total number of shares at the disposal of the mutual fund will change depending on its net inflows or outflows.

The portfolio manager of an open-end fund has to manage the cash inflows and outflows. They may, in fact, have to liquidate fund assets to meet redemption requests. Otherwise, they may feel pressure stemming from the demand for more investment opportunities when there are large inflows to the fund. The structure makes it easy for the mutual fund to grow in size by attracting investor assets.

Closed-end Fund

A closed-end fund will not create new shares when a new investor wants to buy shares. Instead, an existing investor will have to sell their shares to the new investor. The total number of shares in issue is fixed. Transactions do not necessarily occur at the NAV of the fund but may be at a premium or discount to NAV.

The portfolio manager of a closed-end fund does not have to manage the cash inflows and outflows. Closed-end funds tend to attract fewer investor assets and only make up a small portion of the mutual fund universe.

Load and No-load Funds

Mutual funds can also be classified as load or no-load funds. A load fund charges investors a sales charge fee to buy, hold or sell shares in the fund. Retail brokers usually sell these funds. The brokers may receive a portion of the fee as a commission. These types of funds are increasingly becoming less popular.

A no-load fund does not charge a transaction-based fee but an annual fee based on a percentage of the fund's NAV.

Types of Mutual Funds

Mutual funds are broadly classified according to the type of underlying assets they invest in.

Money Market Funds

Money market funds are often seen as substitutes for bank deposits. However, they are not insured in the same way. Therefore, there is some degree of risk over a bank deposit. Money market funds are either taxable or tax-free. Taxable money market funds invest in short-term corporate and federal government debt. Tax-free funds invest in short-term state and local government debt.

Bond Mutual Funds

Bond mutual funds invest in individual bonds and, occasionally, preference shares. A key difference between bond funds and money market funds is the maturity of the underlying bonds. Money market funds may hold positions with an overnight maturity. They rarely last longer than 90 days. A bond fund holds positions with maturities between 1 and 30 years. They also hold bonds of various credit ratings.

Stock Mutual Funds

Stock or equity mutual funds have the most assets under management globally. They can either be actively or passively managed. A passive fund is designed to track a particular index through a buy-and-hold strategy. On the other hand, an actively managed fund comprises equity securities selected by the portfolio manager seeking outperformance. The fees on actively managed funds are higher than those on passive funds and tend to be traded more actively. This more active trading has a tax implication. It attracts higher taxes relative to an index fund.

Hybrid or Balanced Funds

Hybrid or balanced funds invest in both equities and bonds. These funds are gaining popularity as lifecycle funds that target a particular retirement date become more sought after. A lifecycle fund tilts the mix of equities and bonds as the time for retirement draws near.

Other Pooled Investments

In addition to mutual funds, other pooled investments, such as Exchange-Traded Funds (ETFs),

separately managed accounts (SMAs), hedge funds, buyout funds, and venture capital funds, are available to investors.

Exchange-traded Funds

ETFs track a basket of securities decided upon by the sponsor. The sponsor interacts with institutional investors who deposit the securities basket with the sponsor and receive creation units in the ETF in return. These units can then be sold to the public by the institutional investor. The institutional investor can also return their units to the plan sponsor in exchange for the securities basket. This creation and redemption mechanism helps ensure the ETF units are priced close to the NAV.

When an investor buys an index fund, the investor buys the shares directly from the fund. However, when an investor buys an ETF, the investor buys the units (shares) from other investors in the same way one buys trading equity securities. ETFs are priced throughout the trading day, and the purchase of an ETF share in the open market may not be conducted at the NAV but at a price that represents investor demand at the time. Under normal market conditions, this is usually close to the NAV.

ETF expenses tend to be lower than index funds, but brokerage is incurred when transacting. Dividends that arise in an ETF are paid out directly to the shareholders. Index funds and mutual funds tend to reinvest dividends.

The minimum investment amount for ETFs tends to be smaller than that for mutual funds, and investors may choose to buy a single share of the ETF.

Hedge Funds

Hedge fund strategies tend to be more complex than those of mutual funds. They can make use of leverage and extensive derivative positions. Many hedge funds are more loosely regulated than mutual funds. However, to be exempted from regulations, they may not market themselves to the general public.

The minimum investment amounts are usually high – millions of dollars – and hedge funds may impose liquidity restrictions. This means that investors have to commit to retaining and maintaining their investments for a particular period of time.

Buyout and Venture Capital Funds

Both buyout and venture capital funds invest in equity positions. Buyout funds aim to buy all the shares of a public company, thereby occasioning the privatization of the company. Often, large amounts of debt are issued in order to buy all the shares. This is known as a leveraged buyout (LBO). The intention is to use the company's cash flow to pay down the debt and restructure the company. This makes the restructured operation suitable for an initial public offering (IPO) or sale to another company, thus providing an exit to investors.

Venture capital (VC) funds do not buy established companies but finance companies in a start-up phase. In addition to financing, VC funds offer close oversight and management input. As with buyout funds, the intention is to list or sell the funded company in a finite and relatively short time to create an exit for investors.

Question

Which option correctly represents the characteristics of ETFs and index funds?

A. Index funds are priced throughout the trading day like equity securities.

B. When investors purchase an ETF, they pay a brokerage fee.

C. ETFs are always priced at the net asset value (NAV) at which investors transact at the closing price a day.

Solution

The correct answer is **B**.

ETFs trade like equity securities throughout the trading day. When buying ETF shares, investors pay a brokerage amount.

Option C is incorrect. ETFs are usually priced close to NAV but may be priced at a premium or discount, given market forces (supply and demand).

Option A is incorrect. Index funds are priced at NAV, do not attract brokerage fees, and are transacted at the closing price on the day.

Learning Module 4: Basics of Portfolio Planning & Construction

LOS 4a: describe the reasons for a written investment policy statement (IPS)

Before constructing a client's portfolio, an advisor should understand the client's goals, resources, circumstances, and constraints. Portfolio planning is the process of constructing a portfolio to meet a client's investment objectives. The written document governing this process is the Investment Policy Statement (IPS).

The IPS

The IPS is the communication between a client and their advisor that outlines the plan for achieving investment success. Prior to formulating the IPS, the advisor will work with the client to articulate the client's risk tolerance and specific circumstances. Typical constraints center on liquidity requirements, time horizons, regulatory requirements, tax status, and other unique needs.

In the case of institutional clients, IPS formulation may involve asset-liability management studies, identification of liquidity requirements and a range of tax and legal matters, or governance arrangements in the case of an endowment or pension plan. It may also set out the institution's approach to corporate governance and how shareholder voting will be approached and conducted.

A well-structured IPS is a document that the advisor refers to when exploring the feasibility of a particular investment. In some countries, an IPS is, in fact, a legal or regulatory requirement. The document should also be reviewed regularly to keep it in tune with client-based dynamics. This way, it will maintain its relevance and continue to be appropriate for the client's objectives.

Question

Which statement best describes the reasons for an Investment Policy Statement?

A. The IPS ensures there is clear communication between the client and their advisor in regard to the client's investment objectives.

B. The IPS allows for transparency on the fees levied by the advisor for investment work.

C. The IPS spells out the assets the advisor should buy and sell on behalf of the client.

Solution

The correct answer is **A**.

The Investment Policy Statement is the written document governing the portfolio planning process. It ensures the client's investment objectives and constraints are clearly communicated.

LOS 4b: describe the major components of an IPS

There is no standard format to the Investment Policy Statement, but most conform to a basic structure. The two key sections are the investment objectives and the investment constraints.

Typical IPS Structure

The IPS document usually follows the structure below:

- Introduction
    - Description of the client

- Statement of Purpose
    - Purpose of the IPS

- Statement of Duties and Responsibilities
    - Duties and responsibilities of all parties - client, advisor, custodians

- Procedures
    - The steps that will be undertaken to keep the IPS updated and procedures to be followed in response to various contingencies

- Investment Objectives
    - The client's investment objectives

- Investment Constraints
    - The client's investment constraints

- Investment Guidelines
    - Information on how the investment policy should be executed and includes the permissibility and exclusion of assets

- Evaluation and Review
    - Guidance on obtaining feedback for investment results

- Appendices
    - Strategic asset allocation (SAA) – also known as the policy portfolio, provides the baseline portfolio allocation
    - Rebalancing policy

Question

Which section of the investment policy statement is likely to contain information on leverage limits, maximum derivative exposure, and the exclusion of stocks from a particular industry?

A. The procedures section.

B. The investment guidelines.

C. The evaluation and review section.

Solution

The correct answer is **B**.

The investment guidelines section contains information on how the investment policy should be executed and includes the permissibility and exclusion of assets.

LOS 4c: describe risk and return objectives and how they may be developed for a client

The investment objectives and investment constraints are arguably the key components of the IPS. The two elements outline the risk and return objectives. Return objectives and expectations must be consistent with the risk objectives and constraints that apply to a portfolio.

Risk Objectives

The IPS should clearly state a client's risk tolerance. Risk objectives are the specifications for portfolio risk and can be stated as absolute or relative measures using quantitative metrics. Absolute metrics may be around the probability of loss of portfolio capital over a particular time frame, whereas relative risk objectives would key off a particular benchmark, such as the S&P 500 or LIBOR, to measure risk. For institutional clients, the benchmark may be linked to some kind of liability the institution has. For instance, a pension plan must be able to meet its payment obligations when they are due. When a policy portfolio has been specified, the risk objective may be for the portfolio to remain within a certain bandwidth around that policy allocation.

A client's overall risk tolerance is a function of their ability to bear risk and their willingness to take on risk. When there is consistency between risk willingness and ability, the investment task is made easier. Where the two are in conflict, the advisor should seek to explain the conflict and its implications. However, they should not aim to try and change the client's willingness to take a risk if the decision is not a result of misperception. The prudent approach is to reach a conclusion about risk tolerance that is the lower of the two factors – ability and willingness.

Return Objectives

Return objectives may be stated on an absolute or relative basis. An absolute return objective may state the desired returns in nominal or real terms while a relative return objective could be an outperformance, relative to an index or even a peer group. However, a good benchmark should be investable and have the capacity to make return objectives relative to peers or other

managers and institutions less appropriate.

The return objective should be clearly classified either as before or after fees and pre or post-tax. The return objective must be consistent with the client's risk objective and appropriate with respect to the market and economic environment.

Question

Which of the following best demonstrates an absolute risk objective and a relative return objective?

A. Target a maximum annual portfolio volatility of 1.5x the S&P 500 and returns of ±4% of the S&P 500 annual return.

B. Target a maximum portfolio drawdown of 10% with 95% confidence and annual returns of 12%.

C. Target a maximum portfolio loss of $100 000 with 95% confidence and annual returns within 2% of the MSCI World Index.

Solution

The correct answer is **C**.

An absolute objective does not key off a benchmark or index whereas a relative objective is with respect to a benchmark, index or peer group.

LOS 4d: distinguish between the willingness and the ability (capacity) to take risk in analyzing an investor's financial risk tolerance

Financial risk tolerance is made up of two components: the ability to take on risk and the willingness to take on risk. The two may not always be in alignment. While an investor may have the ability to take on risk, they may be extremely risk-averse and unwilling to expose themselves to any potential loss.

Ability to Take on Risk

The ability to bear risk is measured in terms of time horizon, expected income, and level of wealth, relative to obligations. An investor with a longer time horizon has a greater ability to bear risk since there is more scope to recover losses over the time horizon. Similarly, an investor with large wealth relative to its liabilities will typically be able to withstand greater risk. For example, a very wealthy investor who can sustain their lifestyle even in the event of a portfolio loss has the ability to take on a lot of investment risk. Likewise, a pension plan with a large surplus of assets over its liabilities can take on more risk than a plan which has an investment deficit.

Willingness to Take on Risk

Willingness to take on risk has a psychological component. Even though there is no universally accepted method for measuring willingness to take on risk, a discussion with the client and the use of psychometric questionnaires could be useful yardsticks.

Conflict between Ability and Willingness

The willingness to take on risk has to be consistent with the ability to take on risk. There may be instances within an institutional environment where there is a conflict between the willingness and ability to take on risk. For instance, in a well-funded pension plan, the trustees and

beneficiaries may wish to adopt a low-risk investment approach while the plan sponsor wants to invest more aggressively. In such a situation, the trustees must always act in the best interests of the beneficiaries.

Further, in case of such a conflict, the advisor should not aim to change the client's willingness to take on risk, assuming that risk aversion is not due to misinterpretation or miscalculation. The prudent approach is to find a risk tolerance level that is lower than the ability and willingness to assume risk.

Question

Given the following client scenario, which option best describes the ability to take on risk and willingness to take on risk?

The client has a high-paying executive position in a large multi-national company. The client's lifestyle is relatively conservative, and as a result, the client has accumulated $5 million in savings and has paid off the mortgage over a property. The client will reach retirement age in 15 years. The client believes that "cash is king" and the financial markets are "just a gamble."

A. Ability: low; Willingness: high.

B. Ability: high; Willingness: low.

C. Ability: low; Willingness: low.

Solution

The correct answer is **B**.

The client's wealth is relatively substantial and exceeds their lifestyle requirement and financial obligations. The earnings are expected to continue for 15 years, a fairly long time horizon and as such, the ability to bear risk is high.

However, the client demonstrates a low willingness to take on investment risk perceiving the financial markets to be "a gamble." Therefore the willingness to take on risk is low.

LOS 4e: describe the investment constraints of liquidity, time horizon, tax concerns, legal and regulatory factors, and unique circumstances and their implications for the choice of portfolio assets

In addition to return and risk objectives, the IPS has to be cognizant of other investment constraints, such as liquidity requirements, the investment time horizon, tax concerns, legal and regulatory factors, and unique circumstances.

Liquidity

The IPS should detail the likely withdrawal of funds from the portfolio. For institutions, there could be rules around this, like spending requirements in the case of endowment funds. When a client has a known liquidity requirement, the portfolio manager should allocate a portion of the portfolio to cover this liability by ensuring that the allocated assets can quickly be converted to cash whenever the obligation needs to be met. Allocating to a bond that has a maturity profile that matches the liability time horizon is an often-used strategy.

Time Horizon

The IPS should state the time horizon over which the client is investing. Illiquid or risky assets may be unsuitable for an investor with a short time horizon since they may not have sufficient time to recover from investment losses.

Tax Concerns

Different investors will have different tax status. The tax status should be stated in the IPS. Often, tax regimes will treat capital gains and income differently. Capital gains may be subject to a lower tax rate payable only when they are realized rather than when they are received. In this instance, there is a time value of money benefit to deferring tax. A taxable investor may, for example, wish to hold a portfolio that emphasizes capital gains over dividend income. A tax-

exempt investor, on the other hand, may be relatively indifferent to the two.

Legal and Regulatory Factors

The IPS should outline any applicable legal or regulatory restrictions. In some countries, pension funds are subject to restrictions on their portfolio composition. In the case of individuals, they may have access to privileged information on a particular listed company by virtue of directorship and, as such, are restricted from trading on that company ahead of the release of company financial results.

Unique Circumstances

The IPS should also cover any unique circumstances that are applicable. A client may have religious or ethical objections to investing in particular stocks or sectors. These types of considerations are often referred to as ESG (environment, social, governance) factors, and investing in accordance with ESG factors is referred to as SRI (socially responsible investing).

Question

A client is a director of a publicly listed pharmaceutical company and has stock options in the company that will vest over 10 years. Which of the following best reflects where this should be noted in the constraints?

A. Liquidity and tax concerns.

B. Unique circumstance and legal and regulatory factors.

C. Time horizon and liquidity.

Solution

The correct answer is **B**.

The IPS will needs to contain detail on the legal and regulatory restrictions that apply to directors (who have access to privileged information) of publicly listed companies in reference to dealing in shares of those companies.

Also, an over-exposure to a particular stock by virtue of stock options should be noted in the unique circumstances section as the portfolio construction may seek to down weight or avoid any additional exposure to this sector.

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LOS 4f: explain the specification of asset classes in relation to asset allocation

Once the IPS has been specified, the advisor can construct the portfolio. The asset classes need to be defined, and a strategic asset allocation (SAA) formulated. The SAA is the first step and is the set of exposures to permissible asset classes that are expected to achieve the investment objectives subject to the investment constraints.

Capital Market Expectations

The investor expectations on the risk and return prospects of various asset classes are known as capital market expectations. Traditionally, these are quantified in terms of expected returns, the standard deviations of those returns, and the correlation between pairs of asset classes. The expected return consists of a risk-free rate and one or more risk premiums associated with the asset class. Expected returns can be derived in a variety of ways by using historical estimates, economic analysis, or valuation models.

Strategic Asset Allocation

Traditionally, investors have distinguished cash, equities, bonds, and real estate as the major asset classes. This list has recently been expanded to include private equity, hedge funds, commodities, and sometimes, assets such as art and intellectual property rights. These "newer" asset classes sometimes get grouped together as alternative investments.

Since the SAA is built up by asset class, defining the asset classes is an important first step. An investor may choose to have a very granular approach. For instance, they may split bonds into government and corporate bonds. Besides, they may cluster corporate bonds into investment and non-investment grade bonds. Finally, they may split government bonds into domestic and foreign bonds. This creates four different bond categories for which return-risk expectations and correlations with other assets can be expressed. A similar exercise could be conducted on equities. This could, for example, entail differentiating between foreign and domestic, small-cap

and large-cap, or developed and emerging market equities.

When defining an asset class, a number of criteria apply:

- Homogeneity within the asset class: the risk, return, and correlation within the asset class should be high while providing diversification relative to other asset classes.

- Mutual exclusivity.

- Representation of the investable universe.

The SAA for risk-averse investors will have a large allocation to government bonds and cash. In contrast, those investors with more ability and willingness to take on risk will have a greater allocation to equities and alternative assets. The SAA is a result of the capital market expectations of the defined asset classes and the investor objectives and constraints contained in the IPS.

Question

Which option most likely represents the SAA for a pension fund investor?

A. Developed market equities = 15%; emerging market equities = 35%; commodities = 25%; real estate = 10%; government bonds = 5%; corporate bonds = 5%; cash = 5%

B. Developed market equities = 35%; emerging market equities = 5%; commodities = 5%; real estate = 10%; government bonds = 25%; corporate bonds = 15%; cash = 5%

C. Developed market equities = 25%; emerging market equities = 25%; commodities = 20%; real estate = 15%; government bonds = 5%; corporate bonds = 5%; cash = 5%

Solution

The correct answer is **B**.

Pension fund investors tend to have a large allocation of government and corporate bonds. They also tend to have a lower allocation of more volatile asset classes, such as emerging market equities.

LOS 4g: describe the principles of portfolio construction and the role of asset allocation in relation to the IPS

Once the IPS containing the investment objectives and investment constraints has been determined along with the risk budget and the classification of asset classes, a portfolio needs to be constructed with the aim of meeting those objectives. The expected returns, standard deviations, and correlations between asset classes can be used to generate an optimal portfolio on a top-down basis. Alternative frameworks for portfolio construction, such as the core-satellite approach, can also be considered.

Optimal Portfolio

Rational investors will seek to maximize the risk-return tradeoff on their investment portfolio. Their risk-return objectives can be described as a utility function in which utility increases with higher expected returns and lower risk. The portfolio represents a particular asset allocation. The asset allocation that provides the highest expected utility is the one that is optimal for the investor, given their risk aversion.

Capital market expectations specified as the expected returns, standard deviations, and correlations between assets translate into an efficient frontier of portfolios. A multi-asset portfolio's expected return is given as follows:

- $E\left(R_p\right) = \sum_{i=1}^{n} w_i E\left(R_i\right)$ where w_i = weight of the asset class i in the portfolio

The portfolio risk is given as follows:

- $\sigma_p = \sqrt{\sum_{i=1}^{n} w_{p,i} \sum_{j=1}^{n} w_{p,j} Cov\left(R_i, R_j\right)}$ where $Cov\left(R_i, R_j\right) = \rho_{i,j}\sigma_i\sigma_j$

Potential portfolios can be plotted to form an efficient frontier that represents the portfolio with minimal risk for each level of return. When return expectations for an asset class increase while volatility and correlation remain unchanged, the efficient frontier will move upward as each portfolio is able to generate higher returns for the same level of risk. The point at which the efficient frontier intersects the indifference curve with the highest utility represents the optimal

portfolio for the investor.
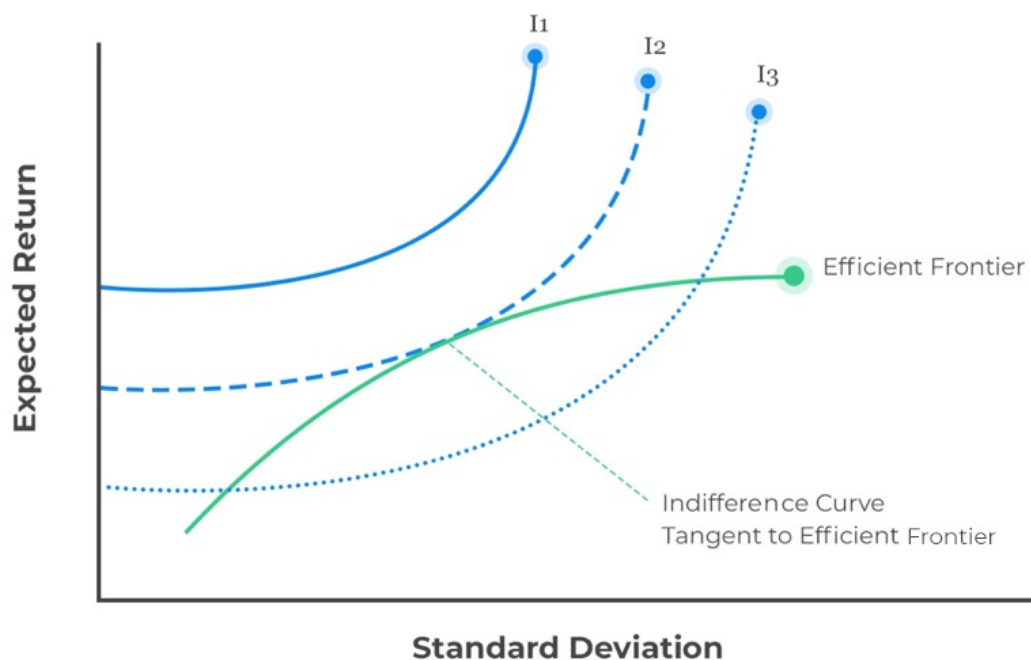
The Actual Portfolio

The SAA is the first step toward determining the investor portfolio. Oftentimes, risk budgeting is the second step. This is the process of deciding the overall risk budget of the portfolio and dividing that risk over the sources of investment return. Apart from the exposure to systematic risk factors as specified by the SAA, the portfolio returns also depend on tactical asset allocation (TAA) and security selection.

TAA is the decision to deliberately deviate from the SAA or policy weights with the objective of adding value based on near-term return forecasts for the asset classes. Likewise, security selection is the attempt to generate higher returns than the portfolio benchmark by selecting securities with a higher expected return. Deviating from policy weights or overweighting

particular securities creates additional return uncertainty, and the IPS should set limits for these activities.

Contrary to SAA, security selection is not rewarded with a long-run payoff to risk. It is a zero-sum game in which all investors compete against one another to identify a small number of mispriced securities. In total, the gross returns from all active investors tend to average out to the market return (the reward for taking on systematic risk), which implies that the active investor will match the market return. However, because of trading costs and active management fees, the average active manager will underperform the market net of costs. This does not mean there are no skillful active managers who consistently beat their benchmarks. Indeed, it does imply that all passive managers will beat the index. However, on average, this is the case.

As the portfolio changes due to the returns from various asset classes, the portfolio weights will gradually deviate from the policy weights. This process is referred to as drift, and the portfolio should be rebalanced back to policy weights. The rules that guide this process are referred to as the rebalancing policy.

Additional Portfolio Principles

Not all portfolios are constructed using a top-down framework. A top-down process requires a multitude of specialist asset managers to work for the same client within the same asset class. Each of these managers will manage risk relative to the client's benchmark. However, because these benchmarks may be similar or overlapping, the aggregate may result in an underutilization of the risk budget. Another drawback is the potential for overtrading, which tends to create capital gains and may be tax-inefficient.

A core-satellite methodology was developed to circumvent these issues, rather than a top-down approach. A large chunk of the portfolio is invested on a passive or low active basis (the core), while a smaller portion is managed more aggressively (the satellite). The aim of the satellite portion is to generate a high active return. The return objective is not necessarily benchmark-cognisant. The core has a low turnover to capture the long-term systematic risk premium in a

tax-optimal manner. A drawback of this approach is the difficulty of assigning the portfolio assets to portfolio managers who have various expected returns, risks, and correlations between those returns.

Question

Which statement best describes tactical asset allocation (TAA)?

A. TAA formulates the portfolio policy weights which provide exposure to systematic risk factors.

B. TAA allocates greater portions of the portfolio to those securities within the benchmark with higher expected returns.

C. TAA deliberately deviates from the SAA to generate additional returns on the basis of short-term asset class forecasts.

Solution

The correct answer is **C**.

Tactical asset allocation will tilt the portfolio to those asset classes expected to outperform in the short term.

On the other hand, strategic asset allocation is the policy portfolio designed to provide exposure to systematic risk factors generating portfolio returns that meet investment objectives.

LOS 4h: describe how environmental, social, and governance (ESG) considerations may be integrated into portfolio planning and construction.

Environmental, social, and governance factors are collectively referred to by the acronym "ESG". ESG integration is the practice of considering environmental, social, and governance factors in the investment process. The integration can be implemented across all asset classes, including equities, fixed income, and alternative investments. ESG issues can be sub-divided into 3 main groups:

- Environmental issues: climate change, pollution, deforestation.

- Social issues: customer satisfaction, gender and diversity, and labor standards.

- Governance issues: bribery and corruption, executive compensation, lobbying.

Investors may exclude or engage with companies with strict consideration of these issues. Alternatively, investors may ask their asset managers to consider these issues in the investment process. For example, an investor might not want to buy polled-investment vehicles that own oil & gas and/or military equipment stocks.

Returns Associated With ESG Considerations

The effort and costs associated with limiting the investment universe as part of sustainable investment suggest a negative impact on investment returns. However, there are some benchmarks that reflect many commonly excluded companies or sectors.
Academic research has elicited mixed arguments on the impact of ESG factors on portfolio returns.

Learning Module 5: The Behavioral Biases of Individuals

LOS 5a: compare and contrast cognitive errors and emotional biases

Behavioral biases are irrational beliefs or behaviors that can influence our decision-making process. Behavioral biases may make our decisions to stray from what is prescribed or recommended, if you may, by the traditional finance theory. Behavioral bias is split into two types:

1. Cognitive errors.
2. Emotional biases.

Cognitive biases, alternatively known as faulty cognitive reasoning, refer to erroneous ways of thinking, reasoning, and judgment that characterize how we process and interpret information.

On the other hand, emotional bias occurs when our emotions blur our sense of judgment, reasoning, and information decoding processes. Emotional bias pushes us to make impulsive decisions and judgments that are not premised upon facts, evidence, logic, or research.

Emotional biases are more difficult to correct than cognitive biases because they are unpremeditated. It is, nevertheless, noteworthy that cognitive errors can be eliminated through such interventions as advice, education, and provision of more information.

Question

Which of the following is *most likely* a form of behavioral bias based on faulty cognitive reasoning?

    A. Cognitive errors.

    B. Emotional biases.

    C. Cognitive errors and emotional biases.

Solution

The correct answer is **A**.

Cognitive errors are based on faulty cognitive reasoning.

B and C are incorrect. Emotional biases are based on feelings or emotions.

LOS 5b: discuss commonly recognized behavioral biases and their implications for financial decision making

Cognitive Errors

Cognitive biases, alternatively known as faulty cognitive reasoning, describe erroneous ways of thinking, reasoning, and interpreting information. Below are the two categories into which cognitive errors can be split:

I. Belief perseverance bias.

II. Processing errors.

I. Belief Perseverance Bias

The belief perseverance bias results from the discomfort experienced as a result of new information contradicting previously held beliefs. Often called cognitive dissonance, it occurs when two opposite beliefs conflict with each other.

There are five sub-types of perseverance biases:

a. Conservatism bias.

b. Confirmation bias.

c. Representativeness bias.

d. Illusion of control bias.

e. Hindsight bias.

a. Conservatism Bias

A conservative bias is a bias in which people hold onto old ideas or views while reluctantly accepting new contradictory or disruptive information. By and large, people often tend to underestimate new information and, instead, overestimate their predictions regarding an event. This leads to inaccurate judgments and inadequate responses to a new situation.

Effects of Conservatism Bias

- Investors may be slow to update forecasts even in the face of new information.

- Investors may reinforce old beliefs instead of dealing with the stress of updating beliefs given new complicated data.

How to Detect and Overcome Conservatism Bias

- The impacts of conservatism bias may be mitigated by running an adequate analysis and weighting of new information. To begin with, we need to be conscious of the existence of biases, more so regarding technical or statistics-related information. This is because the cognitive cost of processing such information is higher than other information pieces.

- If the interpretation and comprehension of information is a challenge, an investor should seek the guidance of an expert. This will enable her/him to clearly understand the information and its business implications.

b) Confirmation Bias

Confirmation bias refers to the tendency to value or notice what reinforces one's previous beliefs and disregard any information that negates them. It occurs when a person rationalizes their beliefs in order to calm their cognitive discomfort.

Effects of Confirmation Bias

- Financial market participants (FMPs) may only pay attention to favorable information about an existing investment and ignore any negative information. FMPs may develop a screening criterion without considering information that questions the validity of the criteria. The direct consequence of this bias is the adoption of wrong investment choices, i.e., good investments that do not meet the approval threshold are not approved. Instead, it is the ill-suited investments that meet the set criterion that is

approved.

- Confirmation bias leads to the under-diversification of portfolios. In this case, an investor may ignore negative news in their potential investment assessment. Instead, the investor only gathers information that validates their views on the stock under review. Such an investor ends up with an inappropriately large position and an under-diversified portfolio. For instance, FMPs may invest a relatively large amount of their investment assets in the company's shares they work for.

How to Detect and Overcome Confirmation Bias

- Confirmation bias can be mitigated or eliminated by aggressively seeking pieces of information that can help one deconstruct one's old beliefs.

- Another way to mitigate it is to confirm an investment choice with a variety of different investment perspectives.

c) Representative Bias

Representative bias occurs when we perceive new knowledge as a repetition of previous experience. Subsequently, one categorizes new information based on previous prejudices, biases, experiences, and classifications. It is important to note that whereas new information may look similar to previously categorized pieces of information, the two sets of information could practically be very different.

There are two types of representative bias: base-rate neglect and sample-size neglect.

i. **Base-rate neglect**: An event's incidence rate in a larger population is ignored in favor of particular information.
ii. **Sample-size neglect**: In this case, investors mistakenly assume that small sample sizes represent populations accurately.

Effects of Representative Bias

- As a result of representative bias, a point of view or a forecast is largely based on small sample size or individual, unique data.

- Instead of dealing with the mental stress that emanates from updating beliefs based on complex data, FMPs update beliefs using basic classifications.

How to Detect and Overcome Representative Bias

- The investment under review should be analyzed based on the likelihood that it belongs to the group to which it is deemed a representative, rather than the group to which it is statistically more likely to belong. The question will prompt the FMPs to reflect on whether they have considered base-rate probabilities or ignored the law of small numbers, which ultimately results in an inaccurate assessment of an even.

- It may be essential to conduct an additional study to gain base-rate information and increase the sample size of observations.

d) Illusion of Control Bias

People with illusions of control bias feel they can manipulate or control results when they can't. A good example is the people's insistence on the freedom to pick their own lottery numbers than having random numbers assigned to them.

Effects of Illusion Control Bias

- Illusion control bias may lead to under-diversified portfolios. According to research, there are high chances of investors investing in companies over which they believe they have control of investment decisions. For instance, an investor is likely to invest in the companies they work for. The reality, however, is that investors do not hold a solid sway over the companies in which they invest. It is also worth noting that in case a company goes bankrupt, the employee will lose both their livelihood (employment) and investment(s).

- Illusion of control bias may make financial market participants to hog a market, i.e.,

trade more than necessary. It is noteworthy, though, that according to researchers, portfolio turnover is inversely associated with investment performance.

- Investors may construct extremely complex and detailed financial models and forecasts. Even then, increasing the complexity of the financial models does not curb the inherent risk and unpredictability of investment results.

How to Detect and Overcome Illusion of Control Bias

- Investors need to acknowledge that investing is a probability-based undertaking beyond anyone's control. In fact, even investment management firms worth their names can neither control nor confidently predict the outcome of an investment. Contrary to what some investors think, companies can never be under their control despite the magnitude of their investments in them. This is because external factors such as the actions of suppliers, customers, and industry competitors influence companies' performance.

- Investors should find contrary viewpoints, such as considering factors that might work against an investment.

e) Hindsight Bias

Hindsight bias is the belief that past events were predictable and foreseeable. Hindsight bias stems from the fact that results realized in the past are evident. This cannot be said of results that were never realized. Moreover, irrational decisions with positive results may be hailed as masterstrokes. On the other hand, strategies that yield poor results might pass for mistakes that could otherwise be avoided.

Effects of Hindsight Bias

- Investors may overestimate the extent to which they correctly forecast the results of an investment or the predictability of a result in general.

- Hindsight bias may result in unfair investment performance assessment. The

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assessment unfairness is attributable to the fact that performance is measured against what actually occurred rather than an investor's expectations when they ventured into an investment.

How to Detect and Overcome Hindsight Bias

- When making investment decisions, investors should not let past events blur their judgment. Instead, they should acknowledge and learn from their past mistakes.

- Investors should keep accurate records of their investment decisions and the factors that informed the decisions. Written records will particularly prevent hindsight bias. Whenever the need arises, investors may refer to the written records rather than relying on their memories. This way, they will run significantly more accurate and objective analyses of the past decisions.

II. Processing Errors

The term 'processing errors' refers to irrational or illogical use of information occasioned by how information has been processed. Note that processing errors are attributed a lot more to how information is processed than memory lapses. There are four types of processing errors:

a. Anchoring and adjustment bias.
b. Mental accounting bias.
c. Framing bias.
d. Availability bias.

a) Anchoring and Adjustment Bias

Anchoring and adjustment bias relates to using a piece of initial information as the premise upon which subsequent judgments, estimates, and conclusions are founded. Investors will begin with a given value 'anchor' when estimating a given value. It is this 'anchor' that they either adjust upwards or downwards. Remember that insufficient adjustment of the 'anchor' produces biased

estimates.

Effects of Anchoring and Adjustment Bias

- When analyzing new information, investors often stick to their initial projections. This is the case for both downward and upward changes.

How to detect and Overcome Anchoring and Adjustment Bias

- Investors should ask questions that may show an anchoring and adjustment-related bias. For instance, such questions should seek to understand the factors that inform an investor's decisions, i.e., are the decisions based on rational analysis, or are they anchored to a particular price?

- Any recommendation for investment should be questioned to determine if it is based on past estimates or a 'default' number.

b) Mental Accounting Bias

Mental accounting bias refers to the mental allocation of money into 'accounts' that manipulate decisions, despite money being fungible (interchangeable).

Effects of Mental Accounting Bias

- Investors tend to disregard opportunities to scale down risk by diversification.

- Mental accounting bias may make an investor irrationally differentiate between returns earned from the income and those flowing from capital appreciation. Even though investors may urge to retain principal investment, mental account bias may inspire them to stick to the idea of spending the income generated by the principal.

- Investors may irrationally divide wealth or a portfolio into investment principal and investment returns. In fact, some investors may conclude that huge risk can be assumed using the returns compared with the initial investment principal. This is

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euphemistically referred to as "playing with house money."

How to Detect and Overcome Mental Accounting Bias

- Mental accounting bias can be recognized by identifying its effects. The main impact of mental accounting bias is that it disregards the relationships between investments, leading to accidental risk-taking.

c) Framing Bias

Framing bias occurs during information processing. As a result of this bias, an individual's response to a question varies depending on the angle from which the question is asked. This explains why a particular decision problem can be structured in multiple ways. For instance, an investor may be inclined to a positive view of investment even though the chances of failure are higher.

Effects of Framing Bias

- Investors may misconceive risk tolerance due to the structure of risk-related questions. This increases investor risk-averseness when a gain frame guides their market analysis. On the other hand, investors would be more risk-seeking when their analysis of a market is based on a loss frame of reference.

- Investors may concentrate on short-term price fluctuations and, therefore, disregard long-run considerations in the decision-making process.

How to Detect and Overcome Framing Bias

- In order to detect framing bias, investors should check if their focus is on one particular position's gain or loss. To avoid this kind of inclination, investors should refrain from referencing previous gains and losses and focus more on future anticipations, remain neutral, and be open to new decision-making suggestions.

d) Availability Bias

Availability bias is an information-processing bias. An individual's estimation of the likelihood of an outcome or the significance of an event depends on how easily a piece of information pops up in their minds. The following are the four most applicable sources of availability bias:

 i. **Retrievability**: The first answer or idea to cross the mind will probably be deemed correct even it is incorrect.
 ii. **Resonance:** The more closely a situation resembles an individual's own situation, the more likely they are to be biased.
 iii. **Categorization**: As people solve problems, they collect information from what they believe to be appropriate sets of searches.
 iv. **Narrow range of experience:** An individual may use a limited scope of experience rather than considering multiple perspectives when estimating. For instance, an investor may assume that the positive performance of an investment in an economy will translate into its success in the global economy.

Effect of Availability Bias

- Investors may work with a narrow set of investments due to the use of known classification schemes. As such, investors may limit investments in stocks or bonds, securities of one country, or one sector.

- The choice of an investor may be affected by the degree of advertising or news coverage. In this respect, given a free hand to make a decision, an investor will most likely settle on the option that is intensely advertised or that which is extensively covered by the media.

- Investors may not diversify their investments. This failure may happen because their choices are limited to a narrow range of experiences.

How to Detect and Overcome Availability Bias

- To avoid availability bias, investors should develop a strategy for choosing investments.

Besides, they ought to research and analyze investment decisions and base their decisions on long-term historical data.

Emotional Biases

An emotional bias is a distortion of cognition and decision-making that results from emotional factors. Emotional biases are more challenging to correct than cognitive errors since they are based on impulses or intuition rather than conscious judgments.

There are six emotional biases:

a. Loss aversion.
b. Overconfidence.
c. Self-control.
d. Status quo.
e. Endowment.
f. Regret aversion.

a) Loss Aversion Bias

Loss aversion refers to the habit of evading losses to realize gains. Rational investors should be willing to assume more risk to increase gains, not mitigate losses. Loss aversion makes investors hold their loss-making investment to avoid recognizing losses and instead, sell their profitable investments to lock in profits.

Effects of Loss Aversion Bias

- Through fundamental analysis, investors may hold onto loss-making investments for a longer period than necessary in the hope that they would return to profitability.

- Fearing that the gains will dwindle, investors may enter a gain position earlier than the fundamental analysis recommends.

How to Detect and Overcome Loss Aversion Bias

- Loss-aversion bias can be mitigated by using a disciplined investment approach. Even if a loss is emotionally painful, a logical evaluation of the chances of gains and losses may aid investors in making investment decisions.

b) Overconfidence Bias

An overconfidence bias occurs when people place unjustified trust in their abilities. Overconfidence is compounded by self-attribution bias, in which people exaggerate their success (self-enhancement) and blame others for their failures (self-protection). Despite having aspects of both cognitive and emotional errors, overconfidence is classified as an emotional error because the bias is predominantly driven by emotion.

There are two types of overconfidence bias:

1. **Prediction overconfidence:** Occurs when investors assign too narrow confidence intervals to their investment predictions.
2. **Certainty overconfidence:** Occurs when the probabilities associated with the outcomes are overstated.

Effects of Overconfidence Bias

- Overconfidence bias may make investors overestimate their expected returns and underestimate risks.

- Investors may invest in poorly diversified portfolios, a move that may lead to significant downside risk.

How to Detect and Overcome Overconfidence Bias

- A comprehensive review of trading records, identifying both winners and losers, and calculating portfolio performance over at least two years is recommended.

- Investors must observe objectivity in their evaluation and execution of investment decisions. Besides, they should interrogate the rationale behind and the outcomes of investments as objectively as possible. Such interrogations should capture both winners and losers.

- In their analysis of unprofitable investment ventures, investors should pay attention to the patterns or mistakes they may have been unconscious of in examining the investment decisions they made that turned out to be unprofitable.

c) Self-Control Bias

Self-control bias occurs when people pursue instant gratification instead of long-term goals. For instance, although many people can and are ready to save money for the future, self-control makes it difficult for them to scale down their current consumption rate.

Effects of Self Control Bias

- Due to their failure to save for the future, investors may take on excess stock market risk to generate higher returns.

- Borrowing too much may lead to investors being unable to meet their current consumption needs.

How to Detect and Overcome Self-Control Bias

- Investors should create personal budgets and ensure that they have appropriate investment plans. Furthermore, the plans must be written to be reviewed regularly.

d) Status Quo Bias

Status quo bias is an emotional bias in which people prefer to keep things as they are rather than make a change, even when it is necessary. In other words, they maintain the status quo.

Effect of Status Quo Bias

- Investors may fail to investigate other investing opportunities.

- Investors may unknowingly retain portfolios that do not only have risky features but are also inappropriate for their circumstances.

How to Detect and Overcome Status Quo Bias

- Investors should embrace portfolio diversification and proper allocation of assets. Investors must consider investment risk reduction and return enhancement.

e) Endowment Bias

Endowment bias occurs when a person values an asset more when they own it than when they do not.

Effects of Endowment Bias

- Endowment bias may inspire investors' failure or reluctance to dispose of certain assets and replace them with others.

- Investors tend to maintain ownership of assets with which they are familiar.

- In some cases, an investor's asset allocation may not be suitable. Consequently, there could be incongruence among an investor's investment portfolio, risk tolerance, and financial goals.

How to Detect and Overcome Endowment Bias

- Wealth managers have seen clients hesitant to sell inherited securities due to emotional attachment. Such clients could be seen as disloyal by selling inherited securities.

f) Regret-aversion Bias

Regret-aversion bias is an emotional bias in which investors avoid making judgments for fear of making a bad decision. It has two dimensions: Actions taken by people and actions that people ought to have taken.

Effects of Regret Aversion Bias

- Investors embrace the herding mentality. This entails investing in ventures that are popular, i.e., those that many market players invest in. The motivation behind the herd mentality is often a result of poor prior results on hazardous investments.

- To avoid future regret, investors may opt to invest in low-risk ventures. In the long run, this causes such investors to underperform the benchmark and fail to beat investment targets.

How to Detect and Overcome Regret-aversion Bias

- Investors should weigh the benefits of diversity and asset allocation regarding risk reduction and return enhancement.

Question 1

If a person prefers high standards of living in the present, rather than saving for retirement, the person suffers from:

    A. Status quo bias.

    B. Overconfidence bias.

    C. Self-control bias.

The correct answer is **C**.

Self-control bias is an emotional bias, where people do not act in their best long-term interest because they lack self-control.

A is incorrect. Status quo bias is a bias in which people prefer to do nothing than make a change.

B is incorrect. Overconfidence bias is a bias in which people demonstrate unwarranted faith in their own abilities.

Question 2

When people make classifications based upon relevant past experience, this represents which of the following bias?

    A. Confirmation bias.

    B. Representativeness bias.

    C. Availability bias.

The correct answer is **B**.

This is a cognitive and belief-perseverance bias where people make classifications based upon relevant past experiences.

A is incorrect. Confirmation bias is when people emphasize ideas that confirm our beliefs while devaluing ideas that contradict our beliefs.

C is incorrect. Availability bias is a cognitive and information processing bias, where investors use a shortcut, based on how familiar the outcome appears in their life. They perceive easily recalled possibilities as the best choices.

Question 3

Which of the following is *most likely* a bias where people demonstrate an unwarranted faith in their own abilities?

    A. Framing bias.
    B. Availability bias.
    C. Overconfidence bias.

The correct answer is **C.**

Overconfidence bias is a bias in which people demonstrate unwarranted faith in their own abilities.

Option A is incorrect. Framing bias occurs during information processing. As a result of this bias, an individual's response to a question varies depending on the angle from which the question is asked.

Option B is incorrect. Availability bias is an information-processing bias in which individuals estimate the probability of an outcome or the importance of a phenomenon based on how effortlessly information is recalled.

LOS 5c: describe how behavioral biases of investors can lead to market characteristics that may not be explained by traditional finance

Some persistent market patterns such as momentum, value, bubbles, and crashes impact market efficiency and are regarded as functions of behavioral finance.

Market Anomalies

Anomalies are noticeable departures from the efficient market hypothesis, as evidenced by persistently aberrant returns. For instance, an anomaly such as misclassifications may stem from statistical problems, choice of asset pricing model, or temporary disequilibria.

There are ways of explaining some anomalies. Such ways include the analysis of the small sample sizes used, statistical bias in sample selection, survivorship bias, or data mining. It is also important to note that that the benchmark choice is paramount in determining the magnitude of any over or underperformance.

Momentum

When future price behavior aligns with that of the recent past, this is known as momentum or trending effects. Before reverting to the mean, the favorable association typically lasts about two years.

Availability, hindsight, and loss aversion biases can all contribute to momentum.

Regret is the feeling one experiences after missing out on an opportunity. It is often a manifestation of hindsight bias, reflecting the human predisposition to see past events as foreseeable. Thanks to regret, investors may feel an overwhelming urge to act emotionally not to miss out on the next big momentum play.

Bubbles and Crashes

Some bubbles may be products of sensible and logical reasoning. For instance, short-term performance-driven investment managers may attribute their decision to participate in a bubble to further advance their careers.

Bubbles excite confidence in investors. This leads to such anomalies as overtrading, underestimation of risks, failure to diversify, and rejection of any piece of information that contradicts their assessment of the market.

Excessive trading and overconfidence are connected to confirmation bias and self-attribution bias, contributing to a bubble. When a bubble bursts, markets may underreact due to anchoring. This occurs when investors fail to quickly update their beliefs.

Values

High book-to-market equity, low price-to-earnings ratios, and low price-to-dividend ratios are common characteristics of value stocks. High price-to-earnings ratios, low book-to-market equity, and high price-to-dividend ratios are distinguishing characteristics of growth stocks.

Behavioral reasons for value anomalies have been proposed in studies, such as in the Fama–French three-factor model (1993), portraying the anomalies as mispricing rather than compensating for greater risk. Less sophisticated investors who are easily driven by emotions may place a higher value on growth stocks.

Question

Which of the following is *most likely* a characteristic of value stocks?

    A. Low book-to-market equity.

    B. Low price-to-dividend ratio.

    C. High price-to-earnings ratio.

The correct answer is **B**

Value stocks are usually characterized by high book-to-market equity, low price-to-earnings ratios, and low price-to-dividend ratios.

A and C are incorrect. They are both characteristics of growth stocks. Growth stocks are characterized by high price-to-earnings ratios, low book-to-market equity, and high price-to-dividend ratios.

Learning Module 6: Introduction to Risk Management

LOS 6a: define risk management

Risk is generally defined as exposure to uncertainty, such as uncertain environmental variables that cause variation in and unforeseeable outcomes. Risk can also be seen as the probability of loss or unfavorable outcome due to an action, inaction, or external event.

Risk exposure is the level to which the underlying environmental or market risks result in actual risk borne by a business or investor who has assets or liabilities that are sensitive to those risks. Generally speaking, risk exposure is the "vulnerability" to risk resulting from the organization's or investor's decisions on risk-sensitive assets and liabilities.

Risks cannot be avoided in a business or investment environment. However, risks taken ought to be cautiously chosen, understood, and well-managed for a chance to make value out of it.

What is Risk Management?

Risk management is the process by which an organization or individual defines the level of risk to be taken, measures the level of risk being taken, and adjusts the latter toward the former, with the goal of maximizing the company's or portfolio's value or the individual's overall satisfaction, or utility.

In other words, risk management includes the decisions and actions that result in an effective way for an investor or an organization to achieve its goals while being exposed to a tolerable level of risk.

It is important to note that risk management does not mean minimizing risk; it is about understanding and taking risks that best suit investment objectives, with a considerable chance of loss, quantifying the exposure, and continuously monitoring and modifying risk.

Moreover, risk management is not about avoiding or predicting risk. Risk management implies that if an unfavaaourable or favorable event occurs, its effect on an organization or a portfolio will not be a surprise and that it should have been quantified and considered beforehand.

Given the dynamic nature of risks and exposures, risk management needs to be continually revised and reevaluated.

LOS 6b: describe features of a risk management framework

Risk management is the process in which the level of risk to be taken is defined, and the levels of risk are measured with the objective of maximizing the company or portfolio value. Risk management is not about minimizing risk; it is about actively understanding and pursuing those risks which maximize the chance of achieving goals and minimizing the chance of failure.

Designing a Framework

Risk management has to be tailored to the enterprise and requires a custom solution. The risk management framework should address the following areas:

Risk Governance

Governance is the top-level system of structures, rights, and obligations in which an organization is directed and controlled. Risk governance defines the goals, grants authority, and determines the to-level decision-making.

Risk governance is, therefore, the top-down process and guidance that directs the risk management activities to align with and support the overall enterprise. Risk governance involves determining the risk tolerance of an organization and risk oversight.

Risk governance is often determined by regulatory concerns and the fiduciary role of the governing body. For best outcomes, risk governance assumes an enterprise-wide view. Enterprise risk management is an overarching governance approach applied in the whole organization and in alignment with its strategy, guiding the risk-management framework to focus risk activities on the objective, health, and value of the entire organization.

Risk Identification and Measurement

Risk identification and measurement is the quantitative core of the risk management process. It requires ongoing evaluation, both quantitative and qualitative, to analyze the relevant risk

drivers of the risk exposures and to calculate risk metrics under various stress scenarios.

Risk Infrastructure

Infrastructure refers to people and systems that carry out the risk management process. This may include technology solutions capable of capturing, storing, computing, and reporting the necessary data, as well as skilled personnel to run this process.

Policies and Processes

Policies and processes are the extensions of risk governance into the daily operations of an organization. These limits, requirements, constraints, and guidelines should be integrated into the business process. Policies and processes may entail:

- Controlling cash flows in line with risk assessments.

- Conducting due diligence on potential investments.

- Ensuring decisions made include important checklists.

- Ensuring data is updated and protected.

Risk Monitoring, Mitigation, and Management

Actively monitoring and managing risk is a challenging task that requires a continuous and comprehensive evaluation of the risk management process. When it is determined that risk exposure is out of tune with the desired risk tolerance, action needs to be taken to normalize the risk exposure.

Communication

There must be a communication loop in place to ensure governance parameters can be communicated clearly to managers. The communication loop should also facilitate clear and timely reporting of risk metrics to the governors to enable them update the same and report

back to the organization.

Strategic Analysis or Integration

The risk management framework should provide tools used to separate activities that add value from those that do not. This analysis can improve decision-making and generate better risk-adjusted returns.
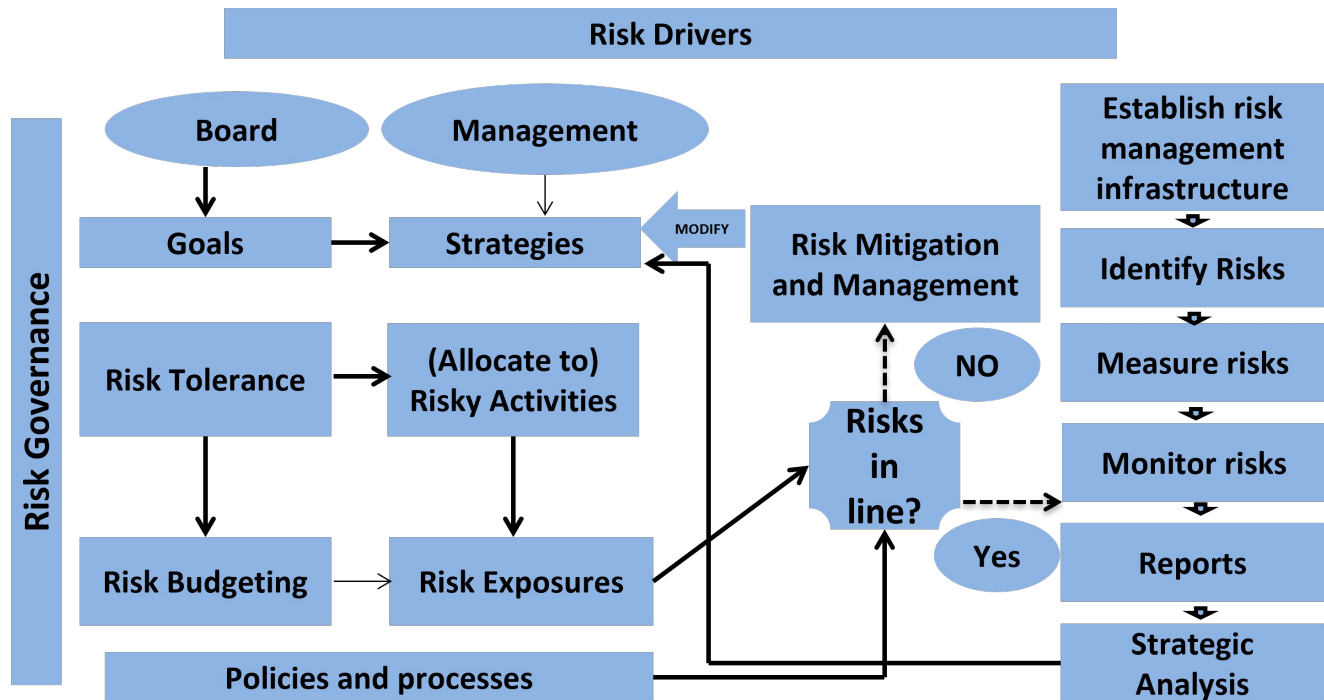
Benefits of a Risk Management Framework

When risk management is integrated into all levels of the business, it means there is an effective risk culture. A risk culture generally produces better results than considering risk as an afterthought or ignoring it completely. The benefits include:

- less frequent surprises and a better understanding of the potential effect of a surprise;

- more disciplined approach to decision-making based on the risk-return relationship;

- better response and risk mitigation;

- better efficiency and fewer operational errors;

- a better relationship between the governing body and organization management; and

- a better corporate reputation.

Question

Which of the following is least likely a benefit of a well-implemented risk management framework?

A. Risks are minimized across the organization to allow for better overall company performance

B. A relationship of trust is developed between the governing body and the company management

C. A risk management framework generates feedback loops to allow for more informed and disciplined decision-making

Solution

The correct answer is A.

Risk management does not set out to minimize risks; it is about actively understanding and pursuing those risks which maximize the chance of achieving goals and minimizing the chance of failure.

LOS 6c: define risk governance and describe elements of effective risk governance

Risk governance is the top-down process that directs and aligns risk management to support the goals of an enterprise. The governing body determines the goals and objectives of an organization and its risk appetite or tolerance. Risk tolerance helps in the determination of acceptable risks, risks that should be mitigated, and risks that are unacceptable.

Elements of Effective Risk Governance

Risk governance can be difficult. Effective risk governance, therefore, requires evident commitment from the governing body. It is important for the governing body to openly discuss risk, undertake scenario planning and evaluate the potential negative outcomes of the risk on the organization. This should happen not only after a crisis but also during periods of normalcy.

The risk governance process should focus on the entire enterprise (enterprise risk management) and consider the full spectrum of potential risks, not just quantitative risks.

Since risk management extends into daily operational management, it is good practice to establish a regular forum for the discussion of the risk framework and key issues at the management level.

Moreover, effective risk governance involves a formal appointment of a chief risk officer (CRO) in an executive role, who is responsible for establishing and implementing the risk framework for the enterprise and overseeing its activities

Question

Which of the following *least accurately* describes effective risk governance practices?

A. Defining risk tolerance and unacceptable risks after a period of crisis

B. Appointing a CRO to work with the CEO and other executives to build and implement a risk framework

C. Integrating the risk management framework and process into the management level of the organization

Solution

The correct answer is A.

Effective risk governance requires the governing body to openly discuss risk, undertake scenario planning and evaluate the potential negative outcomes of the risk on the organization during periods of normalcy.

LOS 6d: explain how risk tolerance affects risk management

At the governance level, the risk appetite of the organization must be established. Risk tolerance identifies the extent to which the organization is prepared to experience losses or opportunity costs in the effort to achieve organizational objectives.

Risk Tolerance Determination

The risk tolerance decision requires the integration of an "inside" and an "outside" view. A determination must be made on the internal shortfalls of an organization which may cause failure as well as the external and sometimes, uncertain risk drivers.

Determination of the risk tolerance level is not straitjacket affair. Rather, it depends on a number of factors. The ability to respond dynamically to changing trends, the capacity to withstand losses and remain afloat, the competitive landscape, and the regulatory environment all shape the risk tolerance level of an organization. On the contrary, personal motivations and beliefs, the agenda of board members, short-term pressures, and management compensation are inconsequential to risk tolerance determination.

The appropriate risk tolerance level should be selected and communicated prior to a crisis and should serve as a strategic response template for the management team. Risk-taking and strategic goals should center around the core competencies of the organization.

Once the risk tolerance is determined, the overall risk framework should be tuned to manage, monitor and communicate the risk tolerance.

Question

Which of the following factors should be considered in determining organizational risk tolerance?

A. Management and employee compensation and bonus schemes

B. The business-critical cash flow requirements over the medium-term

C. Delivering strong performance over the subsequent quarter by increasing leverage

Solution

The correct answer is B.

Organizations should not focus on short-term profits or excessive leverage which may actually either lead to long-term failure or work for management compensation. The risk tolerance should focus on the creation of long-term enterprise value.

LOS 6e: describe risk budgeting and its role in risk governance

Risk budgeting focuses on the implementation of the risk tolerance decisions approved by the management at the strategic or governance level. The risk budget will quantify risk by specific metrics and allocate risk across the organization.

Risk Dimensions

A risk budget may be complex and multi-dimensional or make use of simple risk measures. The single-dimensional risk measures most commonly used in portfolio management are:

- standard deviation;

- beta;

- value at risk (VAR); and

- scenario loss.

A multi-dimensional approach consists of layers of the risk budget. For example, factor analysis may be performed to determine the risk premiums to various factors. The factor exposure may then have a strategic overlay, ensuring the overall equity risk, as measured by beta, is within a particular tolerance level.

Benefits of Risk Budgeting

By implementing a risk budget, a risk culture is created in which all decisions are evaluated with a risk-return tradeoff in mind. Management, therefore, focuses on adding value to the overall enterprise when making decisions and simultaneously remaining within the desired risk tolerance level.

Question

Which statement best describes the role of risk budgeting?

A. The risk budget quantifies risks and allocates risk across the organization based on the risk tolerance level

B. Management should try and "beat" their risk budget to ensure maximum value creation

C. The risk budget allows the governing body to determine the level of risk tolerance

Solution

The correct answer is A.

The governing body sets the risk tolerance at the governance or strategic level. This tolerance is implemented through the risk budgeting process which allows management to quantify and allocate risk within the overall risk tolerance.

LOS 6f: identify financial and non-financial sources of risk and describe how they may interact

Financial risks originate from financial markets and might arise from changes in share prices or interest rates. Non-financial risks emanate from outside the financial market environment and could be consequences of environmental or regulatory changes or an issue with customers or suppliers.

Financial Risk

The three primary types of financial risks are:

Market Risk

Market risk arises from movements within the financial market environment. Such movements include shifts in share prices, interest rates, exchange rates, commodity prices, and other economic or industry market factors.

Currency risk is a form of market risk. It affects investors or companies that operate across different countries. Currency risk arises due to a change in the value of one currency relative to another. For instance, a non-US company that imports some of its raw materials from the US will be affected by currency risk, i.e., a change in the dollar relative to the company's domestic currency will affect the quantity of raw materials imported, thereby affecting the company's value.

Credit Risk

Credit risk is the risk of loss due to the failure of one party to pay the other an outstanding obligation. Credit risk may be defined as default risk or counterparty risk. Defaults and bankruptcies have long-term implications for borrowers and may be irrecoverable.

Liquidity Risk

Liquidity risk is the risk of a severe downward price revision when attempting to sell a particular asset. In stressed market conditions, the seller may have to accept a price well below their perception of value. Within financial markets, the typical transaction cost is measured by the bid-ask spread, where the selling price is less than the buying price. When there is uncertainty in the bid-ask spread, for example, if the spread widens significantly during a stressful market period, it means the liquidation price (selling price) is far lower than the seller believes it should be, and this creates a liquidity risk. Liquidity risk does not just pertain to illiquid assets; market liquidity varies over time for particular assets, and the size of the position and the uncertainty associated with its sale or liquidation increases simultaneously.

Non-Financial Risk

There are a number of non-financial risks that an organization may face:

Settlement Risk

Closely related to default risk, it is the risk around the timing of payments between counterparties. For example, while one party may observe the agreement of a currency swap, the other party may not.

Legal Risk

This is the risk of being sued, particularly in litigious environments, or the risk that a counterparty will not uphold a contractual obligation.

Compliance Risk

Compliance risk is made up of regulatory risk, accounting risk, and tax risk. An update of laws and regulations may create the need for financial restatements, back taxes, or other penalties.

Model Risk

This is the risk of valuation error when the valuation of a particular security is based on a misspecified price model.

Tail Risk

The likelihood or probability of a material negative outcome is often understated in financial models, and it is, in most cases, related to model risk. Financial markets do not follow a normal distribution of returns but tend to have "fat tails." In case the internally selected model does not account for this, tail risk is introduced.

Operational Risk

This risk is related to the people and processes of an organization. The employees of an organization can make errors that are financially costly or act fraudulently due to a lack of proper oversight and control. Companies may also be subject to business interruptions attributable to natural calamities or terrorism.

Solvency Risk

A company may not survive if it runs out of cash and becomes insolvent. In times of solvency pressure, a company may be forced to liquidate assets at unfavorable prices simply to raise the necessary cash. Solvency risk can easily be mitigated by making use of less leverage, using more stable sources of funding, and incorporating solvency measures at the governance level of the business.

Interactions Between Risks

There are numerous interactions between risks – both financial and non-financial – and these interactions become more pronounced during times of market stress. The combined risk is often far more than the "sum of the parts" in the sense that risks may exacerbate one another to drive up the total enterprise risk.

An example of risk interactions may be the failure of a key counterparty to settle an obligation on time. Settlement risk creates a solvency risk for the company which was due to receive the proceeds. In turn, it may not be able to pay its suppliers, which occasions legal risk. Or, it may not meet regulatory solvency requirements, which creates compliance risk. It may also need to rapidly sell assets to raise cash hence creating a liquidity risk.

Often, risk models do not adequately account for risk interactions and understate the overall risk. The governance board, company management, and financial analysts should be aware of how consequential a combination of risks can be. This awareness should motivate them to adopt holistic approach to risk management instead of treating each risk in isolation.

Question

Which of the following are examples of financial risks?

A. Model risk, credit risk, and solvency risk

B. Tail risk, operational risk, and legal risk

C. Credit risk, market risk and, liquidity risk

Solution

The correct answer is C.

Credit risk, market risk, and liquidity risk are classified as financial risks.

Model risk, solvency risk, tail risk, operation risk, and legal risk are examples of non-financial risk.

LOS 6g: describe methods for measuring and modifying risk exposures and factors to consider in choosing among the methods

A conversation on risk would be incomplete without a mention of the ability to measure the risk. Organizations need to evaluate the cost-benefit implications of modifying their risk profiles even as they remain within the governing body risk tolerance levels.

Risk Metrics

The most basic quantitative measure or metric associated with risk is probability. Probability is a measure of the relative frequency of a particular outcome. It is incorporated into other measures of risk to provide meaningful information. Commonly used risk metrics are as follows:

Standard Deviation

Standard deviation is a measure of volatility and provides a range of potential outcomes. It has limitations as a measure for financial markets since it presumes a normal distribution of returns. This is inappropriate when we look at empirical data from the last few decades.

Like many of the financial crises before it, the 2007/2008 financial crisis brought to the fore the divergence between the normal distribution and asset return distributions. Due to the wide applicability of the normal distribution and the occurrence of normality in a broad range of phenomena, analysts have tried to fit asset returns to the normal distribution. And while this approach has had some success, it has proved unreliable and grossly inaccurate, particularly in light of the continuous and recurrent nature of financial crises.

Beta

Beta is a measure of the sensitivity of a security's returns to the overall market portfolio. It provides an indication of systematic risk and is particularly appropriate for equity portfolios.

The Greeks

Commonly referred to as the "Greeks", these metrics are appropriate for measuring the risk associated with derivative positions.

Delta

Delta, ?, is a measure of the degree to which an option is exposed to changes in the price of the underlying asset. It is the ratio of the change in the price of the call option to the change in the price of the underlying asset.

For example, if we have a delta value of 0.5, it means that when the price of the underlying asset moves by a point, the price of the corresponding call option will change by half a point. If delta = 0.5, a $1 increase in the price of the underlying asset price triggers a $0.5 increase in the price of the call option.

Theta

Theta, ?, tells us how sensitive an option is to a decrease in time to expiration. It gives us the change in price of an option prompted by a one-day decrease in its time to expiration.

Options lose value as expiration approaches. Theta estimates the value lost per day if all other factors are held constant. Time value erosion is nonlinear, and this has implications on theta. As a matter of fact, the theta of in-the-money, at-the-money, and slightly out-of-the-money options generally increases as expiration nears. On the other hand, the theta of far out-of-the-money options generally decreases as expiration nears.

Gamma

Gamma, ?, measures the rate of change in an option's Delta per $1 change in the price of the underlying stock. It tells us how much the option's delta should change as the price of the underlying stock or index increases or decreases. Options with the highest gamma are the most responsive to changes in the price of the underlying stock.

Vega

Vega measures the rate of change in an option's price per 1% change in the implied volatility of the underlying stock. And while Vega is not a real Greek letter, it tells us how much an option's price moves in response to a change in volatility of the underlying stock.

As an example, a Vega of 6 indicates that for a 1% increase in volatility, the option's price will increase by 0.06. For a given exercise price, risk-free rate, and maturity, the Vega of a call equals the Vega of a put.

Rho

Rho measures the expected change in an option's price per 1% change in interest rates. It tells us how much the price of an option should fall or rise in response to an increase or decrease in the risk-free rate of interest.

As interest rates increase, the value of call options will generally increase. On the other hand, as interest rates increase, the value of put options will usually decrease. Although rho is not a dominant factor in the price of an option, it takes center stage when interest rates are expected to change significantly.

Long-term options are far more sensitive to changes in interest rates than short-term options are. Furthermore, in-the-money calls and puts are more sensitive to interest rate changes compared to out-of-the-money calls and puts.

Duration

Duration is a measure of sensitivity to interest rates used for fixed-income instruments. We will see how to compute duration in the Fixed Income chapter.

Value at Risk (VaR)

VaR can be defined as the minimum amount of loss that can be incurred with a given confidence level(under normal business conditions). It can also be viewed as the worst possible loss under normal conditions over a specified period. Suppose an analyst calculates the monthly VaR as $100 million at 95% confidence level: what does this imply?

This simply means that under normal conditions, in 95% of the months, we expect the fund to make a profit or loss of no more than $100 million. Put differently, the probability of losing $100 million or more in any given month is 5%.

Limitations of VaR

- It does not describe the **worst possible** loss. Indeed, as seen from the example above, we would expect the $100 million loss mark to be breached 5 times out of a hundred for a 95% confidence level.

- VaR does not describe the losses in the left tail. It indicates the probability of a value occurring but stops short of describing the distribution of losses in the left tail.

- Two arbitrary parameters are used in its calculation – the confidence level and the holding period. The confidence level indicates the probability of obtaining a value greater than or equal to VaR. The holding period is the time span within which we expect the loss to be incurred, say, a week, month, day, or year. VaR increases at an increasing rate as the confidence level increases. VaR also increases with increases in the holding period.

- VaR estimates are subject to both model risk and implementation risk. Model risk arises from incorrect assumptions while implementation risk is the risk of errors from the implementation process.

Conditional Value at Risk (CVaR)

The expected shortfall (ES), also known as the conditional VaR (CVAR), is the average of losses defined by the probability. In other words, it is the expected loss given that the portfolio return already lies below the pre-specified worst-case quantile return (e.g. 5th percentile).

Consider this: the 5% VaR for a fund is -25%. Therefore, 5% of the time, the fund earns a return that's less than -25%. The expected shortfall gives as the expected value of all returns falling at or below the 5 percentile return. As such, ES is a larger loss than VaR. However, unlike the VaR, ES satisfies the subadditivity property.

Conditional Value at Risk (CVaR)
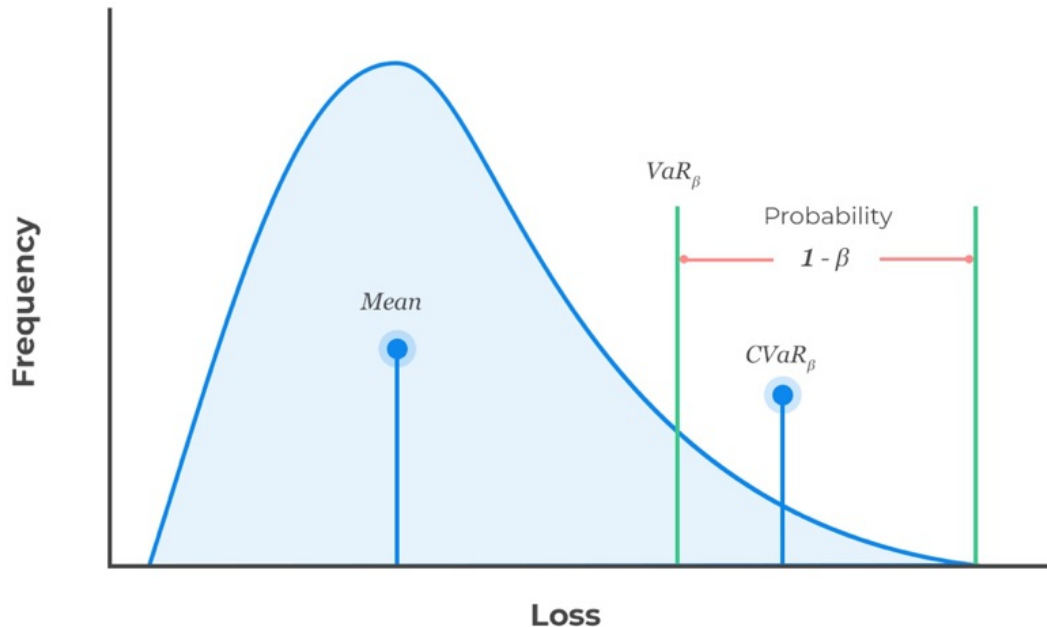
The ES is considered a better risk measure than VaR because, unlike VaR, ES gives an estimate of the magnitude of a loss for unfavorable events.

Scenario Analysis and Stress Testing

In order to complement VaR measures, scenario analysis, and stress testing are undertaken to try and understand the expected loss under different market stress conditions. One of the approaches that have been used to incorporate stress tests in VaR models involves trying to assess whether the stress test loss is part of the loss distribution developed in the VaR estimation. This way, a hypothetical/historical stress scenario can be associated with a given probability.

Credit Risk

Credit risk, which pertains to fixed-income securities, relies on a combination of credit ratings

provided by credit rating agencies as well as measures of liquidity, solvency, profitability, and leverage. Credit Default Swaps (CDS) also provide information on the potential risk of default.

Operational Risk

The operational risk stems from internal functions or processes, systems, infrastructural flaws, human factors, and outside events. Operational risks are particularly hard to quantify but can be costly should they occur.

Modifying Risks

Risk modification is not necessarily about risk reduction. It may be about the deflection of risk towards the desired risk target or exposure. There are four main categories of risk modification:

Risk Prevention and Avoidance

It is difficult to completely avoid risk. The decision to avoid a specific risk altogether will be made at a board level. It is here where it will be determined that some business activities are not worth pursuing based on the risk-return tradeoff.

Risk prevention and avoidance are part of the decision on how much risk to accept and it encompasses a trade-off between the cost and the benefit.

Risk Acceptance

In many cases, it makes sense to be exposed to a particular risk. Even then, an individual or organization should do so in an efficient way. Individuals or companies may, for instance, choose to self-insure. This may mean simply bearing the risk or setting aside some provision to cover losses should they occur.

Another form of efficiently accepting risk is through the use of diversification.

Risk Transfer

Risk transfer is the process of passing risk from one party to another and may take the form of an insurance policy. The insurer charges a premium in return for insuring a specific event. The insurer pools risks by selling a large number of diversified insurance contracts with uncorrelated risks.

Risk Shifting

Risk shifting refers to changing the distribution of risk outcomes rather than passing the risk to another party. Risk shifting is often carried out through hedging by using financial market derivatives. Derivatives are either forward commitments or contingent claims.

Forward commitments are agreements that create a future-based transaction obligation between two parties at an agreed price or rate. These include forward contracts, futures contracts, and swaps.

Contingent claims arise in scenarios where both parties are mutually obligated to each other. Options grant the rights but not the obligation to transact. Consequently, the buyer of the option pays a premium at the start of the contract.

Selecting a Modification Method

Choosing the risk mitigation method to use is a critical part of the risk management process. No single option may have an advantage and a cost-benefit tradeoff that may be required. Low-cost precautions against risks with few benefits should always be the first step.

Organizations with strong cash flow may choose to self-insure as it tends to be the cheapest and most flexible option. Such an arrangement must, however, form part of the governance decision-making and risk tolerance process.

Risk transfer through the use of insurance is widely used but may not always be cost-effective. For financial risks, risk shifting through the use of derivatives is common.

Finally, the cost of the modification method must be balanced against the potential benefits while producing an overall risk profile that is consistent with the risk tolerance and objectives of the

organization.

Question

Which risk metrics are often used within a fixed income portfolio?

A. Beta, delta, and standard deviation

B. Credit rating, CDS, and duration

C. VaR, vega, and loss given default

Solution

The correct answer is **B.**

The metrics commonly used to measure risk in fixed income portfolios are credit ratings, CDS pricing, duration as well as solvency, liquidity, profitability, and leverage.