Efficient Frontier

By AKHILESH GANTI | Updated Apr 1, 2019

What is Efficient Frontier?

The efficient frontier is the set of optimal portfolios that offer the highest expected return for a defined level of risk or the lowest risk for a given level of expected return. Portfolios that lie below the efficient frontier are sub-optimal because they do not provide enough return for the level of risk. Portfolios that cluster to the right of the efficient frontier are sub-optimal because they have a higher level of risk for the defined rate of return.

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Understanding Efficient Frontier

The efficient frontier rates portfolios (investments) on a scale of return (y-axis) versus risk (x-axis). Compound Annual Growth Rate (CAGR) of an investment is commonly used as the return component while standard deviation (annualized) depicts the risk metric. The efficient frontier theory was introduced by Nobel Laureate Harry Markowitz in 1952 and is a cornerstone of modern portfolio theory (MPT).

The efficient frontier graphically represents portfolios that maximize returns for the risk assumed. Returns are dependent on the investment combinations that make up the portfolio. The standard deviation of a security is synonymous with risk. Ideally, an investor seeks to populate the portfolio with securities offering exceptional returns but whose combined standard deviation is lower than the standard deviations of the individual securities. The less synchronized the securities (lower covariance) then the lower the standard deviation. If this mix of optimizing the return versus risk paradigm is successful then that portfolio should line up

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portfolio's risk / reward profile. It also reveals that there is a diminishing marginal return to risk. The relationship is not linear. In other words, adding more risk to a portfolio does not gain an equal amount of return. Optimal portfolios that comprise the efficient frontier tend to have a higher degree of diversification than the sub-optimal ones, which are typically less diversified.

KEY TAKEAWAYS

- Efficient frontier comprises investment portfolios that offer the highest expected return for a specific level of risk.
- Returns are dependent on the investment combinations that make up the portfolio.
- The standard deviation of a security is synonymous with risk. Lower covariance between portfolio securities results in lower portfolio standard deviation.
- Successful optimization of the return versus risk paradigm should place a portfolio along the efficient frontier line.
- Optimal portfolios that comprise the efficient frontier tend to have a higher degree of diversification.

Optimal Portfolio

One assumption in investing is that a higher degree of risk means a higher potential return. Conversely, investors who take on a low degree of risk have a low potential return. According to Markowitz's theory, there is an optimal portfolio that could be designed with a perfect balance between risk and return. The optimal portfolio does not simply include securities with the highest potential returns or low-risk securities. The optimal portfolio aims to balance securities with the greatest potential returns with an acceptable degree of risk or securities with the lowest degree of risk for a given level of potential return. The points on the plot of risk versus expected returns where optimal portfolios lie are known as the efficient frontier.

Selecting Investments

Assume a risk-seeking investor uses the efficient frontier to select investments. The investor would select securities that lie on the right end of the efficient frontier. The right end of the

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properly represent reality. For example, one of the assumptions is that asset returns follow a normal distribution. In reality, securities may experience returns that are more than three standard deviations away from the mean in more than 0.03% of the observed values. Consequently, asset returns are said to follow a leptokurtic distribution or heavy-tailed distribution.

Additionally, Markowitz posits several assumptions in his theory, such as that investors are rational and avoid risk when possible; there are not enough investors to influence market prices; and investors have unlimited access to borrowing and lending money at the risk-free interest rate. However, reality proves that the market includes irrational and risk-seeking investors, there are large market participants who could influence market prices, and there are investors who do not have unlimited access to borrowing and lending money.

Related Terms

Modern Portfolio Theory (MPT)

Modern portfolio theory (MPT) looks at how risk-averse investors can build portfolios to maximize expected return based on a given level of market risk. more

Capital Market Line (CML) Definition

The capital market line (CML) represents portfolios that optimally combine risk and return. more

Excess Returns

Excess returns are returns achieved above and beyond the return of a proxy. Excess returns will depend on a designated investment return comparison for analysis. more

Markowitz Efficient Set

The Markowitz efficient set is a portfolio with returns that are maximized for a given level of risk based on mean-variance portfolio construction. more

Risk Curve

The risk curve is a two-dimensional display creating a visualization of the relationship between risk and return of one or more assets. more

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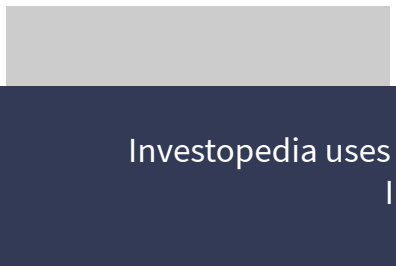

PORTFOLIO CONSTRUCTION

Modern Portfolio Theory: Why It's Still Hip

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