

## Layman Explanation - Diversification

**A given portfolio's "Idiosyncratic Diversification"** value can range from 1 to several hundred and measures how concentrated the holdings are. Smaller numbers indicate less diversification because the portfolio has fewer but more concentrated positions. Larger Idiosyncratic Diversification values indicate more portfolio diversification because of less concentration.

**A portfolio's "Systematic Diversification"** value ranges from 1 to 100 and measures how intra-correlated the portfolio's holdings are to one another. The greater the number, the more closely the portfolio's holdings are expected to react in unison to changes in market conditions and therefore the less diversified the portfolio is.

**A portfolio's "Fiduciary Diversification"** number is a mathematically calculated combination of the above two measures into a single score that defines diversification in terms of the number of equivalently, equally weighted, and sufficiently asymmetric portfolio constituents. The larger the number, the more diversified the portfolio.

## Glossary

**Alpha** is a measure of the difference between a fund's actual returns and its expected performance, given its level of risk (as measured by beta). Alpha grades an investment's return scaled to the return expected by its benchmark. The amount of Alpha delineates the amount by which the investment has outperformed or underperformed its benchmark.

**Ambient Dimensionality (AD)** is the scientific name for Total Number of Portfolio Holdings and is the diversification metric that measures the total numerical *count* of risk assets (only) held in a portfolio. It is one of the 3 quantity factors used to measure diversification.

**Beta** is the measure of an investment's sensitivity to market movements. The beta of the benchmark is 1.00, so a fund with a 1.10 beta is expected to perform 10% better than its benchmark index in up markets and 10% worse in down markets. Conversely, a beta of .85 indicates that the fund is expected to perform 15% worse than the benchmark index in up markets and 15% better in down markets.

**Calmar Ratio** is a measure of risk-adjusted returns. It is calculated by dividing a portfolio's annual rate of return by its maximum drawdown.

**Commonality** is the common name for *Intrinsic Dimensionality* (listed below), one of the 3 quantity factors used to measure a portfolio's diversification.

**Compensated Investment Risk** is unavoidable. It is the inherent risk assumed when making any investment. Compensated risk is also known as "un-diversifiable risk," "market risk," or "systematic risk" because it affects all investments, and is not limited to a particular investment type, security, industry, etc. and investors expect higher returns when assuming more of it. As a result, every participant in the investment market is exposed to it. This compensated risk is both unpredictable and unavoidable. It cannot be changed or diversified away. It changes only when market conditions change. It is considered to be the "price of admission" paid by everyone who becomes a market participant. Compensated risk is approximately 1/3 of total risk.

**Concentration** is the common name for *Spanning Dimensionality* (listed below), one of the 3 quantity factors used to measure a portfolio's diversification.

**Concentration Coefficient (CC)** is the metric used to measure how concentrated a portfolio's investments are. It measures the number of equally-weighted equivalent risk assets present in a portfolio by dividing the number 1 by the sum of the squares of a portfolio's constituent weightings.

**Correlation** compares the direction only (not the amount) of a portfolio's movement in relation to its benchmark. A correlation coefficient of +1 implies that as a benchmark moves either up or down, the portfolio will move in lockstep, in the same direction. Alternatively, a perfectly negative correlation of -1 means that if either the portfolio or benchmark moves one way the other will move in the opposite direction. If the correlation is 0, the movements of the portfolio and index are said to have no correlation; they are completely random.

**Count** is the common name for *Ambient Dimensionality* (see above), one of the 3 quantity factors used to measure a portfolio's diversification.

**Cross-Correlation %** is a stand-alone, holistic metric that measures the correlation composition of all interrelationships within a given portfolio. It quantifies the degree to which the securities held inside the portfolio are expected to move in the same direction and is measured by the Systematic Diversification score in the Diversification Dashboard section.

**Down-Market Capture** ratio is the statistical measure of an investment portfolio's overall performance in down- markets. Portfolios that display a down-market capture of greater than 100% have underperformed their benchmark during periods when the benchmark decreased in value by the percentage amount in excess of 100%.

**Diversification Return (Estimated)**. In *Diversification Returns and Asset Contributions*, Eugene Fama and David Booth (1992) proved how diversification yielded additive portfolio returns, naming the phenomenon "diversification returns." They reasoned that if the correlation of all a portfolio's assets equaled 1, then the weighted average asset variance would equal the portfolio variance. They went on to prove how more diversification increased this incremental return and was a function of the amount of variance reduction, not the actual level of portfolio variance. They estimated a portfolio's "diversification returns" equaled half the variance reduction caused by diversification (e.g. If you start with a portfolio made up entirely of low-volatility assets, their covariance can only reduce the portfolio's standard deviation by a small amount — causing smaller variance reduction and reduced diversification returns). Prudent uncompensated risk management requires focusing on correlations, not standard deviations.

**Fiduciary Diversification Score (FDS)** is another name for Intrinsic Dimensionality (ID). It is the companion Diversification Metric to ICD and is used to quantify the number of diversification elements available for removal of uncompensated risk from a portfolio. FDS is a necessary metric because ICD, alone, cannot differentiate between assets that are highly correlated (e.g. a portfolio holding 5 different S&P 500 Index ETFs at 20% each will have an ICD of 5, but an FDS of 1). The FDS metric measures the number of sufficiently asymmetrical and equally weighted equivalent elements that are present in a portfolio. The more of these elements present in a portfolio; the greater is the ability for each element to perform independently, and independent performance by more elements is the hallmark of diversification.

**Idiosyncratic Concentration Coefficient (ICD)** is also known by the scientific name of Spanning Dimensionality (SD), and is the companion Diversification Metric to AD. It defines the number of equally-weighted equivalent risk assets present in a portfolio. Equally weighted portfolios have maximum ICD possible for the given number of total portfolio assets, and represent the smallest possible concentration structure. Decreases in the ICD metric indicate increases to portfolio concentration and less diversification. Real life portfolios are almost never equally weighted, thereby encompassing varying degrees of unknown concentration. Using the ICD metric to learn a portfolio's equally weighted equivalent asset count is an important step in accurate diversification measurement.

**Intrinsic Dimensionality (ID)** aka Fiduciary Diversification Score is the scientific name for the companion Diversification Metric to SD and is used to quantify the number of diversification elements available for removal of uncompensated risk from a portfolio. ID is a necessary metric because SD, alone, cannot differentiate between assets that are highly correlated (e.g. a portfolio holding 5 different S&P 500 Index ETFs at 20% each will have a SD of 5, but an ID of 1). The ID metric measures the number of sufficiently asymmetrical and equally weighted equivalent elements that are present in a portfolio. The more of these elements present in a portfolio; the greater is the ability for each element to perform independently, and independent performance by more elements is the hallmark of diversification.

**Maximum drawdown** is a portfolio's peak to trough performance measured from the high point reached prior to the decline's inception until a new high is reached. The drawdown is determined upon completion of the entire cycle, which cannot be known until a new high is reached. Once reached the percentage decline from the old high to the lowest interim point of that cycle is the drawdown. Maximum drawdown is the drawdown having the largest decline during the period examined. It is a metric that measures risk.

**R Squared (R<sup>2</sup>)** is the percentage of the portfolio's performance explained by the behavior of the assigned benchmark. R-Squared values range between 0 and 100, where 0 represents the least correlation and 100 represents full correlation. The R-Squared of a portfolio indicates if the index being used to analyze beta is an appropriate benchmark. If a portfolio's R-Squared value is close to 100, the beta of the investment can be trusted. On the other hand, an R-Squared value that is less than 75 indicates that the beta is not particularly useful because the portfolio is being compared to an inappropriate benchmark.

**Quantitative Diversification Factors** consist of AD, ICD, and FDS, the three factors required to identify the number of portfolio assets capable of removing uncompensated risk from a portfolio.

**Qualitative Diversification Factors** are those that measure the extent to which a portfolio's diversifiable risk was reduced and/or its return increased as a result of quantitative diversification factors present.

**Risk** refers to an investment's vulnerability to fluctuations in value relative to changing economic or market conditions. Risk is used to define all uncertainty relating to the outcome. The level of risk incurred by a fund varies from fund to fund, depending primarily on the types of securities in which a fund invests.

**Semi-Correlation** excludes instances of pair wise series that exhibit concurrent positive movement. It has the objective of enhancing diversification protection during down market periods, while reducing diversification during up market periods thereby delivering more alpha.

**Semi-Deviation** measures the negative fluctuations of an asset's price. It is a measure of dispersion for the values of a data-set falling below the observed mean or target value. Semi-Deviation is the square root of semi-variance, which is found by averaging the deviations of observed values that have a result that is below the mean.

**Sharpe Ratio** measures a portfolio's excess return over its risk-free rate divided by the standard deviation of the excess return. It is a measure of the absolute rate of return per one unit of risk. The better an investment's risk-adjusted performance has been, the higher its Sharpe ratio will score. A negative Sharpe ratio indicates that a risk-less asset would have performed better than the investment being analyzed.

**Sortino Ratio** is a variation of the Sharpe ratio used to measure risk adjusted return. It differentiates harmful or downside deviation from total standard deviation by only using the asset's standard deviation of negative portfolio returns in its formula. The Sortino Ratio measures a portfolio's excess return over its risk-free rate, then divides that amount by the asset's downside deviation. Because positive volatility is not regarded as risk, defining "risk" as only the negative deviation of a portfolio's returns from the mean is thought to represent a better view of a portfolio's risk-adjusted performance.

**Spanning Dimensionality (SD)** is the companion Diversification Metric to AD. It is the scientific name for the number of equally-weighted equivalent risk assets present in a portfolio. Equally weighted portfolios have maximum SD possible for the given number of total portfolio assets, and represent the smallest possible concentration structure.

Decreases in the SD metric indicate increases to portfolio concentration and less diversification. Real life portfolios are almost never equally weighted, thereby encompassing varying degrees of unknown concentration. Using the SD metric to learn a portfolio's equally weighted equivalent asset count is an important step in accurate diversification measurement.

**Standard Deviation** is a statistical measure of portfolio risk measured by the variability of the portfolio's return around its average over a specific time period. Unlike alpha, beta, and R-squared which are relative to a benchmark index, standard deviation is an absolute measure. In general, the higher the standard deviation is, the greater the volatility or risks.

**Systemic Risk**, in finance, is the risk of collapse of an entire financial system or entire market, as opposed to risk associated with any one individual entity, group or component of a system that can be contained therein without harming the entire system. It refers to the risks imposed by inter-linkages and inter-dependencies where the failure of a single entity or cluster of entities can cause a cascading failure, which could potentially bankrupt or bring down the entire system or market. Normally systemic risk is not a great factor, but when it is it becomes a tsunami it overruns all other factors in the marketplace.

**Important Note: "systemic" (8 letters) risk is sometimes erroneously referred to as "systematic" (10 letters) risk (compensated risk).**

**Total Number of Portfolio Holdings** is also known by the scientific name of **Ambient Dimensionality (AD)**. It is a quantitative diversification metric that measures the total numerical *count* of risk assets (only) held in a portfolio. It is one of the 3 quantity factors used to measure diversification.

**Tracking Error** measures the divergence between the price behavior of the listed portfolio and the price behavior of the benchmark. Tracking error shows how well the movement of each portfolio tracks the benchmark over the period of time being measured. Even portfolios that display high R-squared values to their benchmark usually behave differently than the benchmark during shorter periods of time within the overall measurement period. Tracking error quantifies this difference.

**Ulcer Index (UI)** is a technical indicator that measures downside risk in terms of both the depth and duration of a portfolio's short-term market value declines. The index increases in value as the value moves farther away from a recent high and falls as the value rises to new highs. The indicator is usually calculated over a 14-day period, with the Ulcer Index showing the percentage drawdown an investor can expect from the high over that period. The greater the value of the Ulcer Index, the longer it takes for a portfolio to get back to its former high.

**Uncompensated Risk** is a risk that can be eliminated with diversification and unlike compensated or systematic risk investors cannot expect added return for assuming more uncompensated risk. Uncompensated risk is also referred to as unsystematic risk and can be reduced by methodically re-balancing the portfolio. Uncompensated risk represents approximately 2/3 of total risk.

**Uncompensated Risk Removed from Portfolio** measures the percentage of risk eliminated from the portfolio by diversification and is the percentage of the Variance Gap divided by the sum of a portfolio's weighted position variances. Because the benefits of diversification are primarily driven by the asymmetric correlation of holdings' returns, it is important for this risk metric to be reviewed in conjunction with the Fiduciary Score to further define the level of diversification adequacy in a portfolio.

**Up-Market Capture** ratio is the statistical measure of the investment portfolio's overall performance in up-markets. Portfolios that display an up-market capture of greater than 100 have outperformed their benchmark during periods when the benchmark increased in value by the percentage amount in excess of 100.

**Variance** is a measurement of the spread between numbers in a data set. It measures how far each number in the set is from the mean and is calculated by taking the differences between each number in the set and the mean, squaring the differences (to make them positive) and dividing the sum of the squares by the number of values in the set. Variance is a key metric in diversification management. Along with correlation, the variance of asset returns helps investors prudently manage the risk/return trade-off in investment portfolios. The square root of variance is standard deviation.

**Variance Gap** is a qualitative factor in uncompensated risk measurement. According to Restatement (3rd) of Trusts "...a portfolio's risk is less than the weighted average of the risk of its individual holdings." The variance gap is the difference between the sums of the weighted average variances of the portfolio's individual asset holdings less the portfolio's overall variance. The greater the Variance Gap, the greater the diversification benefit.

**Volatility** is a statistical measure of the dispersion of returns for a given security, a portfolio, or market index. Volatility can either be measured by using the standard deviation or variance between returns from that same security, portfolio, or market index. Usually, the higher the volatility, the riskier the portfolio is.

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