HOW TO MEASURE PORTFOLIO DIVERSIFICATION

Still Talking about Eggs and Baskets when It comes to Diversification?
Here is the science behind Diversification.

SUMMARY

Measuring Portfolio Diversification is refined from the simple Count of assets, to then adjust for the assets Concentrations and finally adjust for the assets Commonality to arrive at a robust portfolio diversification

Count	500	S&P 500 Index
Concentration	145	
Commonality	21	

Ignorance of Diversification causes naive investors to take more risk than presumed and exposes professional investors to liability from breach of fiduciary duty.

Applying a process such as Principal Component Analysis to a weighted correlation matrix or asset time series produces several dimensions which measure diversification effectively.

SIMPLE DESCRIPTION
ASSET COUNT

S&P 500 Stock Market Index

S&P 500 EXAMPLE
500

NAIVIETY
High

FIDUCIARY RISK EXPOSURE
↑ Significant

SCIENTIFIC — Ambient Dimension — DESCRIPTION

TASK
Simple Count of the Number of Assets in the Portfolio.

DESCRIPTION
Relying on the count of assets to measure diversification is inappropriate and likely misleading.

DISCUSSION
The S&P 500 Stock market Index contains 500 stocks and is naively assumed to be a diversified index. But is it?

SIMPLE DESCRIPTION
CONCENTRATION EQUIVALENT

S&P 500 EXAMPLE
145

NAIVIETY
Medium

FIDUCIARY RISK EXPOSURE
↗ Material

SCIENTIFIC — Spanning Dimension — DESCRIPTION

DESCRIPTION
After refining our portfolio diversification measure from the simple asset count to account for the inequalities in the weights of each asset, 500 stocks has already shrunk to 145 stocks. But this is just one step to get a clear measure.

TASK
Normalize asset count for weighting scheme to produce equally weighted equivalent asset count.

DISCUSSION
On average the portfolio behaves like it has 145 equally weighted assets. This is a.k.a. the Concentration Co-Efficient.

SIMPLE DESCRIPTION
INDEPENDENCE EQUIVALENT

S&P 500 EXAMPLE
21.5

NAIVIETY
None

FIDUCIARY RISK EXPOSURE
↓ Low

SCIENTIFIC — Intrinsic Dimension — DESCRIPTION

DESCRIPTION
Reduce the spanning dimensionality[1] by the Gini-Coefficient - which serves as a measure of the % of commonality - reveals the Intrinsic Dimension of the portfolio. The Quantity computed is the equivalent number of completely independent assets.

TASK
Normalize again to refine for commonality among the performance of the assets over time. Quantify the number of independent diversification resources (dimensions).

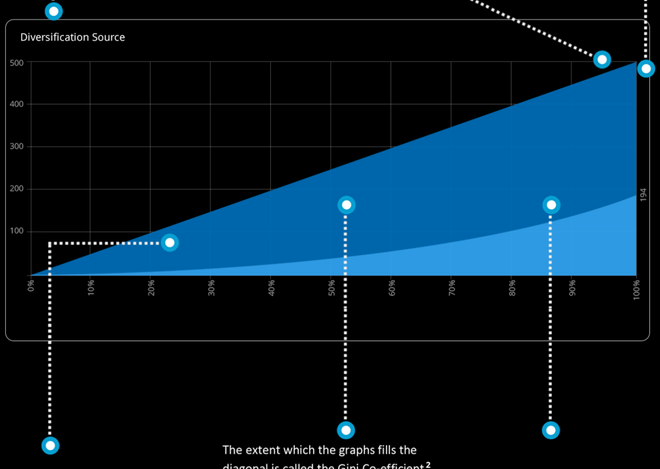
DISCUSSION
The Gini Co-efficient of the S&P 500 is only 11%. This means that compared to a portfolio of 500 equally weighted and uncorrelated assets, the S&P 500 is only 11% diversified. Multiplying 194 Spanning dimensions by the Gini Co-Efficient (11%) gives 21.5. In spite of having 500 assets, the S&P 500 Index has only the equivalent of 21.5 equally weighted and uncorrelated assets.

Understanding How Dimensions Measure Diversification

This chart shows how diversification is distributed in any portfolio. A more even distribution is more diversified.

The Asset Count is the top end of the diagonal and is also called the ambient dimension. In the S&P 500 example, this is 500.

The peak value shows how many dimensions it takes to span the portfolio with 100% of the information included. More dimensions = more diversification. If the top value of the curve is less than the top of the diagonal, then there is redundancy in the portfolio. Redundancy is often greater in larger index strategies. In the S&P 500 example, this drops all the way to 145 indicating large amounts of redundancy. The peak of the curve is the spanning dimension and approximates the Equally Weighted Equivalent.



The graph would fill the diagonal exactly if all the assets were uncorrelated and equally weighted. As systematic commonality and weighting concentrations impact the strategy, the graph will dip down, lowering diversification

The extent which the graphs fills the diagonal is called the Gini Co-efficient.[2] The Gini Co-efficient is a measure of how evenly things are distributed. For the S&P 500 example, the graph only covers 11% of the triangle. The Gini Co-Efficient answers the question, "What Percent diversification does this portfolio have given the count of investments.

The chart integrates idiosyncratic (asset specific) diversification (AKA holding count) with the systemic commonality of the positions (the Gini Co-Efficient). Multiplying the two yields the Intrinsic Dimension.

1. The Spanning Dimension is approximately equivalent, but not equal to the Concentration Co-Efficient. The Spanning Dimension is a reduction from the count that removes statistical overlap and will usually be a bit higher than the Concentration Co-Efficient.

Get a free account to measure your diversification here (gsphere.net)

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