Diversification Dashboard March 2014:

TOBAM's Diversification Ratio (DR)[1] measures to what extent a portfolio is diversified. The DR2 (square of the diversification ratio) measures the number of effective degrees of freedom to which a portfolio is exposed. As the table shows, the "broad market" indices leave diversification on the table. In addition to a snapshot of each market's DR², the table shows the DR² of a well-diversified portfolio, and the fraction of available diversification used by the index.

	DR² - Index diversification	***DR² - Maximum diversification***	***% diversification used by index***
MSCI All Countries	5.43	25.01	*21.69%*
MSCI World	4.96	18.54	*26.75%*
MSCI Emerging	4.86	9.87	*49.23%*
MSCI Canada	4.61	9.42	*48.98%*
MSCI US	3.38	9.09	*37.22%*
MSCI EMU	2.77	8.66	*31.98%*
MSCI Pacific ex-Japan	2.70	6.49	*41.61%*
MSCI UK	2.98	5.45	*54.66%*
MSCI Australia	2.62	4.74	*55.39%*
MSCI Japan	1.97	4.37	*45.05%*

As of 28th February 2014.

Does rebalancing a portfolio more frequently increase its returns?

There have been suggestions by practitioners and to a lesser degree by academics that rebalancing more frequently portfolios systematically increases their performance. The rationale behind this argument often takes its root in Booth and Fama [92] and/or in Fernholz [82].

It is well behind the scope of this dashboard to delve into the theoretical aspects developed in the above publications. We can say however that what the above authors have shown is essentially that when one rebalances a given portfolio to its original weights, its long term expected growth rate increases deterministically; even when asset returns are not forecastable (more precisely when they follow a Gaussian geometric random walk).

Now, it should be noted that if one assumes that asset prices are not forecastable (in the above sense), there is no reason why rebalancing more frequently a portfolio could be forecasted to increase its expected return over each rebalancing period (not its expected growth rate). That would indeed mean that one would be able to create a forecastable synthetic asset: long the rebalanced portfolio and short its initial version..

How can we reconcile this apparent contradiction? In a nutshell, what those above suggestions are missing is that in a rebalanced portfolio, it's expected long term growth rate is only one term of the equation and is mitigated by a second, non-deterministic term. Indeed the increase in performance coming from rebalancing a portfolio is mitigated by relatively less frequent, large negative underperformances; coming for example from assets that ends up dominating all others. In that case a portfolio that is not rebalanced would effectively dominate a rebalanced one...

[1] TOBAM's Diversification Ratio measures a portfolio's or index's diversification. It is supported by original research and is based on a mathematical definition of diversification. TOBAM's "Anti-Benchmark" Most Diversified Portfolio® maximizes this Diversification Ratio. Maximizing diversification within a universe of securities provides a result closer to the true market risk premium from that universe. "Maximum Diversification®" and "MaxDiv®" are registered trademarks of TOBAM.

However, rebalancing a portfolio can demonstrably create value when:

- Asset prices are mean reverting (evident)
- The market stays diversified enough in the sense that no asset can dominate all others as for instance shown by Fernholz [02].

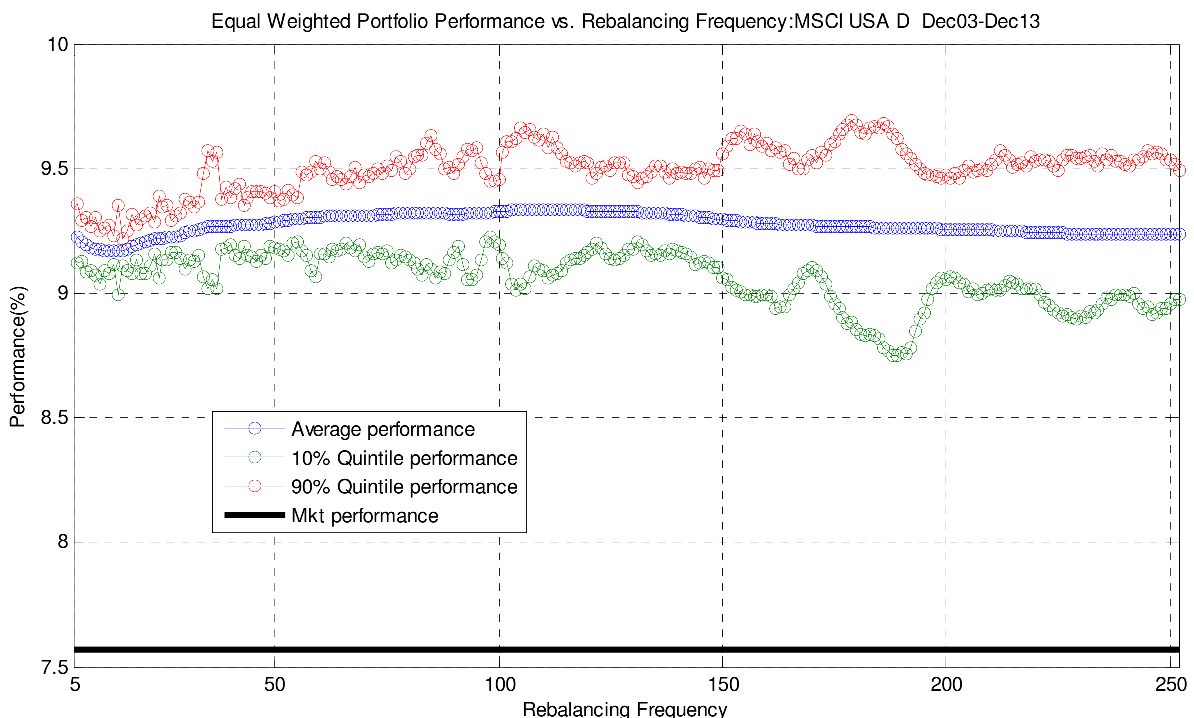
Note that in those cases, asset returns or future relative prices are forecastable.

How much value is added by rebalancing a portfolio?

If there are real world structural reasons that are favorable a priori to rebalancing a portfolio (mean reversion for example), a key question is how much value is created. In order to estimate it, the following experiment has been conducted:

- Investment Universe: MSCI US over the last decade (2004-2013)
- Simulation of the performance of an equal-weighted portfolio rebalanced at different frequencies ranging from a week to a year (from 5 trading days to 252 trading days)
- More specifically, when considering for example a yearly rebalancing , we simulated the 252 possible rebalancing policies (1 for each possible rebalancing day in a year), and computed their average performance as well as their 10% and 90% performance deciles
- Note that transaction costs have not been taken into account
- In total this represents over 30,000 simulations

The below chart shows the performance achieved by the EW for different rebalancing frequencies:



Key Take Away:

- The US market as defined by MSCI did not provide any significant opportunity to add value by rebalancing an equal weighted portfolio at frequencies greater than a year over the last decade.

- The outperformance of the Equal-Weight portfolio versus the market cap weighted portfolio is hence due to other considerations than rebalancing only. Two possible explanations could be:

    1. The EW portfolio is more diversified (although naively) compared with the Benchmark.

    2. It is the Benchmark that actually underperforms the EW portfolio, as it carries unwanted biases that underperform a more reasonably constructed portfolio (from a risk and return point of view).

- To be followed in upcoming dashboards…

References:

- Booth and Fama, "Diversification returns and asset contributions", Financial Analysts Journal (1992)

- Fernholz and Shay. "Stochastic portfolio theory and stock market equilibrium", The Journal of Finance (1982)

- Fernholz, E. Robert. Stochastic portfolio theory. Springer New York, 2002

For more information

TOBAM is an asset management company offering innovative investment capabilities whose aim is to maximize diversification. TOBAM's flagship Anti-Benchmark® strategies, supported by original research and a mathematical definition of diversification, provide clients with diversified core equity exposure, both globally and in domestic markets. The company manages over $5.6 billion via its Anti-Benchmark strategies for institutional clients worldwide. Its team includes twenty four financial professionals.

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