**Bouchey2012**

Volatility Harvesting: Why Does Diversifying and Rebalancing Create Portfolio Growth?

Bouchey, Paul;Nemtchinov, Vassilii;Paulsen, Alex;Stein, David M

Apple and Starbucks Stock From 1994 to 2011.

For B&H investors the highest return they could get is 100% from Apple since its annualized growth rate is higher than that of Starbucks. However, the actual annual grow rate would change in different periods where Starbucks grew more quickly in the early periods and Apple grew more quickly in the late periods. Thus, for rebalancing investors they could adjust the portfolio and take the advantage of higher growth rate for higher return.

Coin flipping game

For a coin flipping game that a head means doubling the money while a tail means losing half of the money. In the long run, since the probability of heads and tails would approach 0.5 and the expected return would be 0. However, if the investor holds half of the money(rebalancing) after each game, the long-term growth rate would be 6% on average.

For any asset the growth rate would approximately equal average return minus volatility which could be usually measured by the variance of the asset. Consequently, the intuition behind rebalancing strategy is that it could reduce the volatility and add rebalancing premium(Average variance - portfolio variance) to the asset.

According to stock portfolios tested on three strategies: capitalization weighted(CAP), equal weights allowed to drift with no rebalancing(EWD), and equal weights rebalanced monthly(EWR), volatility is higher for the equal-weighted portfolios and turnover is higher in the rebalancing portfolios.

**Kitces2015**

Rebalancing Revisited

by Michael Kitces

He used rolling 30-year historical periods to compare rebalancing between large-cap U.S. stocks and intermediate-term government bonds to a buy-and-hold strategy. Over most 30-year periods buy and holds noticeably outperformed rebalancing yet when the difference is negligible when rebalancing outperformed buy and hold. Rebalancing is not a return enhancing strategy, but instead a return reducing strategy that is done for risk management purposes

Rebalancing between assets which have similar returns and a high (but less than 1.0) correlation does enhance the returns compared to just buying-and-holding each. However, rebalancing amongst investments with different returns would have more impacts on risk management rather than expected returns.