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

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Smart Beta

Where does the alpha come from?
Smart Beta

Where does the alpha come from?

– Risk factor tilts
  • Beta
  • Small Cap
  • Value
  • Momentum
Smart Beta

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  • Less risk for the same return
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– Rebalancing
  • Volatility harvesting
Roadmap

– Explore the simplest of smart beta strategies: equal weighting.
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– Develop an understanding of where the excess return is coming from.
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– Develop an understanding of where the excess return is coming from.
– Examine some practical issues with implementation.
Why Does Equal-Weight Outperform?


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CAP: Capitalization weighted
EWD: Equal weights allowed to drift
EWR: Equal weights rebalanced monthly
Thought Experiment: Monkeys

– Select 100 securities at random.
  • Universe: Russell Global
  • Dates: 1997 – 2012
  • Trials: one million
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– Use three portfolio strategies.
  • CAP: Capitalization weighted
  • EWD: Equal weights allowed to drift
  • EWR: Equal weights rebalanced monthly
Thought Experiment: Monkeys

Annual Return Contribution (in bps):
- Diversification: +138 (EWD-CAP)
- Rebalancing: +139 (EWR-EWD)

Probability of outperforming CAP:
- Equal weights allowed to drift (EWD): 74.0%
- Rebalanced equal weights (EWR): 90.4%

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Annual Return Contribution (in bps):
- Diversification: -133 (EWD-CAP)
- Rebalancing: -64 (EWR-EWD)

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Thought Experiment: Binomial Trees

Risky Bet:

- $1
- $2
- $.50

P=1/2
Thought Experiment: Binomial Trees

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Thought Experiment: Binomial Trees

Risky Bet: $1

Riskless Bet: $1

P = 1/2

P = 1

$.50

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Thought Experiment: Binomial Trees

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Mathematics of Long-Term Growth

- Volatility is a drag

\[ g = \mu - \frac{\sigma^2}{2} \]
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- Volatility is a drag
  \[ g = \mu - \frac{\sigma^2}{2} \]

- Diversification enhances returns

  \[ g_p = \sum_i w_i g_i + \frac{1}{2} \sum_i w_i \sigma_i^2 - \frac{1}{2} \sum_{ij} w_i \sigma_{ij} w_j \]

  = AverageGrowth + \frac{1}{2} AverageVariance - \frac{1}{2} PortfolioVariance

  = AverageGrowth + RebalancePremium

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Volatility is a Drag on Return

Source: Parametric. Decile portfolios formed on trailing 3yr volatility for stocks in the Russell Large-Mid Global Index 1997-2011. Provided for illustrative purposes only. Illustrations do not represent the experience of any particular client. Not an offer to buy or sell securities. Past performance does not guarantee future results. It is not possible to invest directly in an index. All investments are subject to the risk of loss. See Disclosures for additional information.
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Rebalancing Enhances Returns

Source: Parametric. Monthly rebalanced portfolios using split and dividend adjusted prices, 1995 – 2012. Provided for illustrative purposes only. Illustrations do not represent the experience of any particular client. Not an offer to buy or sell securities. Past performance does not guarantee future results. It is not possible to invest directly in an index. All investments are subject to the risk of loss. See Disclosures for additional information.
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Volatility is Energy

– Cross-sectional volatility can be thought of as “potential” energy.
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Quantifying the Extra Return

Drifting Wastes Energy

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- The cap-weighted index drifts and wastes the potential energy created by cross-sectional volatility.

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- Diversification and rebalancing are sources of excess return for smart beta strategies.

Emerging Markets Example

Source: Parametric. MSCI. Monthly rebalanced portfolios, equal weighted, using 18 emerging market countries, 2000-2012. See “Energy, Entropy and Arbitrage” by Pal and Wong, 2013 Parametric Working Paper, for details on the return decomposition methodology. Provided for illustrative purposes only. Illustrations do not represent the experience of any particular client. Not an offer to buy or sell securities. Past performance does not guarantee future results. It is not possible to invest directly in an index. All investments are subject to the risk of loss. See Disclosures for additional information.
Volatility Harvesting in Practice

Problem:
Turnover creates higher explicit trading costs.
Volatility Harvesting in Practice

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Resolution:
Use trigger-based rebalancing, instead of calendar, and only trade those parts of the portfolio that are out of balance. Pay attention to how much “energy” is being lost by drifting.
Volatility Harvesting in Practice

Problem:
Equally weighting securities creates turnover in the least liquid parts of the market. This increases implicit trading costs.
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Resolution:
Use modified equal weighting. Avoid putting too much money into illiquid securities.
Volatility Harvesting in Practice

Problem:
Equal weight ignores correlation and can lead to higher portfolio volatility.
Volatility Harvesting in Practice

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Equal weight ignores correlation and can lead to higher portfolio volatility.

Resolution:
Use a risk model and minimum-variance optimizer to manage portfolio volatility, while preserving diversity (modified-equal weight constraints).
“Look at market fluctuations as your friend, rather than your enemy; profit from folly rather than participate in it.”

- Warren Buffet
“Investment management is a highly fickle discipline. There is plenty of room for successful investors to prosper. Those who do, have learned the need for humility and adopted investment processes which rely on measured decisions and possess discipline.”

- Jean Brunel
Closing Thoughts

– Smart beta is more than just a bundle of traditional quant risk premia (dumb alpha)
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– Diversification and rebalancing can increase the expected long-term growth rate of a portfolio (not the same thing as alpha, but it does leave you with more money).

  • Volatility risk can be reduced by combining uncorrelated securities into a portfolio.
  • Rebalancing is a source of extra return—buy low, sell high.
Smart Beta in Practice

Diversify > reduce risk

(both volatility and concentration risks)
Smart Beta in Practice

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**Rebalance** > enhance returns

(compounded returns, not alpha)
Smart Beta in Practice

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Rebalance > enhance returns
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Implement efficiently > control costs
(mindless index trades are not the answer)
References

Volatility Harvesting: Why Does Diversifying and Rebalancing Create Portfolio Growth?
Paul Bouchey, Vassilii Nemtchinov, Alex Paulsen and David Stein
Journal of Wealth Management (Fall 2012)

Energy, Entropy and Arbitrage
Soumik Pal and Leonard Wong
Disclosures

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