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Inaugural Practitioner Seminar

Raman Uppal
Edhec Business School

Academic Perspective

20 January 2015

Discussion of *Efficiently Combining Multiple Sources of Alpha* by Zoltan Nagy (Barra/MSCI)

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Related academic papers I

- Role of alpha and factors in portfolio weights and portfolio return.
  - MacKinlay, C. and L. Pastor, *Asset Pricing Models: Implications for Expected Returns and Portfolio Selection*, Review of Financial Studies 13, 883-916.
  - Pesaran M. and P. Zaffaroni, 2009, *Optimality and Diversifiability of Mean Variance and Arbitrage Pricing Portfolios*, Working paper.
- Dangers of using models based on "important" factors
  - Harvey, Liu, Zhu, 2013, *... and the Cross Section of Expected Returns*, Working paper.
  - Kogan, L. and M. Tian, 2013, *Firm Characteristics and Empirical Factor Models: A Data-Mining Experiment*, Working paper.

Related academic papers II

- Are differences in risk-adjusted out-of-sample returns significant?
  - How are transaction costs of each strategy accounted for?
  - Is the analysis truly out of sample?
- IR is an incomplete measure of portfolio performance; it is accurate only if there are no intermediate cashflows.
  - Bhamra, H. and R. Uppal, 2014, *Does Household Finance Matter? Small Financial Errors with Large Social Costs*, Working Paper, Edhec.
- Mean-variance portfolios are not time-consistent.
  - Basak, S., and G. Chabakauri, 2010, *Dynamic Mean-Variance Asset Allocation*, Review of Financial Studies 23, 2970-3016.

Discussion of *Risk Parity Strategies For Equity Portfolio Management* by Frank Siu (Axioma)

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Alternative-weighted portfolios

- Out-of-sample performance of Markowitz mean-variance optimal portfolios that ignore estimation error is very poor.

- One can consider three types of portfolios that do **not** rely on estimates of mean returns:

  1. **Fundamental-weighted portfolios:**
     - These portfolios are based on fundamentals such as sales, dividends, earnings, etc., rather than financial measures of size.
  2. **Minimum-variance portfolios:**
     - The optimal weights are based only on risk estimates.
     - Dangl and Kashofer (2013, Working paper) provide an excellent discussion of the performance of these portfolios over time.
  3. **Risk-parity portfolios:**
     - These portfolios are based only on risk estimates but there is no optimization.

Interpretation of Risk-Budgeting Portfolio Weights

- Assume only two uncorrelated assets with risk budgets b_1, b_2:

$$w_1 = \frac{\frac{\sqrt{b_1}}{\sigma_1}}{\frac{\sqrt{b_1}}{\sigma_1} + \frac{\sqrt{b_2}}{\sigma_2}} \quad \ldots \text{increasing in risk budget, decreasing in volatility}$$

$$= \frac{\frac{b_1}{\beta_1}}{\frac{b_1}{\beta_1} + \frac{b_2}{\beta_2}} \quad \ldots \text{increasing in its risk budget, decreasing in beta.}$$

- Risk-budgeting portfolios can be interpreted as minimum-risk portfolios subject to a constraint on portfolio diversification.
  - Just like in Jagannathan and Ma (2003, Journal of Finance), one can show that the risk-budgeting portfolio is a minimum-variance portfolio with shrinkage of the covariance matrix.

Equal-Risk-Contribution Portfolio: Definition

- A special case of the risk-budgeting portfolio is the equal-risk-contribution portfolio, where all the risk budgets are equal:

$$b_i = b_j = \frac{1}{N}.$$

- Thus, the equal-risk-contribution portfolio inherits all the properties of the risk-budgeting portfolio.
- The equal-risk contribution portfolio also has some additional properties derived by Maillard, Roncalli ,Teiletche (2010):

$$w_1 = \frac{\frac{1}{\sigma_1}}{\frac{1}{\sigma_1} + \frac{1}{\sigma_2}},$$

implying that the weight of an asset is

  - inversely proportional to its volatility, and
  - independent of correlation.

Understanding Portfolio Weights From Different Criteria

- It is difficult to decide how best to choose a portfolio that is "optimally diversified".

Portfolio	Evaluation in terms of "optimal divers."
• Mean-variance optimal portfolio	Portfolio on the efficient frontier
• Minimum-variance optimal portfolio	Portfolio on the efficient frontier
• Equal-weighted portfolio	Has the lowest weight concentration
• Weight-budgeting portfolio	Arbitrary weight budgets
• Equal-risk-contribution portfolio	Lowest risk concentration
• Risk-budgeting portfolio	Arbitrary risk budgets

Risk-Budgeting Portfolios: Performance

- These portfolios outperform cap-weighted portfolio.
- These portfolios have exposure to factors other than value and size, such as low idiosyncratic volatility, low beta, momentum.
- Risk-budgeting portfolios may provide
  - better conditional performance across bull/bear markets;
  - more control on factor exposure;
  - better diversification, especially when strategies are combined.

Risk-Budgeting Portfolios: Summary

- These portfolios do not rely on estimates of expected returns.
- They do not use optimization.
- They lead to portfolios that are diversified (that is, the weights are not concentrated).

- But, why should one care about weights being diversified? How does this relate to portfolio performance?

Discussion of *Correlation, De-correlation and Risk-Parity* by Nick Baltas (UBS)

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Alternatives for modeling correlation I

- "Dilemma faced in portfolio construction:
  - Alternative 1: make proper use of pairwise correlations (unstable and poorly estimated)
  - Alternative 2: completely ignore pairwise correlations."

Alternatives for modeling correlation II

- But, there is a **third alternative**
  - Estimate a non-zero correlation coefficient that it assume to be the same across all assets.
  - Elton, Gruber and Spitzer, 2006, *Improved Estimates of Correlation Coefficients and their Impact on Optimum Portfolios*, European Financial Management, 12.3, 303–318.
  - Driessen, Maenhout, and Vilkov, 2009, *The Price of Correlation Risk: Evidence from Equity Options*, Journal of Finance, 64.3, 1377–1406.
- And, there is a **fourth alternative**
  - Large literature in financial econometrics on estimating time-varying correlations, building on the work of Engle (2002) on *Dynamic Conditional Correlation*, Journal of Business Economics and Statistics, 20.3, 339–350.

Focus on portfolio performance, rather than correlations

- In practice,
  - our interest is not in correlations per se,
  - but instead on portfolio performance.
- Hence, it would be better to ask the question:
  - Which approach for modeling correlations leads to the best out-of-sample performance of portfolio strategies.

Discussion of *Inter-temporal Risk Parity* by Raul Leote de Carvalho (BNP Paribas)

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Issues regarding measurement

- How are transaction costs of each strategy accounted for?
  - Daily rebalancing implies high turnover
  - Trading costs will vary with market volatility
- Are differences in risk-adjusted out-of-sample returns significant?
  - Improvement in Sharpe ratio of 0.08 (from 0.40 to 0.48) appears small.
- Improvements in Sharpe ratio decline as one rebalances less frequently.
- What is source of improvement in Sharpe ratio or Information ratio?
- Is Sharpe ratio appropriate measure when volatility is changing?

Discussion of *Asset Allocation with Concentration Risk Insights from Real Estate* by Robert Rice (OCCAM)

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Related academic papers

- Real estate is very different from other asset classes
  - Transaction costs are much larger
    - Grossman and Laroque (Econometrica, 1990, v. 58.1, 25-51).
  - Behavioral biases amongst investors trading real estate are much larger
    - Beracha and Skiba, 2014, *Real Estate Investment Decision-Making in Behavioral Finance* in Investor Behavior: The Psychology of Financial Planning and Investing. ed. H. Kent Baker and Victor Ricciardi.
  - Large academic literature on housing and real estate
    - Real estate may not be the best asset class for applying Markowitz analysis

Suggestions

- May be useful to look at real estate along with other asset classes?
- May be important to look at the issue of dynamic asset allocation?

Discussion of *Evaluating Alternative Betas* *When Is a Portfolio Efficient Enough?* by Andrew Harmstone (Morgan Stanley)

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Some questions I

- Why restrict attention to these particular five portfolio strategies?
  - Cap weighting, GDP weighting, equal weighting, minimum-variance, risk parity.
- There are many other strategies that have been shown to outperform the strategies considered:
  - Parametric portfolios
    (Brandt, Santa-Clara, and Valkanov, 2009, Review of Financial Studies).
  - Norm-constrained minimum-variance portfolios
    (DeMiguel, Garlappi, Nogales, Uppal, 2009, Management Science)

Some questions II

- How is the portfolio called "Efficient Enough" different from the Markowitz efficient-frontier portfolios?
- Implied returns from reverse optimisation
  - Not sure how these are computed?
  - Not clear what information can be obtained from them?
- How are anchor portfolios different from "prior portfolio weights" in Bayesian optimization?

Overall Comments

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- Mean-variance portfolios are not time-consistent.
- SR/IR is an incomplete measure of portfolio performance; it is accurate only if there are no intermediate cashflows.

Empirical Evaluation of Portfolio Performance

- Data-snooping biases – dangers of using models based on "important" factors
  - Harvey, Liu, Zhu, 2013; Kogan, L. and M. Tian, 2013.
- Differences in risk-adjusted out-of-sample returns?
  - Is the analysis truly out of sample?
  - How are transaction costs of each strategy accounted for?
  - Are differences in SRs or IRs statistically significant?

Risk-Parity Portfolios

- What exactly are we trying to achieve with these portfolios?
  - Why should one care about weights being diversified?
  - How exactly does this translate into portfolio performance?