

Principles for Risk Adjustment of Performance Figures

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Our Task

Provide advice on how to measure the risk and return of the GPFG

- Risk-adjusted performance
- Factor risk-adjusted performance
- Related questions
 - Costs
 - Sample selection
 - Effect on managerial incentives

Performance Measurement

- No unambiguous method of measuring and reporting risk-adjusted performance exists
- As a consequence, when choosing methods, NBIM should balance
 - Models and techniques from the cutting-edge
 - Clarity of the methods used
 - Continuity of the results across reporting periods
 - Consistency of the conclusions across models

Report Structure

- Divide the performance reporting into two parts
 - Main report for the wider Norwegian public
 - Appendix for specialists exploring the robustness of the results in the main report
 - Alternative factor models
 - Different sample periods (5yr, 10yr, since inception)
 - Different factor construction (global versus regional)
- Supplement the report with a research paper providing in-depth analysis of key issues related to performance measurement of the GPFG

Risk-adjusted Performance

- Central idea in finance is the trade-off of risk and return
- For example, in the CAPM, the market portfolio maximizes expected return per unit of risk
- The report should measure the risk-return trade-off for both the fund's absolute returns and its returns relative to the benchmark chosen by the Ministry of Finance

Risk-adjusted Performance

- Absolute returns
 - Sharpe ratio
 - mean return divided by the standard deviation of that return
- Relative returns (*excess of the benchmark*)
 - Information ratio
 - mean excess return divided by the standard deviation of that excess return
 - Jensen's alpha
 - mean beta-adjusted return
 - Appraisal ratio
 - mean beta-adjusted return divided by the standard deviation of that beta-adjusted return

Risk-adjusted Performance

$r_{p,t}$ \equiv return on the fund's portfolio

$r_{b,t}$ \equiv return on the fund's benchmark portfolio

$r_{f,t}$ \equiv risk-free return

$\mu(\cdot)$ \equiv mean

$\sigma(\cdot)$ \equiv standard deviation

$$r_{p,t} - r_{f,t} = \alpha_p + \beta_p (r_{b,t} - r_{f,t}) + \varepsilon_{p,t}$$

$$\text{Sharpe Ratio} \equiv \frac{\mu(r_{p,t} - r_{f,t})}{\sigma(r_{p,t} - r_{f,t})}; \text{ Information Ratio} \equiv \frac{\mu(r_{p,t} - r_{b,t})}{\sigma(r_{p,t} - r_{b,t})}$$

$$\text{Jensen's Alpha} \equiv \alpha_p; \text{ Appraisal Ratio} \equiv \frac{\alpha_p}{\sigma(\varepsilon_{p,t})}$$

Factor Risk-adjusted Performance

- Theory and empirical work suggest the market may not fully capture the risk-return trade-off
 - Other sources of systematic risks (factors)
 - Market inefficiencies
- Regression analysis attributes performance to these factors
 - Reveals a fund's exposures to styles / risks
 - If investable factors are used, the factor risk-adjusted performance reveals value added relative to the model, perhaps through stock selection

Factor Risk-adjusted Performance

- Equity portfolio
 - Fama and French (2015) international 5-factor model
 - market, size, value, investment, and profitability factors
- Fixed-income portfolio
 - Default and term factors as in Fama and French (1993), possibly supplemented by factors suggested in Ang, Brandt, and Denison (2014)
- Entire fund
 - The union of the equity and fixed-income models, with an emphasis on parsimony

Factor Risk-adjusted Performance

Important details

- To measure value added by the fund, the dependent variable should be the excess return of the fund relative to the benchmark
- The construction of both the equity and fixed-income factors should take the fund's investment constraints and other relevant characteristics into account

Fama-French Five-Factor Model

$$r_{p,t} - r_{b,t} = \alpha_p^{FF5} + b_p RMRF_t + s_p SMB_t + h_p HML_t + r_p RMW_t + c_p CMA_t + \varepsilon_{p,t}^{FF5}$$

$RMRF_t \equiv$ Return on the Market minus the Risk-Free rate

$SMB_t \equiv$ Small Minus Big portfolio return

$HML_t \equiv$ High Minus Low book-to-market portfolio return

$RMW_t \equiv$ Robust Minus Weak profitability portfolio return

$CMA_t \equiv$ Conservative Minus Aggressive investment portfolio return

$$FF5 \text{ Alpha} \equiv \alpha_p^{FF5}; \text{ FF5 Appraisal Ratio} \equiv \frac{\alpha_p^{FF5}}{\sigma(\varepsilon_{p,t}^{FF5})}$$

Though Fama and French form size-stratified factors to measure premiums throughout the cross-section, NBIM should form factors only among stocks that are in their investable universe

Other Questions

- NBIM should decompose return, risk, and associated costs of all key components of the investment strategy
 - Benchmark portfolio
 - Internal “operational reference portfolio”
 - Systematic factor exposures and universe expansion
 - Tactical allocation decisions, enhanced indexing, and security selection
- Potential unintended strategic consequences limits much further decomposition

Summary

- Clarity, simplicity, and the current knowledge of academic finance have guided our performance recommendations
- Our suggestions will improve the communication of the fund's returns, risks, and costs to its owners
 - Ministry of Finance, the Norwegian Parliament and, ultimately, Norwegian citizens