

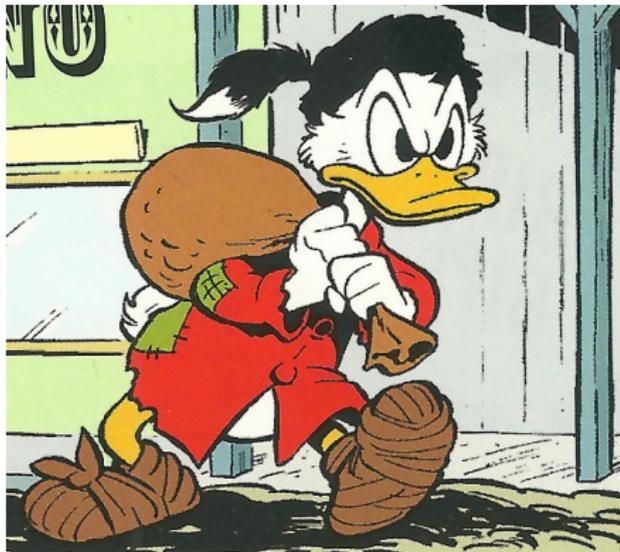
The debate on NBIM and performance measurement, or the “factor wars” of 2015

May 2016

Bernt Arne Ødegaard
University of Stavanger (UiS)

How to think about NBIM

Principal: People of Norway



Drawing by Arild Midthun

How to think about NBIM

Mission: Store the Wealth from Oil Revenues



Drawing by Arild Midthun

How to think about NBIM

People select first principal: Ministry of Finance

Ministry make decisions regarding the conservation of wealth

Optimization problem (e.g. mean-variance optimal portfolio)

Solution of this optimization problem a desired mix of assets.

(*broad mission*)

Gathering the right asset mix *implemented as*

- ▶ Delegated Portfolio Management
- ▶ Where the asset manager is given a *reference portfolio* to
 - ▶ match
 - ▶ beat

Note that this is an

- ▶ *indirect* way of implementing the original portfolio problem
- ▶ but it is much easier to control.

Asset Managers Problem

Two asset managers

- ▶ Norwegian Bank Investment Management
- ▶ Folketrygdfondet.

The *narrow mission* of these portfolio managers:

Maintain a portfolio with returns

- ▶ matching, and (preferably)
- ▶ beating

the reference portfolio (index).

How to ask if these asset managers are doing a good job?

The task of *Portfolio Performance Measurement*.

Portfolio Performance Measurement

Performance Measurement: Narrow Question.

Are institutions managing money doing “the right thing”?

Perspectives:

- ▶ Relative to the broad mission: The original Risk Return Tradeoff.
→ Absolute Portfolio Performance
- ▶ Relative to the narrow mission: How are they tracking the index?
→ Relative Portfolio Performance

Portfolio Performance Measurement

Important to keep these two perspectives separate.

For the manager taking care of the money:

The relevant perspective is the narrow mission. (Relative Performance)

- ▶ How are they doing their tracking of index?
- ▶ How are they generating extra returns?

The broader perspective (Absolute Performance) more relevant for

- ▶ Finansdepartementet (is the mission of giving an index and a tracking error the right way of solving the original risk-return tradeoff.)
- ▶ The original owners (people of Norway).
 - ▶ They should worry that the risk-return tradeoff is implemented correctly.
 - ▶ They may also disagree with the use of the money (which is not relevant for a discussion of portfolio performance, but keeps getting dragged into any public discussion, and clouding the issues.)

Methods for Measuring Portfolio Performance

There is no single, unambiguous measure that can be used to evaluate Portfolio Performance.

Instead, a menu of many different measures, all informative, but not guaranteed to agree.

Relating to this menu:

Enough material for a master's level course in Investments.

Some Examples

- ▶ Sharpe Ratio
- ▶ Treynor Ratio
- ▶ Jensen's Alpha
- ▶ Information Ratio
- ▶ Appraisal Ratio
- ▶ Fama French 3-factor model
- ▶ ...

Methods for Measuring Portfolio Performance

What to do?

Alternatives

- ▶ Pick one, just present that.
 - ▶ Criticism: Why are you not presenting [insert favorite method]?
- ▶ Calculate Several
 - ▶ Present various performance measures
 - ▶ Potential problem: Different measures may lead to different conclusions.
 - ▶ → Need to discuss sources of differences.

NBIM reporting

- ▶ From the start, very limited reporting of risk-adjusted results.
- ▶ 2008-2009: Report by three academics, Andrew Ang, Will Goetzmann and Stephen Schafer (Ang, Goetzmann, and Schafer, 2009).
Essentially a summary of factor models, pointing out the importance of adjusting for factor risk exposures.
- ▶ Nothing much changes in the reporting from NBIM's side.
- ▶ 2014: New report, also involving Andrew Ang (Ang, Brandt, and Denison, 2014), running numerous factor regressions.
- ▶ Beginning of 2015: NBIM say they will report risk-adjusted returns (i.e. alphas calculated using factor models.)
- ▶ Dagens Næringsliv critical to what NBIM produced
 - ▶ It is not enough - Folketrygdfondet produced more.
 - ▶ We can't trust the numbers

The Summer of '15 Newspaper Discussion

An article by Hoddevik and Priestley in “Dagens Næringsliv”

Pick *one* model for estimating portfolio performance.

“Fama and French” factor model with returns influenced by the systematic factors:

- ▶ Size
- ▶ Book/Market
- ▶ Momentum

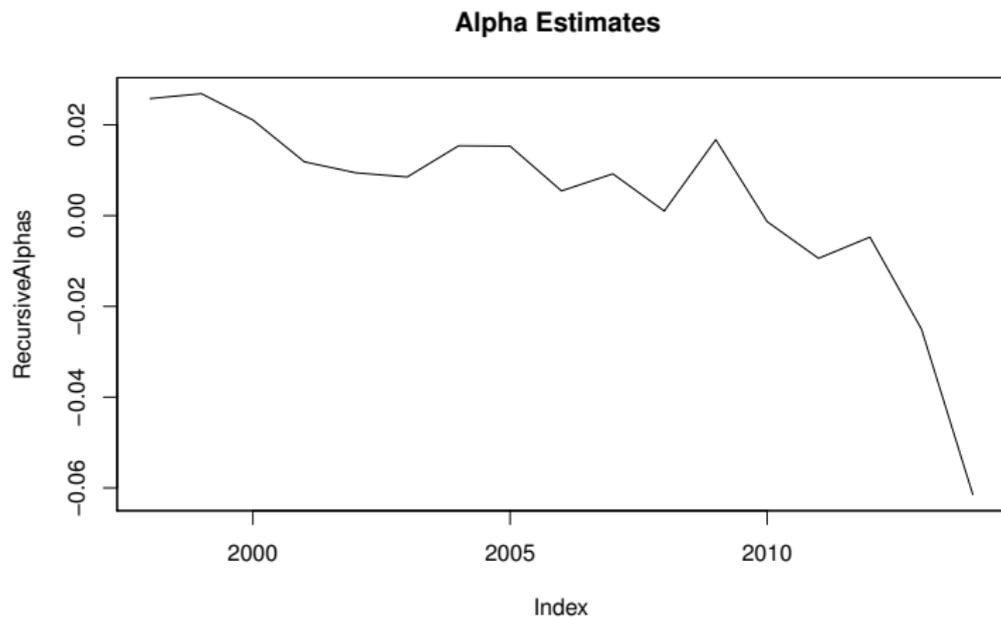
$$r_p = \alpha_p + b_p RMRF_t + h_p HML_t + s_p SMB_t + m_p WML_t$$

Result in an estimate of alpha.

The Summer of '15 Newspaper Discussion

Illustrate the main result of Hoddevik and Priestley.

Average estimates of Alpha



The Summer of '15 Newspaper Discussion

The negative alpha estimates are argued to show that NBIM is doing a bad job.

However, just so many problems with drawing that conclusion from this particular regression.

- ▶ Is it the right question?
 - ▶ Is this the right factor model? How are the factors calculated?
 - ▶ This is not looking at *relative* performance, which is what NBIM is judged on.
- ▶ Data issues
 - ▶ Returns in currency basket translated to USD by authors
- ▶ Methodological issues.
 - ▶ How are conclusions arrived at?
 - ▶ How *significant* are the claims?
 - ▶ How *robust* are the claims?

The Summer of '15 Newspaper Discussion

My contribution to the summer's debate:

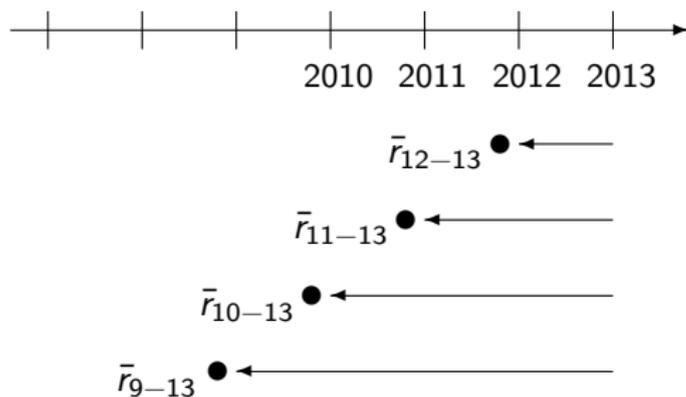
Pointing out a couple of methodological issues.

A limited set of all the possible issues with the analysis, but some of the more glaring ones.

- ▶ Their chosen method of averaging
- ▶ The (lack of) significance

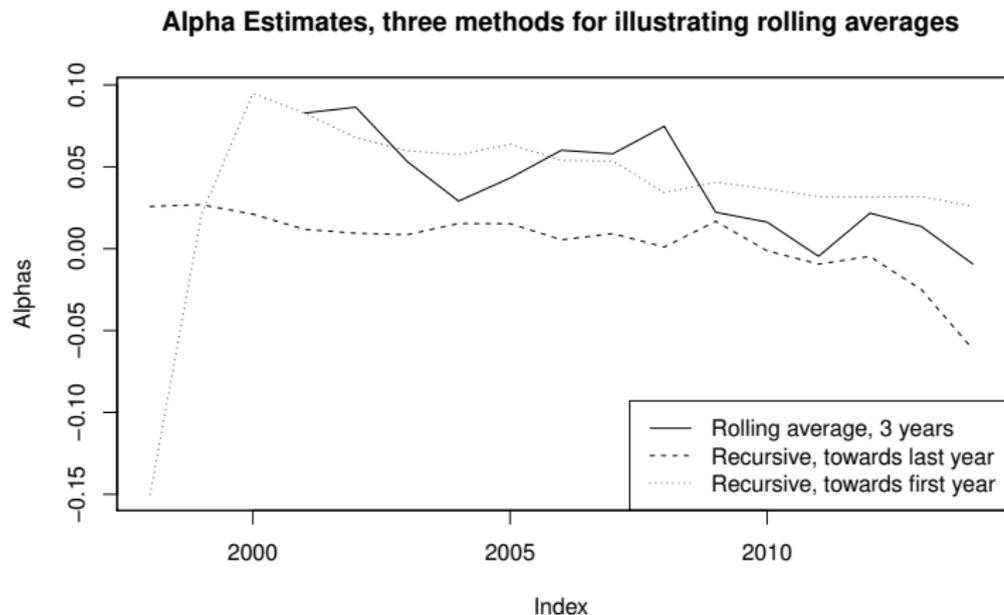
The Summer of '15 Newspaper Discussion

Method of averaging, illustrate as:



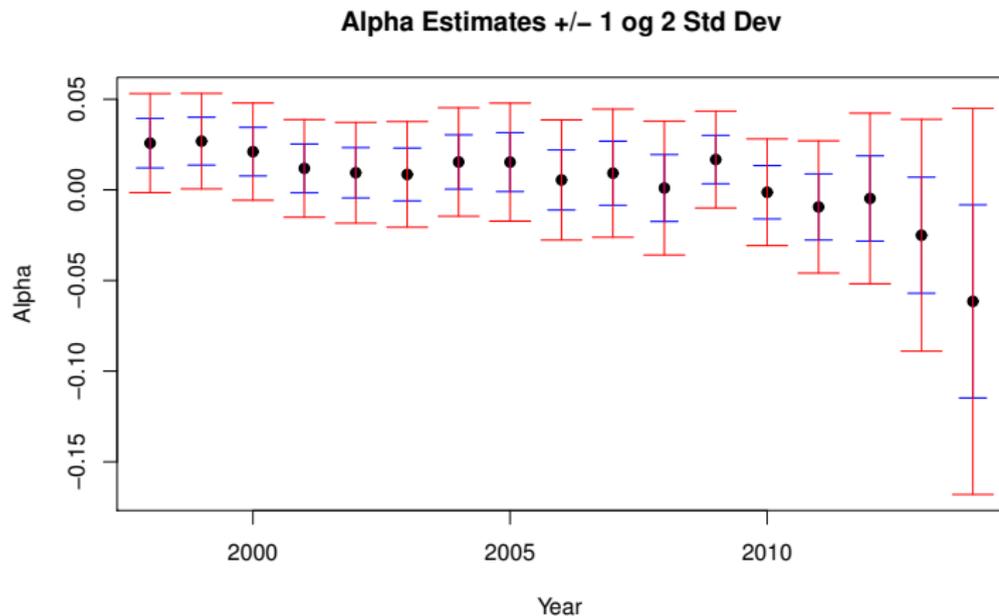
The Summer of '15 Newspaper Discussion

Methods of averaging



The Summer of '15 Newspaper Discussion

Significance



Expert Group

Following of the summers newspaper discussion:
Norges Bank appoints an expert group to

- ▶ Suggest how results from NBIM should be presented in annual reports.
- ▶ Should incorporate best academic practice.

Expert group meets through the fall.

Proposal to the board of Norges Bank November 2015.

Highlights of recommendations

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
- ▶ 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

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

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

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

$\mu(\cdot)$ mean

$\sigma(\cdot)$ standard deviation

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

$$\text{Sharpe Ratio} = \frac{\mu(r_{p,t} - r_{f,t})}{\sigma(r_{p,t} - r_{f,t})}$$

$$\text{Information Ratio} = \frac{\mu(r_{p,t} - r_{b,t})}{\sigma(r_{p,t} - r_{b,t})}$$

$$\text{Jensen's Alpha} = \alpha_p$$

$$\text{Appraisal Ratio} = \frac{\alpha_p}{\sigma(\varepsilon_{p,t})}$$

Factor Risk-adjusted Performance

Theory and empirical work suggest the market may not fully capture the risk-return trade-off

- ▶ Other sources of systematic risk (factors)
- ▶ Market Inefficiencies

Regression analysis attributes performance to these factors

- ▶ Reveal a fund's exposure 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 - **R**eturn on the **M**arket minus the **R**isk **F**ree rate

SMB - **S**mall minus **B**ig portfolio return

HML - **H**igh minus **L**ow book-to-market portfolio return

RMW - **R**obust minus **W**eak profitability return

CMA - **C**onservative minus **A**ggressive investment portfolio return.

FFF5 Alpha = α_p^{FF5}

FFF5 Appraisal Ratio = $\frac{\alpha_p^{FF5}}{\sigma(\varepsilon_{p,t}^{FF5})}$

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.

Andrew Ang, William N Goetzmann, and Stephen M Schafer. Evaluation of active management of the Norwegian government pension fund – global. Report available at the website of the Norwegian Ministry of Finance, December 2009.

Andrew Ang, Michael W Brandt, and David F Denison. Review of active management of the norwegian government pension fund global. Report to the Norwegian Ministry of Finance, January 2014.