Benchmarking Asset Managers

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Preliminary and Incomplete

*The views here are those of the authors only and not necessarily of the Bank of England
Asset Management Sector

...is large

The “Trillion Dollar Club”:

<table>
<thead>
<tr>
<th>Rank</th>
<th>Company</th>
<th>Assets Under Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>BlackRock Inc.</td>
<td>$5.7 trillion</td>
</tr>
<tr>
<td>2</td>
<td>Vanguard Group</td>
<td>$4.4 trillion</td>
</tr>
<tr>
<td>3</td>
<td>State Street Global Advisors</td>
<td>$2.6 trillion</td>
</tr>
<tr>
<td>4</td>
<td>Fidelity Investments</td>
<td>$2.3 trillion</td>
</tr>
<tr>
<td>5</td>
<td>J.P. Morgan Asset Management</td>
<td>$1.9 trillion</td>
</tr>
<tr>
<td>6</td>
<td>BNY Mellon</td>
<td>$1.8 trillion</td>
</tr>
<tr>
<td>7</td>
<td>Pimco</td>
<td>$1.6 trillion</td>
</tr>
<tr>
<td>15</td>
<td>Norges Bank Investment Management</td>
<td>$1.0 trillion</td>
</tr>
</tbody>
</table>

GDP of the UK: $2.6 trillion
Asset Management Sector

... has been growing over time

![Graph showing Global Assets Under Management (Current and Projections)]

**Figure**: Global Assets Under Management (Current and Projections)

Source: PWC, Asset Management 2020 in Beyond
This Paper

• There has been a policy debate on whether asset managers (AMs) pose a threat to financial stability by
  ○ holding correlated portfolios, buying/selling at the same time
  ○ amplifying economic shocks
  ○ contributing to fire-sales

• We develop a simple model assessing the implications of asset management for economic welfare and financial stability
  ○ Embed an optimal (linear) contracting problem into a standard asset-pricing framework
  ○ Some savers hire AMs to manage their money (while others do not)
  ○ There is moral hazard on the side of AMs
  ○ AMs’ compensation is linear in absolute and relative performance
• Questions:
  ○ What is the optimal contract from the viewpoint of fund investors?
  ○ What are the effects of contracts on asset prices?
  ○ Individual contracts impose a *pecuniary externality* on market participants by affecting asset prices because
    - markets are incomplete: there is an aggregate, uninsurable shock
    - contracts cannot be made contingent on the shock
  ○ Suppose a social planner is subject to the same restrictions, but internalizes the effect of the contract on asset prices
    - How does the socially-optimal contract differ from the privately-optimal one?

• **Main Insight:** Incentive contracts amplify the effects of aggregate shocks (fire-sales) on prices
Environment
Investment Opportunities

- Two periods, $t = 0, 1$
- This talk: one risky stock (paper: multiple assets)
- Claim to cash flow $D \sim N(\bar{D}, \sigma^2)$ in the final date
- Net supply of stock is $\bar{x}$
- Stock price is denoted by $S$
- One risk-free bond with a zero interest rate
  - In infinite net supply, i.e., just a storage technology
In投资者

- Three types of agents:
  - Normal investors—invest on their own (fraction $\lambda_N$)
  - Shareholders—delegate investment to AMs (fraction $\lambda_S$)
  - AMs (fraction $\lambda_{AM}$)
    - $\lambda_N + \lambda_S + \lambda_{AM} = 1$
    - For this talk, assume $\lambda_S = \lambda_{AM}$ — one shareholder per one AM

- All agents have CARA utility: $-E \exp(-\alpha W_1)$
  - where $W_1$ is final wealth

- All agents have equal endowments of the bond and stock
  - Initial wealth is $W_0 = B + \bar{x}S$, where
    - $B$ is the endowment of bond, $\bar{x}$ is the endowment of stock
Normal Investors

- **Final wealth of normal investors:**

\[
W_1 = W_0 + x(D - S) + nq(D - \bar{D})
\]

  - Initial wealth
  - Return on \( x \) shares of the stock
  - Liquidity shock

- **Liquidity shock (or a “fire-sale” shock)**
  - Creates a motive for trading
  - Hits normal investors, but can put it on shareholders instead (or as well)
  - Is correlated with the dividend, has zero mean
  - \( n = 1 \) or \(-1\), both with probability \( \frac{1}{2} \)
  - \( q \geq 0 \) captures the magnitude of the shock
  - Forces trading at dislocated prices (\( \sim \) fire-sale)

- Normal investors want to sell when \( n = 1 \), buy when \( n = -1 \)

- This is a standard CARA-normal framework with liquidity shocks
Shareholders and AMs

- Return on delegated AM portfolio:
  \[ R = e + x(D - S) + \epsilon \]

- \( e \) is effort by the AM, with cost \( \psi(e) = -\frac{\gamma}{2}e^2 \) to the AM
  - AMs can lower trading costs and expenses
  - AMs can boost returns by lending out securities

- \( \epsilon \sim N(0, \tilde{\sigma}^2) \) (only need this in the one-asset case)

- Both \( e \) and \( x \) chosen by the AM are unobservable/non-contractible
  - Holdings are reported irregularly, and AMs can window dress
Contracts

- AM’s compensation:
  \[ w = k + aR + b(R - R_\theta) = k + (a + b)R - bR_\theta, \]
  where
  \[ \equiv \hat{a} \]
  - \( k \) is a flat fee
  - \( a \) is the coefficient on absolute performance
  - \( b \) is the coefficient on performance relative to an index
    - refer to \( b \) as benchmarking
  - \( R = e + x(D - S) + \epsilon \) is return on AM’s portfolio
  - \( R_\theta = \theta(D - S) \) is return on a benchmark portfolio (index) \( \theta \)
    - for this talk, assume \( \theta \) is exogenous

- AM’s payoff: \( W_0 - \psi(e) + w \)

- Shareholder’s payoff: \( W_0 + R - w \)
Timing

• Shareholders choose contracts \((a, b, k)\)

• The realization of the liquidity shock becomes known

• AMs choose effort, and AMs and normal investors trade

• Returns are observed, contract payments are made, consumption takes place
Privately-Optimal Contracts
AM’s problem

• AM maximizes expected utility of wealth in each state
  ○ With CARA and normal returns this is just a mean-variance problem:

\[
\max_{e,x} -\frac{\gamma}{2} e^2 + \hat{a} e + k + [\hat{a} x - b\theta] (\bar{D} - S) - \frac{\alpha}{2} [\hat{a} x - b\theta]^2 \sigma^2 - \frac{\alpha}{2} \hat{a}^2 \tilde{\sigma}^2
\]

• FOC wrt \( e \): \( e = \frac{\hat{a}}{\gamma} \) – higher \( \hat{a} \) increases effort

• FOC wrt \( x \): 

\[
x = \frac{1}{\hat{a}} \times \frac{1}{\alpha} \frac{\bar{D} - S}{\sigma^2} + \frac{b\theta}{\hat{a}}
\]

  ○ Higher \( \hat{a} = a + b \) lowers the \( |\text{slope}| \) of the demand function
    - makes the AM effectively more risk-averse
Shareholder’s Problem

- Shareholders maximize their expected utility subject to participation and incentive constraints:

\[
\max_{a,b,k,e,x} -E \exp \{-\alpha (W_0 + R(e,x) - w)\}
\]

s.t. \( -E \exp \left\{-\alpha \left( W_0 + w - \frac{\gamma e^2}{2} \right) \right\} \geq \text{outside option} \)

\[
e = \frac{\hat{a}}{\gamma}
\]

\[
x = 1 \frac{\bar{D} - S}{\hat{a} \alpha} + \frac{b \theta}{\hat{a}}
\]

where \( w = k + \hat{a}R(e,x) - bR_\theta \)

\[
R(e,x) = e + x(D - S) + \epsilon
\]

- Note: \( S \) and \( x \) are contingent on the liquidity shock \( n \)
- The expectation is wrt \( D \) and \( n \)
Privately-Optimal Contracts

- If effort was observable, the shareholder would choose $\hat{a} = \frac{1}{2}$ and $b = 0$. This achieves perfect risk sharing between the shareholder and AM
  - The first-best effort is $e^{FB} = \frac{1}{\gamma}$
- If effort is unobservable, $\hat{a} = \frac{1}{2}$ underprovides effort ($e = \frac{1}{2\gamma}$). Incentive provision calls for a larger $\hat{a}$
- Suppose we restrict $b = 0$. Setting a larger $\hat{a}$ increases risk faced by AM, and makes him reduce the risky-asset holdings $x_{AM}$
- To raise $x_{AM}$, it is optimal to set $b > 0$.
- This makes effort provision less costly, and allows the shareholder to *increase $\hat{a}$ further* to bring effort closer to $e^{FB}$
  - So $b$ mitigates the undesirable effect of $\hat{a}$ (on the AM’s asset holdings)
- In the privately-optimal contract, shareholders and AMs share risk optimally (50/50) in expectation, but not state by state
  - The fact that contracts can’t be contingent on shock is crucial here
Aggregate Demand and Equilibrium Price

- Recall that a higher $\hat{a}$ makes the AM’s demand function flatter $\Rightarrow$ aggregate demand function is also flatter:

$$\lambda_{AM} \times x_{AM} + \lambda_{N} \times x_{N} = \frac{1}{\hat{a}} \frac{\tilde{D} - S}{\alpha \sigma^2} + \frac{b \theta}{\hat{a}} = \frac{\tilde{D} - S}{\alpha \sigma^2} - nq$$

$$= \left[ \frac{\lambda_{AM}}{\hat{a}} + \lambda_{N} \right] \frac{1}{\alpha \sigma^2} (\tilde{D} - S) + \lambda_{AM} \frac{b \theta}{\hat{a}} - \lambda_{N} nq = \bar{x}, \text{ market clearing}$$

- **Main Result:** Incentive contracts (higher $\hat{a}$) make prices vary more with the liquidity shock relative to the frictionless economy

  ○ i.e., relative to the economy with observable effort,
  or to the economy where everyone invests on their own

$$S = \tilde{D} - \Lambda \alpha \sigma^2 \left( \bar{x} - \lambda_{AM} \frac{b \theta}{\hat{a}} + \lambda_{N} nq \right), \text{ where } \Lambda = \frac{1}{\lambda_{AM}/\hat{a} + \lambda_{N}}$$
Asset Management Amplifies Illiquidity Discount

\[
S = \bar{D} - \Lambda \alpha \sigma^2 \left( \bar{x} - \lambda_{AM} \frac{b \theta}{\hat{a}} \right) - \Lambda \alpha \sigma^2 \lambda_N n q, \text{ where } \Lambda = \frac{1}{\lambda_{AM}/\hat{a} + \lambda_N}
\]

- I.e., incentive contracts (↑ \(\hat{a}\) above \(\frac{1}{2}\)) amplify illiquidity/fire-sale discount
  - Liquidity suppliers are risk averse ⇒ they require price movement away from fundamental value to absorb the liquidity shock
  - Higher \(\hat{a}\) makes ‘average’ trader less responsive to price changes ⇒ prices react more to the shock to convince liquidity suppliers to trade

- The use of benchmarking (\(b > 0\)) exacerbates this effect because it makes the shareholders increase \(\hat{a}\) even more
  - While \(b\) mitigates undesirable effect of \(\hat{a}\) on \(x\), it actually aggravates the undesirable effect of \(\hat{a}\) on the illiquidity discount (price volatility)

- A larger illiquidity discount is bad because it drives agents’ marginal utilities in different states further apart
Socially-Optimal Contracts
Social Planner’s Choice of $\hat{a}$

- Consider the problem of a social planner
  - who is subject to the same restrictions as shareholders
  - but recognizes that contracts affect asset prices
  - and maximizes weighted-average of all agents’ expected utilities

- Planner’s choice of $\hat{a}$:
  - On the one hand, the planner is able to achieve better risk sharing between the shareholder and AM state-by-state
    - Lower cost of effort provision pushes the planner to $\uparrow \hat{a}$
  - On the other hand, the planner internalizes the fact that contracts amplify the illiquidity/fire-sale discount
    - This pushes the planner to $\downarrow \hat{a}$
  - We show that the second effect dominates for some parameter values
    - In particular, when $q$, $\alpha$, and/or $\sigma^2$ are large enough
Recall that keeping $\hat{a} = a + b$ fixed, $b$ simply increases the asset price by a constant:

$$S = \bar{D} - \Lambda \alpha \sigma^2 \left( \bar{x} - \lambda_{AM} \frac{b \theta}{\hat{a}} + \lambda_{N} n q \right)$$

Thus an increase in $b$ benefits sellers and hurts buyers.

We choose Pareto weights that eliminate the redistribution motive:

$$\omega_j = \frac{\lambda_j}{EMU_j} = \frac{\lambda_j}{E \alpha \exp(-\alpha W_1)}, \ j = S, AM, N$$
• Changing $b$ can help bring $MUs$ in different states closer together
  ○ E.g., normal investors are worse off in state $n = 1$ than in $n = -1$
    - When $n = -1$, Corr(shock, returns) $< 0$, so there’s a “natural” hedge
  ○ Also, they sell in state $n = 1$ and buy in state $n = -1$
    - So they benefit from ↑ price when $n = 1$ and are hurt by it when $n = -1$
  ○ To bring their $MUs$ closer together, need to ↑ price
  ○ In the one-asset case, other agents’ $MUs$ are the same across states
    - So planner only cares about normal investors’ $MUs$, and wants to ↑ $b$
  ○ But in the multi-asset case all agents’ $MUs$ differ across states, and there is a tradeoff
    - We show that for some parameter values the planner wants to ↓ $b$
Extensions

- With multiple correlated assets, asset management amplifies spillover from a fire-sale of one asset to movement in prices of other assets.

- In a two-period version of the model, there is an additional channel through which \( b \) amplifies the illiquidity discount:
  - and the illiquidity discount is larger for stocks that have larger weights in the index.

- Endogenizing the benchmark portfolio \( \theta \).
Conclusions

- Develop a simple asset-pricing model with asset management
- Shareholders use linear contracts to incentivize AMs to exert effort and choose investment portfolios
- Shareholders, who do not account for the effects of their contracts on prices, impose a pecuniary externality on other agents
  - This is due to contract inflexibility and uninsurable aggregate shocks
- Contracts amplify the effects of aggregate shocks on asset prices
- While there are opposing forces, we show that for some parameter values the planner wants to reduce both $\hat{a}$ and $b$
Other Results

• Equilibrium price:

\[ S = \bar{D} - \Lambda \alpha \sigma^2 \left( \bar{x} - \lambda_{AM} \frac{b\theta}{\hat{a}} + \lambda_Nnq \right) \]

• Equilibrium demand:

\[ x_{AM} = \frac{1}{a} \Lambda (\bar{x} + \lambda_{N}nq) + \left[ 1 - \Lambda \frac{\lambda_{AM}}{\hat{a}} \right] \frac{b\theta}{a} \]

> 0

• Results (in the multi-asset case):
  ○ Stocks with higher benchmark weights have higher prices and hence lower expected returns
  ○ AMs’ holdings of stocks with higher benchmark weights are higher
  ○ If AMs’ are benchmarked to the same index, their portfolios are more correlated