Laboratory Experiment on Delegated Portfolio Management


October 29, 2008
The Question

- Are asset prices affected by delegated portfolio management?
- What are channels of the effect?
  - Agency problem.
  - Competition and information of investors.
  - Size of managers.
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- Are asset prices affected by delegated portfolio management?
- What are channels of the effect?
  - Agency problem.
  - Competition and information of investors.
  - Size of managers.
- Experimental baseline: simple situation, well understood in absence of managers.
## Some numbers

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Motivation

- Historical perspective: 1950 – American households held 91% of all common stock; 2004 – they held 32%.
- Recent work: *Active management* more popular and more lucrative than previously thought (Cremers & Petajisto 2008).
Motivation

Market *anomalies* and *inefficiencies* attributed to delegation. E.g.

- Speculative bubbles (Allen and Gorton 1993)
- Index effect or downward-sloping demand curves (Petajisto 2007)
- No aggregation of information (Admati and Pfleiderer 1997)
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Contract design and regulation – what are important aspects for individual investors and for efficient risk sharing.
Delegation and asset prices:

- Manager’s objective *assumed* different from investor’s
- Performance measured or rewarded in fixed, exogenously given ways.
Agency problem:

- One-shot environment:
  - Optimal compensation complicated by manager's ability to manipulate both mean and variance.
  - Benchmark compensation (Admati and Pfleiderer 1997).
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- Repeated environment:
  - Competition between managers in continuous time (Breton, Hugonnier and Masmoudi 2008).
Delegated-management experiment

- Laboratory financial markets do not exhibit (in the limit) same distortions as natural markets.
Delegated-management experiment

- Laboratory financial markets do not exhibit (in the limit) same distortions as natural markets.
- Great place to study asset prices:
  - "fundamentals" are known.
  - Properties of market are fixed for long enough to allow for and observe convergence of prices.
  - Informational asymmetries are, to a large extent, controlled and known.
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- Great place to study asset prices:
  - “fundamentals” are known.
  - Properties of market are fixed for long enough to allow for and observe convergence of prices.
  - Informational asymmetries are, to a large extent, controlled and known.
- Great place to study contracts:
  - Treatments can be contractual arrangements.
  - Information and skill parameters can be calibrated.
Delegated-management experiment

- Base experiment, close to experiments without delegation.
- Incorporate a few aspects of delegation:
  - Managers invest investors’ wealth charging a fee proportional to wealth.
  - Managers are long lived and may build reputation.
- We do not incorporate many elements considered in literature:
  - Informational advantage of managers, or manager talent.
  - Explicit use of benchmark for compensation.
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- Give market good shot for no distortions.
Delegated-management experiment

We find:

- Significant deviations from equilibrium pricing predictions.
- Fast reputation effect for money flows into fund. Mostly based on return information.
- Endogenous appearance of market leaders.
- Size of participants (managers) in market are first-order effect on prices.
Outline

1. Introduction
2. Experiment
   - Stage I
   - Stage II
   - Payoffs
   - Information
   - Asset-market Experiments
3. Results
   - Equilibrium prices
   - Market Concentration
4. Conclusion
Experimental setup

- Two types of participants – managers and investors. Investors own capital but cannot trade, managers can trade but do not own capital.
- One session composed of two stages.
  1. Investors assign capital to managers.
  2. Managers trade assets.
- Dynamic.
  - Several (9) weekly sessions.
  - Same managers but possibly different investors.
  - Information regarding past sessions publicly announced.
Investors’ choices

- Two types of investors, depending on capital:

<table>
<thead>
<tr>
<th>Type</th>
<th>Asset A</th>
<th>Asset B</th>
<th>Cash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>100</td>
<td>0</td>
<td>$6</td>
</tr>
<tr>
<td>Type II</td>
<td>0</td>
<td>70</td>
<td>$9</td>
</tr>
</tbody>
</table>

- Each investor chooses allocation of asset holdings to different managers (proportional allocation of cash).
- By allocating capital to a manager, investor acquires a share in the manager’s fund.
- When making allocations, investors know past performance of managers.
- Allocation done via software.
Managers’ choices

- Managers receive capital from investors. This is their initial endowment.
- Notified of initial endowment only at beginning of trading period.
- Trade assets with following dividends:

<table>
<thead>
<tr>
<th></th>
<th>Asset A</th>
<th>Asset B</th>
<th>Bond</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>5</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Y</td>
<td>80</td>
<td>30</td>
<td>100</td>
</tr>
<tr>
<td>Z</td>
<td>0</td>
<td>80</td>
<td>100</td>
</tr>
</tbody>
</table>

Equally likely states of the world.

- No extra skills or information w.r.t. other managers or investors.
Trading

- Trading period lasting 30 minutes.
- Remote access to computerized double auction (jMarkets)
Subject payoff

- *Mean value* of portfolio is sum of expected dividends of holdings of each asset plus cash. *No prices involved.*
Subject payoff

- *Mean value* of portfolio is sum of expected dividends of holdings of each asset plus cash. *No prices involved.*
- Manager’s payoff is 40% of *mean value* of his initial endowment.
- Investor’s payoff is sum of her share in each manager’s residual earnings:
  - Investor’s share = (*mean value* of assets and money assigned to manager)/ (mean value of manager’s initial endowment).
  - Manager’s residual earnings are dividends of final portfolio minus manager payoff.
Dividends

- All participants (investors and managers) know the distribution of asset dividends.
- No information asymmetries about the likelihood of states of the world.
- Market portfolio unknown to all.
Investors

After each session, investors (and potential investors) receive info about manager performance.

- Drawn state of the world is announced on experimental website.

- Four indicators of performance:
  - **Return.** (Dividends of final portfolio) - (value of initial portfolio at trading prices), as fraction of latter.
    - Measure of *ability*.
  - **Volume.** (Mean value of manager’s initial endowment)/(Mean value of all managers’ initial endowment).
    - Measure of *market power*
Investors

Four indicators...

- **Residual.** \((\text{Dividends of final portfolio})-(\text{manager’s payoff})\).
  - Combination of previous two.
- **Risky fraction.** \((\text{Value of risky assets at trading prices})/(\text{value of portfolio at trading prices})\).
  - Measure of manager’s *risk attitude*. 
Investors

- Four indicators...
  - Residual. \((\text{Dividends of final portfolio})-\text{(manager’s payoff)}\).
    - Combination of previous two.
  - Risky fraction. \((\text{Value of risky assets at trading prices})/(\text{value of portfolio at trading prices})\).
    - Measure of manager’s risk attitude.
- All info announced on website and student weekly newspaper.
One session summary

- Investors make allocations → Managers see initial holdings (and payoff) → Trade in DA → State of the world drawn. Dividends realized
### Weekly calendar

<table>
<thead>
<tr>
<th>Wed</th>
<th>Fri</th>
<th>Sat</th>
<th>Mon</th>
<th>Tue</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investors and managers informed of payoffs</td>
<td>Performance indices published on website</td>
<td>Sign-up announcement for investors</td>
<td>Performance indices published in <em>Tech</em></td>
<td>18.00 Close investor allocation stage</td>
</tr>
<tr>
<td></td>
<td></td>
<td><em>Restricted</em> sign up for managers</td>
<td>Investors receive access to allocation software</td>
<td>22.00 Opening trading round</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Managers see allocations</td>
</tr>
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</table>
Other Details

- Managers with pseudonyms – names of minerals.
- Final session with different payoff of managers – terminal-period effect.
- Benchmark portfolio (not equal to market portfolio!)
Experiments without delegation

- Similar asset-dividends structure.
- Similar number of traders.
- Same market design.
- No managers and hence, no contract between managers and investors.
- No reputation-building.
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Experiments without delegation

- Not all trading prices behave like theoretical equilibrium prices, but
- Convergence to prices that
  - Satisfy equilibrium ranking when risk-averse subjects.
  - Look very much like CAPM prices (they render the market portfolio efficient).
- Median subject holds market, but individuals do not.
Experiments without delegation

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- With sufficiently thick markets, findings very robust.
What we expect(ed)

- *Information* and *reputation* will move managers to trade on frontier. Prices will look like in case without delegation.

- Other hypotheses:
  - Managers will trail benchmark.
  - Pricing will relate to chosen benchmark.
Measures of equilibrium

Result

State-price probability ranking NOT consistent with risk aversion and equilibrium in all sessions.

Result

Market portfolio close to efficient, but large variations across sessions.
State-price probabilities

\[
\begin{array}{ccccccc}
X<Z<Y & X<Z<Y & X<Z<Y & X<Z<Y & X<Z<Y & X<Z<Y \\
0.1 & 0.15 & 0.2 & 0.25 & 0.3 & 0.35 & 0.4 & 0.45 & 0.5 & 0.55 & 0.6 \\
\end{array}
\]
Sharpe ratios

- Clearly, correlation between correct ranking of SPP and low SR differences: -0.0167; -0.0186; -0.0035; -0.0954; -0.0861; -0.000.

- MV-efficiency of individual portfolios seems uncorrelated with market performance. (Agrees with experiments without delegation in that subjects do not hold market).
Market concentration

Result

*Market leaders emerge after first two sessions.*

Result

*Strong correlation between market concentration and pricing distortions.*
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<th>Share of leader</th>
<th>Gini index</th>
<th>Corr. first 10 minutes</th>
<th>Corr. last 10 minutes</th>
<th>Corr. for all trades</th>
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ABCCCM Laboratory Experiment on Delegated Portfolio Management
Other results

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- Investor behavior:
  - Use of information.
  - Little diversification.
  - Lock-in.
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- Benchmark trailing. Market leaders move away from it; managers in the middle trail.
- Investor behavior:
  - Use of information.
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  - Lock-in.
- Theoretical treatment:
  - Many equilibria, including those where managers specialize.
  - Abstract away from investor-manager game. Assume investors use benchmark as reference and they cannot short-sell funds. Get numerically solvable model (often no equilibrium) – bad fit.
Treatment in literature mainly focused on agency problems. Leads to believe that this is main mechanism for potential distortions in prices.

Surprisingly find direct effect on pricing coming from manager size. First order effect, enhanced by other elements.

Market power probably a consequence of investor inference about manager skill. Is this inference correct, justified?
Ex-post lamentation

- Free entry of managers? No extra incentive for *not leaving* the market.
- Information given to investors could be much more precise.
- Other issues – software and logistics.
Potential

- Exact trading behavior of subjects and channel of effect of market power.
- Use of benchmark by investors.
- Efficiency of benchmark.
- Manager sophistication w.r.t. track record.