A Rational Model of the Closed-End Fund Discount

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The Mutual Fund Industry

Broadly speaking the industry is divided into three types of funds

- Mutual Funds (open-end funds)
- Closed End Funds
- Hedge Funds

There are a number of big picture issues that, at least on the surface, have puzzled researchers
Puzzles

- Inability of active portfolio managers as whole to beat passive strategies
- Performance is unpredictable
- Flow of funds/performance relationship in open-end funds
- Behavior of the discount in closed end funds
- Compensation contracts in the industry
Overall Research Agenda

I argue that the same economic model/assumptions can explain all these seemingly unrelated puzzles in delegated portfolio management.

Two papers:
- Berk and Green (forthcoming, JPE)
- Berk and Stanton (today)
Today

I am going to focus on just one of these puzzles --- the closed end fund puzzle.

But

I will point out how the same model can explain the major puzzles in open end funds.
What is the Closed-end fund Puzzle?

Lee, Shleifer and Thaler (LST) in their review article in the JEL define the puzzle as:

- Closed-end funds are issued at (or above) their NAV, more often than not start trading at a premium to NAV, and then decline.
- On average, closed end funds trade at a discount relative to their NAV.
- The discount is subject to wide variation over time and across funds.
- Discounts disappear as the fund approaches the open end date.
Prior Explanations

There have been many, I am going to review just two (later in this presentation). Check the paper for the others.

Bottom line is that there is general consensus that no satisfactory rational explanation exists (or could exist).

LST:

The major lesson we take from this analysis is that the demand for securities can influence price, even if that demand is based on irrational beliefs.
Objective of this Paper

} Critique of this status quo

| We will derive a completely rational model that will simultaneously explain all four empirical regularities cited by LST.

} Our objective is not to claim that our model explains the whole anomaly, nor that behavioral explanations have no place.
Instead

We argue that dismissing a rational explanation of all aspects of the closed end puzzle is premature (and unlikely)

Before you can identify what aspects of the puzzle cannot be explained rationally, you need a rational model of what can be explained. Based on our model, we can then identify what aspects of the puzzle need behavioral explanations.
Fees (Malkiel, 1977)

Consider a fund whose manager is paid a fraction \( c \) of the fund's value at the end of each year (say 1%).

What is value of manager's claim if investor leaves money in fund forever, and all dividends are reinvested?

\[
\text{PV of first year's compensation} = c \times \text{current value of fund.}
\]

\[
\text{PV of second year's compensation} = c \times (1 - c) \times \text{current value.}
\]

\[
\frac{PV \text{ of Compensation}}{\text{Current Value of Fund}} = c[1 + (1 - c) + (1 - c)^2 + \ldots] = 1
\]

The manager gets everything! This holds for any \( c > 0 \).
Fees (con’t)

In general, if the fund pays a constant fraction of assets every year, \( \gamma \), and if the manager charges a proportional fee \( \delta \), then the discount is:

\[
\frac{\delta}{\gamma + \delta}
\]

Clearly this is large enough to explain discounts.

Problem: Very little cross sectional variation in fees.
Managerial Ability

In the absence of fees, good managers should trade a premia and bad managers should trade for a discount.

Problem

- Investors must expect that the manager is good or average at the IPO
- After the IPO investors must expect most managers to be poor
- LST: Logic suggests that it is impossible for both predictions to be rational
Thought Experiment

We start with a fully rational and competitive market in which all participants are fully informed.

In this case how do the return from active management differ from passive management?

What does the return earned by investors tell us about management skill level?
What happens when participants are not fully informed?

In this case, managers cannot necessarily appropriate all the rents.

They might have to give up some rents initially in order to convince investors that they are good.

Two different kinds of funds exist:
- Mutual Fund --- fixed price with capital flows
- Closed-end Fund --- No capital flows with floating price
Closed vrs Open end funds

Two major difference between open and closed end funds
- Cash in and out flows
- Price

Two Puzzles
- Flow of funds in open end funds
- Discounts in closed end funds

The same economic fundamentals explain these to seeming unrelated puzzles
- Berk and Green --- flow of funds
- This paper --- Discounts
Intuition for Closed-End Funds

Based on Berk and Green (2002)
Tradeoff: fees (-) vs. ability (+)
Competitive capital markets
  Investors always receive a fair return

Implication
  If managers add more in ability than they charge in fees the fund must trade a premium
  If managers add less in ability than they charge in fees the fund must trade a discount
Inferences

} Uncertainty exists on managerial ability
| Neither investors nor the manager himself knows the ability of the manager, they have the same priors and update based on the same info.

} What happens?
| Bad managers are entrenched and so these funds trade at discounts
| Good managers leave so these funds do not trade at premia.
IPO

Pick a fee such that a fund trades at par
Investors understand that they are providing employment insurance for the manager, so the reduce the fee to take this option into account
So this means that for the first period, at least, investors expect managers to make more than they charge in fees
Post IPO

Investors expect good managers to leave (or get a pay raise) and bad managers to become entrenched, so they rational expected the average fund to fall into discount.

They still get a fair return, because in each period, the discount adjusts to ensure this.
Discounts

Since discounts adjust to ensure that investors get a competitive return, they reflect the cross sectional variation in management ability, so they have wide cross sectional and time series variation.

Since discounts are the capitalized value of the expected cost of entrenchment, they shrink to zero as the open end date approaches.

Aside: It’s not cross sectional variation in fees that drives variation in discounts --- it is variation in perceived ability.
Summary

Make very few assumptions:

- A few skilled managers exist
- Closed-end fund managers sign binding long-term contracts at fund inception, guaranteeing payment of fixed fees
- Contracts cannot prevent managers from quitting

This is enough to generate the four regularities cited by LST

In particular, there is no

- Investor Irrationality
- Asymmetric Information on managerial ability (as in Ross 2002)
Model Implications

- Funds are issued at par  ✓
- Most funds trade at a discount  ✓
- Discount disappear close to the funds liquidation date  ✓
- Wide variation in discount, both in the time series and cross-sectionally  ✓
The Model

\[ r_t = \tilde{r}_t + \alpha - \frac{1}{2\omega} + \varepsilon_t, \]
\[ \tilde{r}_t = r - \frac{1}{2\zeta} + \xi_t. \]

Where

- \( r_t \) is the return on the (observable) portfolio at the start of the period
- \( r \) is the expected return on the (observable) portfolio at the start of the period
- \( \varepsilon_t \) and \( \xi_t \) are independent normal iid r.v. with zero means and precisions \( \zeta \) and \( \omega \) respectively
The manager charges a proportional fee, \( c \). If the manager starts with \( \text{NAV}_{t-1} \), then at the end of the period he will have

\[
\text{NAV}_t = \text{NAV}_{t-1} e^{r_t - c}
\]

So

\[
E_{t-1}[\text{NAV}_t] = \text{NAV}_{t-1} e^{\alpha + r - c}
\]

\( \alpha \) is the value added by the manager.
Skill (con’t)

\( \alpha \) is unknown to both investors and managers. Let \( \phi_t \) be the posterior estimate of \( \alpha \), that is,

\[
\phi_t = E_t[\alpha]
\]

Then, for a manager that starts at time \( \tau < t \), \( \phi_t \) has precision \( \gamma + (t-\tau)\omega \) and evolves as follows:

\[
\phi_{t+1} = \phi_t + \frac{\omega}{\gamma + \omega(t - \tau + 1)}(r_t + 1 - \tilde{r}_t + 1 - \phi_t + \frac{1}{2\omega})
\]
Additional Assumptions

- The manager cannot be fired and will leave the fund when his perceived ability exceeds $\bar{\phi} > \phi_0$
- Fund receives a fixed amount of capital at time 0
- No additional capital enters or leaves
- All dividends are reinvested until date T when the shares are distributed to investors
Capital Market Competition

Competition between investors ensures that the expected return to investors cannot exceed \( r \)

Rationality ensures that the expected return to investor cannot be less than \( r \)

So investors must always earn \( r \), that is, if \( P(NAV_t, \phi_t) \) is the price of the fund then

\[
E_{t-1}[P(NAV_t, \phi_t)] = e^r P(NAV_{t-1}, \phi_{t-1})
\]
Discount

Let the discount, expressed at a fraction of NAV, at time $t$ given ability $\phi$ for a manager that started at time $\tau < t$ be:

$$D^\tau_t (\phi) = \frac{P(NAV_t, \phi)}{NAV_t}$$

Then

$$D^\tau_T (\phi_T) = 1$$
$$D^\tau_\tau (\phi_\tau) = 1$$
$$D^\tau_t (\bar{\phi}) = 1 \quad \tau < t \leq T.$$
Evolution of the Discount

\[ D_t^\tau(\phi_t) \text{ does not depend on } r \text{ and is given by} \]

\[
D_t^\tau(\phi_t) = \begin{cases} 
1 & \text{if } \phi_t \geq \bar{\phi} \\
\exp^{\phi_t-c+\frac{1}{2(\gamma+(t-\tau)\omega)}}N\left[-\frac{(\tilde{\phi}-\phi_t)}{\Phi_t} + \Delta_{t-\tau}\right] + \\
\frac{1}{\Phi_t} \int_{-\infty}^{\tilde{\phi}} D_{t+1}^\tau(\phi) \exp^{\frac{\gamma+(t-\tau+1)\omega}{\omega}(\phi - \phi_t) + \phi_t - \frac{1}{2\omega} - c_n(\frac{\phi - \phi_t}{\Phi_t})} d\phi & \text{o.w.}
\end{cases}
\]
## Calibration

<table>
<thead>
<tr>
<th>Variable</th>
<th>Symbol</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage fee</td>
<td>$c$</td>
<td>1%</td>
</tr>
<tr>
<td>Mean of prior</td>
<td>$\phi_0$</td>
<td>6.2%</td>
</tr>
<tr>
<td>Prior precision</td>
<td>$\gamma$</td>
<td>42</td>
</tr>
<tr>
<td>Return precision</td>
<td>$\omega$</td>
<td>33</td>
</tr>
<tr>
<td>Exit mean</td>
<td>$\bar{\phi}$</td>
<td>6.5%</td>
</tr>
<tr>
<td>Years to open date</td>
<td>$T$</td>
<td>10</td>
</tr>
</tbody>
</table>
Discount vrs Ability

% NAV

-0.1 -0.06 -0.02 0.02 0.06

New

1 2

% NAV

-0.1 -0.06 -0.02 0.02 0.06

8 6 4

Q Group April 2006
Initial Ability
Expected Discount
Distribution of the Discount
NAV return predictability

![Graph showing return against tenure](chart)

Return (%)

Tenure

Q Group April 2006
What cannot be explained?

The post IPO 90 day return appears to be highly negative. This seems to come from the average 7% fee charged on the IPO and subsequent price support provide by the investment banks.
Conclusion

The conclusion that the behavior of closed end funds is *prima facie* evidence of irrationality is premature.

Now we have a model of what the rational paradigm predicts, we can identify important departures that the behaviorists can work on.