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?
  - PV of first year's compensation = c x current value of fund.
  - PV of second year's compensation = c (1 - c) x 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, γ, and if the manager charges a proportional fee δ, then the discount is: $\dfrac{\delta}{\gamma+\delta}$
  - 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

$$r_t = \hat{r}_t + \alpha - \frac{1}{2\omega} + \epsilon_t,$$

$$\hat{r}_t = r - \frac{1}{2\zeta} + \xi_t.$$

- Where
  - $\hat{r}_t$ 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
  - ε_t and ξ_t are independent normal iid r.v. with zero means and precisions ζ and ω repectively

Skill

- The manager charges a proportional fee, c
- If the manager starts with NAV_{t-1}, then at the end of the period he will have
- So

$$NAV_t = NAV_{t-1} e^{r_t - c}$$

$$E_{t-1}[NAV_t] = NAV_{t-1} e^{\alpha + r - c}$$

- α is the value added by the manager

Skill (con't)

- α is unknown to both investors and managers. Let ϕ_t be the posterior estimate of α, that is,

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

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

$$\phi_{t+1} = \phi_t + \frac{\omega}{\gamma + \omega(t-\tau+1)}(r_{t+1} - \hat{r}_{t+1} - \phi_t + \frac{1}{2\omega})$$

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 $P(\mathrm{NAV}_t \phi_t)$ 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 ϕ for a manager that started at time $\tau<t$ be:

$$D_t^\tau(\phi) = \frac{P(NAV_t, \phi)}{NAV_t}$$

- Then

$$\begin{aligned} D_T^\tau(\phi_T) &= 1 \\ D_\tau^\tau(\phi_\tau) &= 1 \\ D_t^\tau(\bar{\phi}) &= 1 \quad \tau < t \leq T. \end{aligned}$$

Evolution of the Discount

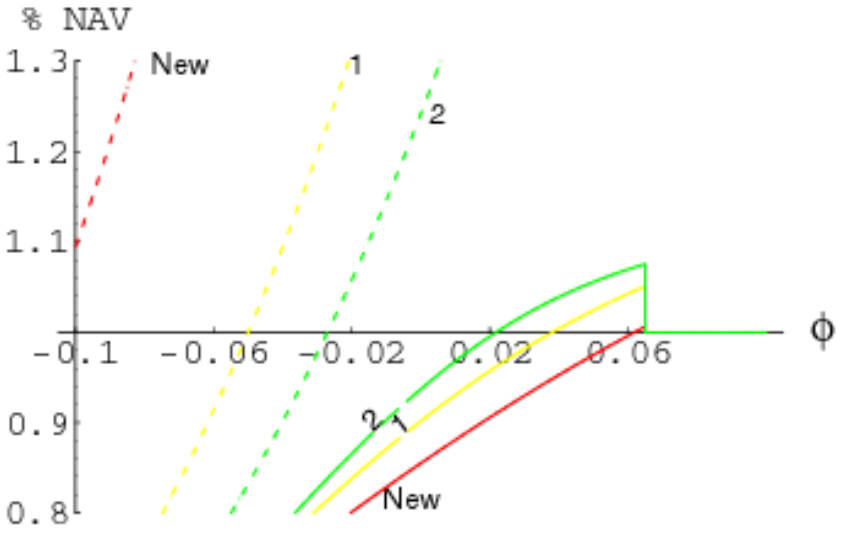
- $D_t^\tau(\phi_t)$ does not depend on r and is given by

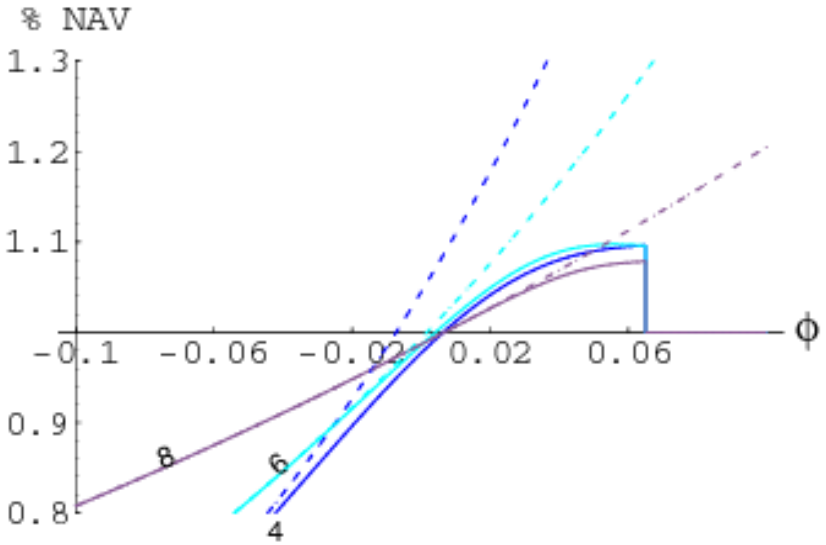
$$D_t^\tau(\phi_t) = \begin{cases} 1 & \text{if } \phi_t \geq \bar{\phi} \\ e^{\phi_t - c + \frac{1}{2(\gamma+(t-\tau)\omega)}} \mathrm{N}\left[-\frac{(\bar{\phi}-\phi_t)}{\Phi_t} + \Delta_{t-\tau}\right] + & \\ \frac{1}{\Phi_t}\int_{-\infty}^{\bar{\phi}} D_{t+1}^\tau(\phi) e^{\frac{\gamma+(t-\tau+1)\omega}{\omega}(\phi-\phi_t)+\phi_t-\frac{1}{2\omega}-c}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

Calibration

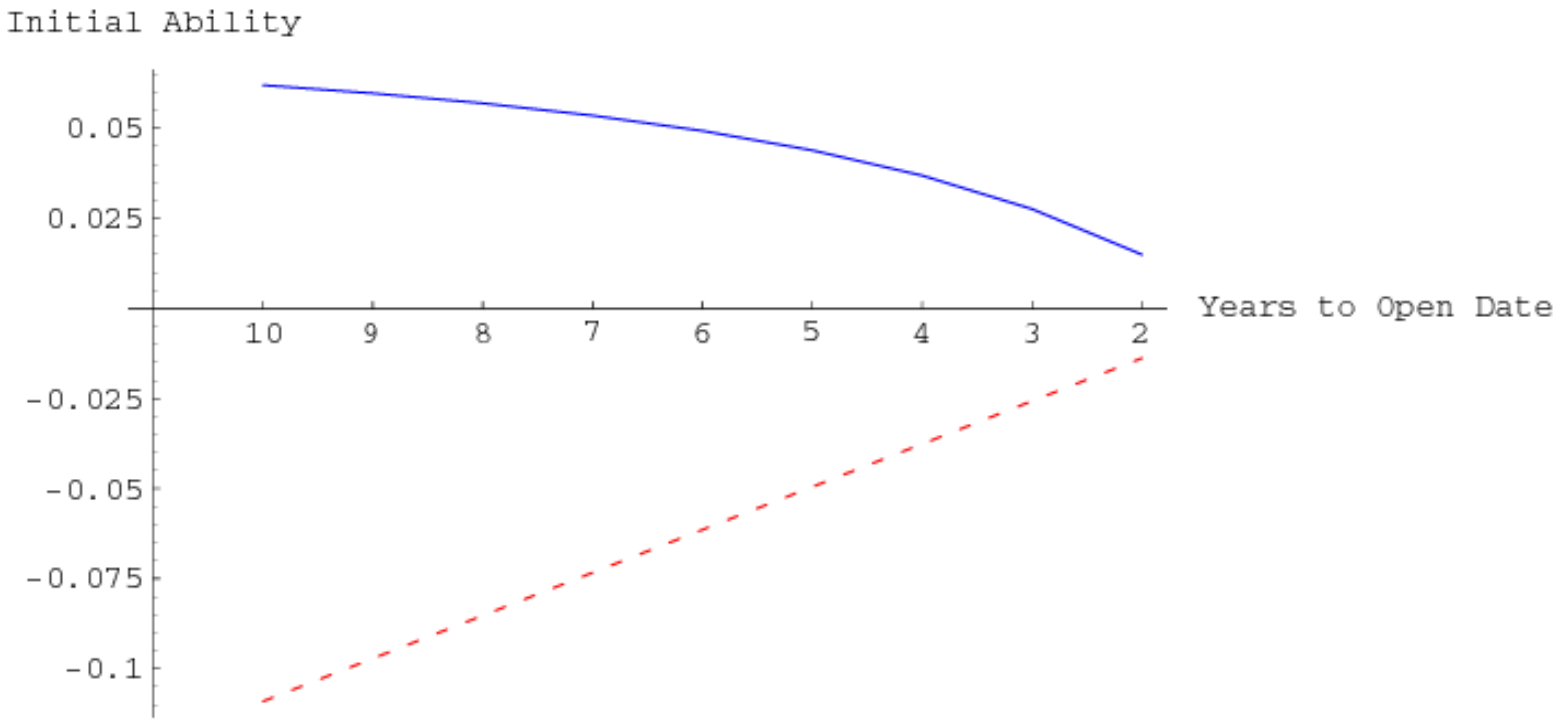
Variable	Symbol	Value
Percentage fee	c	1%
Mean of prior	ϕ_0	6.2%
Prior precision	γ	42
Return precision	ω	33
Exit mean	$\bar{\phi}$	6.5%
Years to open date	T	10

Discount vrs Ability

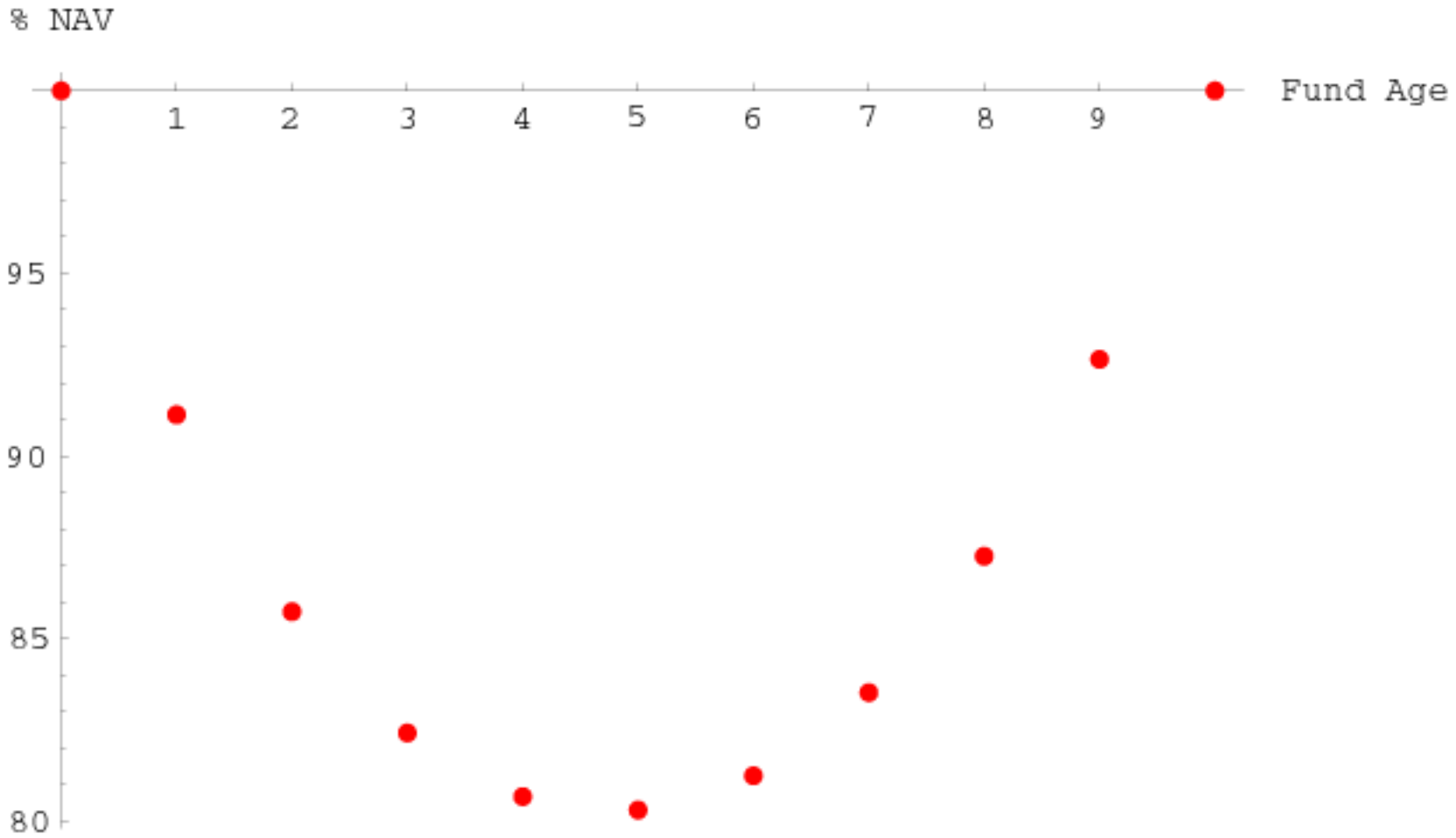




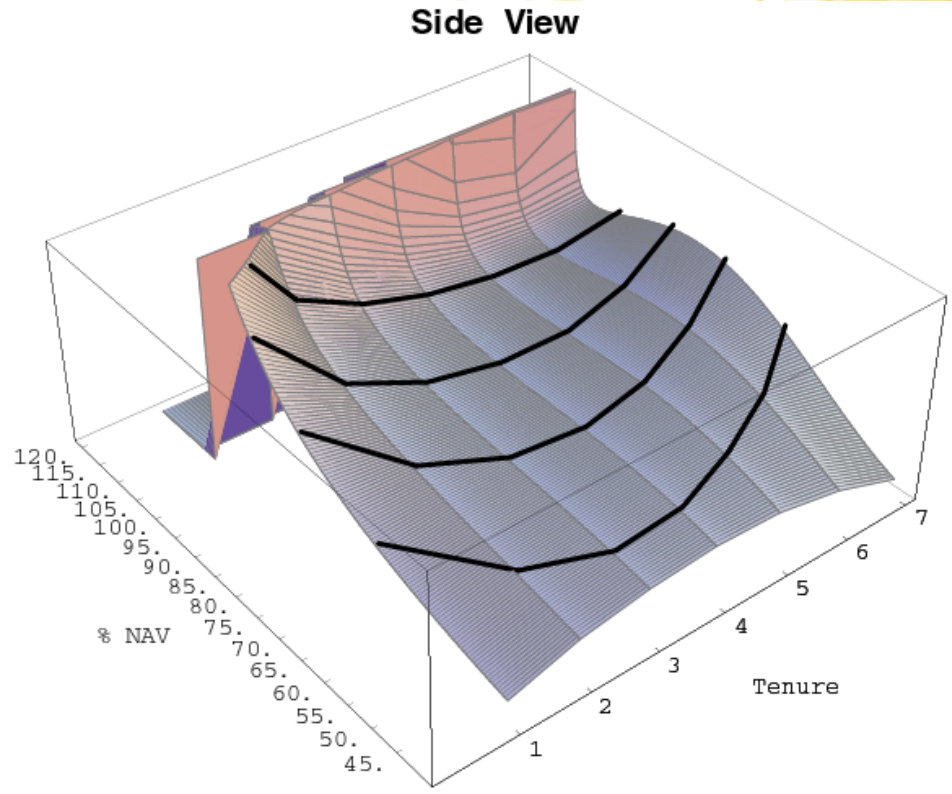
Initial Ability

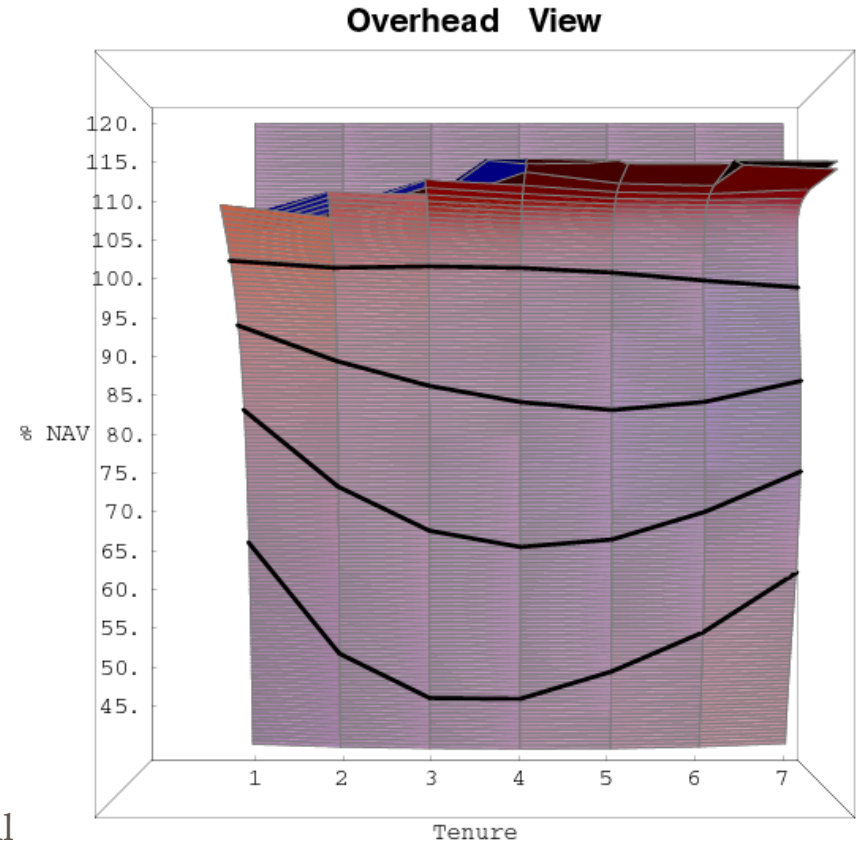


Expected Discount

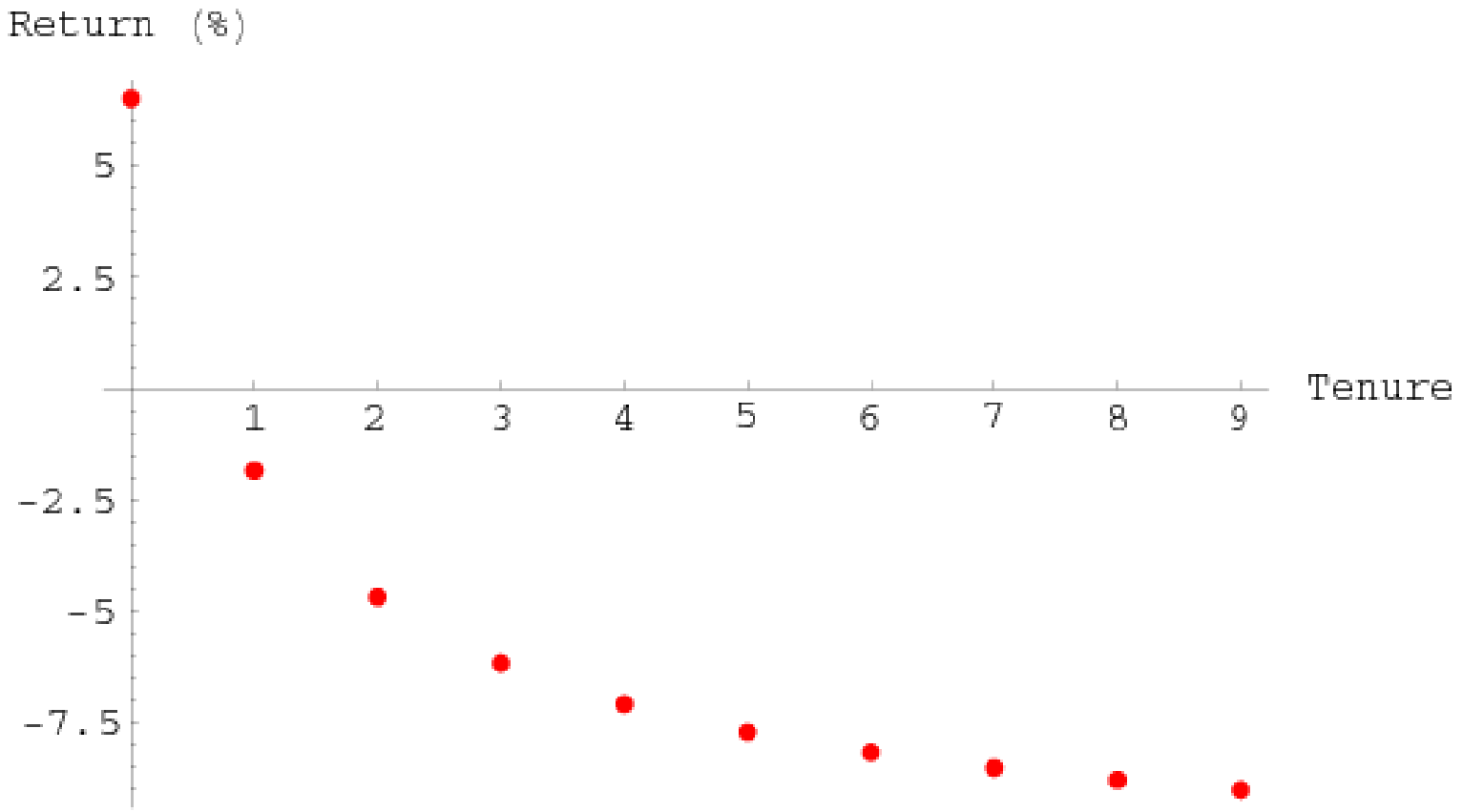


Distribution of the Discount





NAV return predictability



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 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.