

# A POSITIVE THEORY OF CLOSED-END FUNDS AS AN INVESTMENT VEHICLE<sup>1</sup>

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## Abstract

This paper offers a positive theory of closed-end funds. It views them as an organizational innovation designed to serve clienteles of small investors with long holding periods and large transaction costs. Closed-end funds economize on transaction costs while investing safely in the most illiquid assets.

The closing of assets generates managerial tenure and, thus, a new allocation of property rights on the fund's assets. The fund's premium equals to the (capitalized) value added by clientele service minus the (capitalized) value of the costs of management. The capitalized value of clientele service changes with the market-wide liquidity premium.

This approach is rich enough to explain the persistence of discounts, the relationship between a fund's discount and its dividend policy, the zero correlation between discounts and interest rates, and the excess volatility of a fund's share price. The paper's arguments are supported by a preliminary empirical study.

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<sup>1</sup> Ben Bernanke, Patrick Bolton, and Burt Malkiel helped me to shape the economic arguments of an early version (1998-99) of this paper. I have received helpful suggestions from many of my colleagues at Princeton and Wharton; they all have my heartfelt thanks. The work of Mathew Spiegel introduced me to the topic; he and Jeff Pontiff were great "sounding boards".

## ***I. Introduction***

### *I.1 The puzzle*

A closed-end fund (CEF) is an asset management firm organized as a publicly traded corporation. A CEF holds a bundle of financial assets; both the firm's shares (the "bundle") and the assets that it owns trade contemporaneously in financial markets. But an individual investor can quit the fund only via selling his shares in the market; the fund's assets under management are locked in the fund "forever."

The puzzle is that the price of the "bundle" is often below the market value of its parts (that is, the fund trades at a "discount"). Two identical assets trading contemporaneously at different prices provide a classical recipe for a money machine and contradict the Efficient Markets Hypothesis. The fact that "bundling" assets into a closed-end fund adds (or subtracts) value refutes the Miller-Modigliani analyses. And this situation persists for decades, involves billions of dollars, and grows in size. For example, by the end of 1999 U.S. closed-end funds had \$165 billion in assets under management.<sup>2</sup> During the year 2000, an average of 90% of closed-end funds traded at a discount, and the average discount was -10.14%.<sup>3</sup> With discounts being so prevalent, one would expect the CEF industry to wither away because investors have the right to convert a CEF into a regular "open-end" mutual fund. Yet only seven closed-end funds (from more than 500 existing funds) open ended during the year 2000;<sup>4</sup> and about 540 new CEFs were IPOed between 1986 and 2000.

Theorists are puzzled by persistence of discounts, and perplexed by the fact that investors continue to buy new CEFs. Pontiff (1996) concludes that "...pricing theories

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<sup>2</sup> 2001 Year Mutual Fund Fact Book , p.103.

<sup>3</sup> Investment Companies Yearbook 2001, pp. 31-32.

<sup>4</sup> Ibid, p.33

... had very little if any ability to explain discounts” and Lee et al. (1991) observe that “it seems necessary to introduce some type of irrational investor to be able to explain why anyone buys the fund shares at the start ...”

Not surprisingly, the last 15 years have witnessed a number of attempts to solve the CEF pricing puzzle (see Dimson and Minio-Kozerski(1999) for an extensive literature review). Researchers have discussed CEF discounts from two (complementary) angles:<sup>5</sup> fund management issues and impediments to arbitrage.

*Fund management issues.* Why is it that only CEFs, which are viewed as being not different from open-end funds (OEFs), exhibit the puzzling behavior, whereas OEFs are “well behaved”? For example, Lee et al. (1990, p.156) state: “Large closed-end funds... charge fees that are comparable to those of large no-load mutual funds. Since both are providing similar services, it would seem that both should sell at the same price.” This line of literature tried to solve the discount puzzle via arguments of “tax overhang,” “agency costs,” etc. Malkiel (1977) showed that these arguments can explain the phenomenon only partially, at best.

*Impediments to arbitrage.* The “bundling” of assets in a CEF-type arrangement is viewed by this strain of literature as being a portfolio-type operation: the ownership of x% in the CEF (according to this literature) gives ownership of x% of the NAV. Yet Pontiff’s (1997) influential article showed that any attempt to solve the puzzle within a classical rational-and-efficient-markets paradigm has to be built on different assumptions (than the above): if “...a share in a closed-end fund is [*just*] a claim on the fund’s assets, the volatility of a closed-end fund [*share price*] should equal the volatility of the underlying

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<sup>5</sup> See also Spiegel (1999) and Berk-Straton (2004) for models that explain CEF discounts from first principals.

portfolio”(p.155). Yet Pontiff shows that the volatility of a CEF’s price is much higher than the volatility of its NAV; most of that excess volatility is idiosyncratic in nature and could be diversified away. Pontiff interpreted his findings as “...contradict[ing] the efficient markets model” (p.155).

The presence of excess volatility may point to the presence of an additional risk factor. Lee et al. (1991) suggest *investor sentiment* as this risk factor. Their theory is based on the following facts and assumptions: 1) trading in the shares of the CEFs is done predominantly by small investors; 2) small investors are inclined (being mainly noise traders) to bouts of optimism and pessimism (this is investor sentiment); and 3) investor sentiment cannot be diversified (due to a large mass of small traders) and has to be compensated via an additional risk premium. Therefore, the CEF has to trade at a discount.

But this theory leaves unexplained the prolonged presence of premiums among many CEFs. Premiums are rarely observed among the equity CEFs but they are commonplace among the municipal bond funds. In 1998, for example, a full quarter of the 171 municipal bond CEFs traded at a premium and the maximum premium was 9.7% (see Table II). Similarly, during the period 1988-1994 most municipal bond CEFs traded (on average) at premium. Obviously, investor sentiment risk could not be the only factor that influences the behavior of CEF discounts.

The literature avoids analyzing whether closing the funds in a CEF has any efficiency justification. It is viewed as a rent-seeking arrangement that provides “tenure” to the entrenched management team. The new CEF IPOs are explained by a marketing hypothesis: the presence of naïve investors motivates professionals to market new CEFs to

a less-informed public (Hanley, Lee, and Seguin, 1996, p.130). In other words, the CEFs' *raison d'être* is rooted in market inefficiency.

### *1.2 A new framework of analyses of CEFs*

Following Amihud and Mendelson (1986) I assume that investors are heterogeneous in their expected holding period and that assets are heterogeneous in their liquidity. [Liquidity is measured by the asset's inter-dealer bid-ask spread.] Then assets with higher trading costs will yield higher gross returns (the liquidity premium) to compensate for higher cost of trading; and investors with longer holding periods gravitate to less-liquid/higher-yield assets: there will be a clientele relationship between low-liquidity assets and investors with longer holding periods.

Assume that investors are heterogeneous with respect to their investable wealth, and that individual costs of trading are composed of the inter-dealer bid-ask spread (common to all) plus individual costs consisting of the fixed costs per transaction, brokerage costs, and the investor's marginal cost of information and expertise acquisition. Then investor's trading costs [on a per-dollar-invested-basis] vary with the size of the investment: in every asset smaller investors will have larger per-dollar costs of trading<sup>6</sup>.

To present my idea, I consider a simple situation with two types of individual investors by investable wealth (large and small) and two types of individual investors by holding period (long-term and short-term). By assumption, there is no correlation between wealth and holding period.

Let the investment universe be composed of two risky assets, X and Y, and a risk-free interest-bearing bank account. Assets X and Y have the same risk characteristics (for

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<sup>6</sup> Harris and Piwovar (2004) find that "effective spreads in municipal bonds average about 2% of price for retail size trades of \$20,000 and about 1% of price for institutional size trades of \$200,000 (p.1.)"

example they have both beta of 0.9, or they are both California municipal bonds) but asset X is more liquid and, thus, Y yielding in equilibrium a higher return than X,

High liquidity/low yield	Low liquidity/high yield
X	Y

Trading costs: large investors' trading costs are equal to the bid-ask spread plus a small addition and those small investors' trading costs are equal to the bid-ask spread plus a large addition.

Holding period	Short	Long
Individual trading costs		
Low	A	B
High	C	D

Then A, B, C, and D are four types of individual investors with respect to trading costs and holding periods. Among individual investors, type B has a comparative advantage to invest in Y due to B's lower trading costs and longer holding period. Assume that the size of the four groups and the supply of assets X and Y are such that type B investors are marginal direct investors in asset Y in equilibrium, i.e., small investors (both C and D type) will not invest in Y directly.

*Structure of a mutual fund.* I allow one type of asset-management Company (called a mutual fund) with trading costs equal to the asset's inter-dealer bid-ask spread.

Any entrepreneur can originate a mutual fund and charge a percentage of assets under management as the managerial fee. All funds have the following organizational structure: a fund either allows redemption upon request (this is an OEF) or no redemption by the fund while fund's shares are listed on a stock exchange (this is a CEF).

For OEF-type funds, imbalance in daily net redemptions requires the fund to sell/buy assets. The investor's share of the fund is the pro rata value of the fund's assets net of all costs (including trading costs and management fees) accrued so far. Funds are allowed to charge front and back loads (that is, upfront and redemption fees, respectively). *Specialized fund.* An open-end fund that invests exclusively in asset Y and attracts only long-term investors will be called a *specialized fund*. Gross returns on a specialized fund will be larger than (or equal to) returns on any other fund. For example, an open-end fund, that invests exclusively in Y but has long-term and short-term investors, will generate smaller returns due to additional costs caused by frequent redemptions by short-term investors. The additional costs are shared by all investors to the detriment of long-term investors.

A specialized fund could discriminate between long- and short-term investors by charging new investors a two-part fee: a one-time upfront fee (that is, a front load) and a periodical managerial fee. An upfront fee equal to the highest incremental gain of the short-term investor from investing in the specialized fund (vs. that investor's next-best investment option) would discourage short-term investors from investing in the fund. Only the "target" clientele group with longest holding period will consider investing in the fund. Then the fund can specialize in the low-liquidity assets that are optimal for this clientele.

Long-term investors would benefit from investing in a specialized open-end mutual fund (due to low institutional trading costs of the fund), provided that costs of institutional services are smaller than savings on trading costs.

There is sufficient empirical evidence that this is the practice of existing funds. Edelen (1999) showed that a fund's failure to discriminate among investors (by its

readiness to provide free liquidity) generates sizable losses for that fund's average investor. Chordia (1996) shows that mutual funds try to attract specific groups of investors by using load and redemption fees as instruments of costly signaling.

Now we take this idea one step further: assume that there are investors with holding periods that vary from 1 to K years and, at least K different liquidity groups among assets. Then, investors with the longest holding periods should be interested in assets that yield highest return and have highest liquidity costs. A fund that plans to attract these investors and, accordingly, specialize in the lowest-liquidity assets may need special redemption arrangements: if redemptions have to be financed by the sale of assets, the nature of the assets ultimately defines the nature of redemption rights.

For example, a Real Estate Investment Trust (REIT) cannot be organized as an OEF as any sizable redemption would cause a substantial loss of value. The latter would be borne by the remaining investors. And an unlimited at-will redemption rights might be dangerous in a case of a "fund run": a rush of redemptions would impose the liquidity costs on the investors that redeem last<sup>7</sup>.

As the place in the redemption queue defines the investor's net proceeds, a run may become a self-fulfilling prophecy. The Diamond-Dybvig solution for bank runs (to impose a freeze on withdrawals after a certain threshold is crossed) is theoretically and legally available to the fund management. But the solution that CEFs utilize is different: funds are "locked" in the CEF, so that an investor who wants to quit a CEF has to find a new client as a replacement, which means that a change of ownership does not impose any costs on the remaining investors. Investors' decision to join the fund depends now on

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<sup>7</sup> Mutual funds are not immune to massive withdrawals as the latest experience of Putnam shows: more than \$32 Billion of Putnam-managed assets were redeemed within one month (See WSJ, 12/8/2003)

investor's evaluation of costs of trading in fund's shares vs. net returns generated by the fund. A closed-end fund is freed from the redemption-cost dilemma. It can invest in the least-liquid assets, and generate higher net-of-trading-costs returns.

*Allocation of property rights in a closed-end fund.* Locking of the assets in a CEF creates a new allocation of property rights.<sup>8</sup> The management team of an OEF is just a “hired hand”; investors (collectively or individually) can “fire” the team by withdrawing funds. An investor in a CEF gives up the option to “fire” the fund's managers: the CEF management team is “tenured” and its annual compensation (as a percentage of NAV) is guaranteed “forever.” This empowers the current entrenched management with property rights over a portion of the fund's assets.<sup>9</sup> The property right allocation is crucial in understanding the presence and persistence of CEF discounts

Our theory offers a *raison d'être* for the CEFs as an organizational form. It explains rationally why the funds in a CEF are closed and why premiums/discounts are a rational and predictable phenomenon: 1) a closed-end fund is an organizational innovation designed to allow small investors with long holding periods to invest safely in the least liquid assets via a mutual-fund-type vehicle; 2) fund closing generates managerial tenure as a by-product: the CEF's management team gets the valuable “tenure “rights; and 3) a CEF's premium is equal to the capitalized value of “clientele service” minus the capitalized cost of managerial tenure. The resulting amount<sup>10</sup> can be positive or negative<sup>11</sup>.

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<sup>8</sup> The CEF-related literature habitually ignores this organizational difference between the CEF and the OEF. Gruber (1995) being the noticeable exception.

<sup>9</sup> Our calculations below show that this portion can be as large as 20%.

<sup>10</sup> The assumption that CEF provides clientele service explains premiums: they are clientele's valuation of the net value-added (above the cost of management).

<sup>11</sup> Elsewhere[ see Cherkes (2002)] I showed that empirical data supports a contention that this amount is always positive at the time of fund's IPO.

Our model predicts that CEFs (when compared to same-asset OEFs) should invest in less-liquid assets, and should generate higher gross rates of return. It also emphasizes that managerial costs play an important role in the pricing of CEF shares. In particular, we conjecture that the interplay of two forces (the value added by clientele service and the capitalized value of the costs of management) explains the cross-sectional behavior of discounts.

Below we report our empirical findings and present the literature's empirical findings that support our theory. In particular, we show that municipal bond CEFs, when compared to same-asset OEFs, hold lower-liquidity assets and generate higher returns. We also show that CEF premiums are negatively correlated with the size of managerial compensation.

The rest of the paper is laid out as follows: the formal model is presented in section II; and analysis and applications of the model are given in section III. Section IV deals with ramifications of investor/management interests alignment in a CEF; empirical results in support of the theory are given in section V. Conclusions and further research are discussed in section VI.

Two groups of researchers (the Lee-Shleifer-Thaler team, and Katherine Hanley-Weiss and her collaborators) pioneered the intense interest of financial economists in the peculiar behavior of CEFs. Their work (as well as that of many others) contributed to our understanding of that complicated asset class. The current paper is a direct extension of their previous efforts. In a recent lecture (Princeton, May 2001); Prof. Stephen Ross presented a line of arguments that are close in spirit to some of mine (see Ross, 2002).<sup>12</sup>

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<sup>12</sup> I thank Prof. Ross for commenting on an earlier version of this paper.

## ***II. The Model***

### *II.1 Heuristic description of the model.*

The investment universe has two assets (with same risk characteristics and infinite horizon) that differ by their liquidity; the liquid assets yield a constant risk-adjusted rate of return; the less-liquid assets yield (in addition to the above rate) a constant per-annum liquidity premium rate.

Investors differ by the length of expected holding period (long or short) , by their investable wealth (large or small) and by their optimal mode of investment (direct or indirect). Direct investors can be either large or small; indirect investors utilize mutual funds (open-end and closed-end) as vehicles for investment.

Trading costs differ among investors, with mutual funds having the smallest per-share cost of trading in each asset and small direct investors having the largest cost of trading in each asset.

As discussed above, CEF invest in the less-liquid asset only. The pricing of CEF's shares is defined by the fund's marginal investor.

I further assume that large investors are marginal *direct* investors in the less-liquid asset: small investors (with the same holding period as the marginal direct investor in the less-liquid asset) do not invest in the less-liquid asset directly. But indirect investment via a fund could be still a viable strategy for that small investor. When CEF's lower trading costs are considered, this small investor's required liquidity premium goes down (remember, we interpret the liquidity premium as the minimal required additional return to cover the costs of trading). Let marginal *direct* investor in the less-liquid asset requires a liquidity premium of size  $\rho$  . Then the CEF marginal investor's required liquidity

premium  $\tau$  has to be less than  $\rho$ , because CEF investor incurs (in addition to trading costs) the costs of fund management:  $\rho > \tau$ . [Aide: For every dollar invested in the fund a client receives approximately  $\$(\rho - \tau)$  in annual benefits and pays approximately  $\$k$  in costs. A seasoned closed-end fund trades at a premium when the benefits are larger than the costs, or  $\rho - \tau > k$ .]

The closed-end fund is assumed to have an infinite life with a constant rate of per-annum management fee. Assets of the fund grow at an annual rate of  $(1+r)*(1+\rho)$ , where  $r$  is the required rate of return on high-liquidity assets and  $\rho$  is the liquidity premium (above  $r$ ) on low-liquidity assets.

The fund pays out (as matter of policy or law)  $\delta\%$  of end-of-the-year NAV in annual dividends and management is annually paid  $k\%$  of the end-of-the-year NAV. No other cash outflows occur.

The marginal investor in the fund applies to the fund's cash flows the discount rate  $(1+r)*(1+\tau)$ , where  $\tau$  is the marginal investor's required liquidity premium. We assume that managers are large investors (by their personal wealth) and thus do not belong to the fund's clientele: they apply to their annual compensation (paid as  $k\%$  of the end-of-the-year NAV) the discount rate of  $(1+r)*(1+\rho)$ .

## II.2 Notation

The values below are measured as rates or in "dollar-per-share" terms.

$X(t)$  = NAV of the CEF at the end of year  $t$ ;

$k$  = percentage of NAV paid annually as a management fee;

$r$  = risk-adjusted real discount rate on the liquid asset;

$\rho$  = liquidity premium (above  $r$ ) on less-liquid asset;

$\tau$  = required liquidity premium by the fund's marginal investor;

$\delta$  = percentage of NAV paid out as annual dividend;

$M(0)$  = PV [at time  $t = 0$ ] of management's future fee payments;

$P(0)$  = the market price of a CEF share at time  $t=0$ ;

$I(0)$  = PV [at time  $t = 0$ ] of all future dividends to be paid out by the CEF.

### *II.3 Assumptions:*

1. The CEF is managed in perpetuity by an infinitely lived team;
2.  $\delta = \text{const.}$ ;  $\rho = \text{const.}$ ;  $k = \text{const.}$ ;  $r = \text{const.}$ ,  $\tau = \text{const.}$ ;
3. The CEF invests only in the less-liquid assets; the annual expected growth of the fund's assets is  $(1+r) * (1+\rho)$  ;
4. All annual payments [equal to  $(k + \delta)X(t)$  ] are made at the end of the year; the fund has  $(1-k - \delta)X(t)$  in assets under management at the beginning of the year  $(t+1)$ .
5. The beginning of year 1 (today) will be denoted  $t=0$ .
6. The fund's marginal investor discounts his dividend flows at a rate  $(1+r) * (1+\tau)$  ;
7. Managers of the fund discount the fund's cash flows at a rate  $(1+r) * (1+\rho)$ .

### *II.4 Results*

*Managerial claim on assets.* Assume that fund's NAV is equal to  $X(0)$  at  $t = 0$ ;

then, for all  $t$ ,  $\text{NAV}(t)$  is

$$X(t) = (1 - k - \delta)^{t-1} (1+r)^t (1+\rho)^t X(0); \quad (1)$$

as assets grow at  $(1+r) * (1+\rho)$  annually and are depleted at rate  $(k + \delta)$  annually.

The annual management fee at the end of year  $t$  is

$$k * X(t) = k * [(1 - k - \delta)^{t-1} (1+r)^t (1+\rho)^t X(0)] \quad (2)$$

and its present value at  $t = 0$  is  $PV[k * X(t)] = k(1 - k - \delta)^{t-1} X(0)$ .

The PV of all future fee payments is

$$M(0) = PV\left[\sum_{t=1}^{\infty} k * X(t)\right] = \frac{k}{(k + \delta)} X(0), \quad (3)$$

i.e., entrenched management has a claim on  $\alpha = \frac{k}{(k + \delta)}$  % of the fund's assets.

*Pricing of an existing CEF.* At the end of each year, a dividend  $\delta * X(t)$  is paid out:

$$\delta * X(t) = \delta * [(1 - k - \delta)^{t-1} (1 + r)^t (1 + \rho)^t X(0)]. \quad (4)$$

The PV of this dividend to fund's marginal investor is

$$PV[\delta * X(t)] = \delta (1 - k - \delta)^{t-1} \frac{(1 + \rho)^t}{(1 + \tau)^t} X(0) \quad (5)$$

as the marginal investor's annual discount rate is  $(1 + r) * (1 + \tau)$ .

Then the PV of all future dividends is

$$I(0) = PV\left[\sum_{t=1}^{\infty} \delta * X(t)\right] = \frac{\delta(1 + \rho)}{\tau + k + \delta - \rho * (1 - k - \delta)} X(0). \quad (6)$$

Thus, the fund's marginal investor values the fund as  $\beta * X(0)$  where<sup>13</sup>

$$\beta = \frac{\delta(1 + \rho)}{\tau + k + \delta - \rho * (1 - k - \delta)}. \quad (7)$$

But  $\beta \neq 1$  if  $\tau + k \neq \rho * (1 - k)$ , i.e., the marginal investor's valuation of the fund might be different from fund's NAV. Denote  $P(0)$  as the market price of a CEF stock at time  $t = 0$ .

A rational investor will pay for that stock the PV of its future cash flows:

$$P(0) = \frac{\delta(1 + \rho)}{\tau + k + \delta - \rho * (1 - k - \delta)} X(0). \quad (8)$$

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<sup>13</sup> We shall assume that  $(1 - k - \delta) \frac{(1 + \rho)}{(1 + \tau)} < 1$ ; this condition is necessary for the value of the Fund's shares to be finite.

*Formula for CEF's Discount.* The CEF's discount rate is defined as the difference between the fund's NAV and the share price, divided by the fund's NAV<sup>14</sup>:

$$d(0) = \frac{X(0) - P(0)}{X(0)}. \quad (9)$$

Then by formula (8),

$$d(0) = \frac{(\tau + k) - \rho^*(1 - k)}{\tau + k + \delta - \rho^*(1 - k - \delta)} \quad (10)$$

Formula (10) affords a straightforward interpretation of the CEF discounts: from

$(1 - k - \delta) \frac{(1 + \rho)}{(1 + \tau)} < 1$ , the denominator of  $d(0)$  is positive; i.e.,

$$d(0) > 0 \Leftrightarrow (\tau + k) - \rho^*(1 - k) > 0 \Leftrightarrow (\tau + k) > \rho^*(1 - k) \quad (11)$$

Inequality (11) tells that discount arises when the annual liquidity premium  $\rho$  is less than the management's annual compensation  $k$  plus the marginal investor's required liquidity premium  $\tau$ . And that the fund trades at a premium when  $(\tau + k) < \rho^*(1 - k)$ .

Bellow we will show that the interplay between  $\rho$ ,  $\tau$ , and  $k$  can explain the presence of discounts or premiums; that the interplay between  $\delta$  and  $k$  will influence the size of the discount; and that relaxation of the assumption that  $\rho = \text{const.}$  helps to explain Pontiff's (1997) "excess volatility" findings.

### ***III. Explaining past empirical findings***

CEF discounts are deemed to be irrational. Yet they exhibit many puzzling regularities; it would appear as if there is a "method to the madness". In the next few pages I provide an

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<sup>14</sup> This definition implies that  $d(0) > 0$  occurs when the CEF trades at a discount and  $d(0) < 0$  occurs when the CEF trades at a premium. In the literature, discounts usually have *negative* values. The reader should be aware of this peculiarity in our definition.

explanation of these regularities<sup>15</sup> within the rational markets paradigm. I will do this by invoking the allocation of property rights within a CEF and by utilizing the features of the market-wide liquidity premium as described by Pastor and Stambaugh (2003). I start with a short review of past empirical findings and then apply my model to explain them.

### *III.1 Review of past findings*

*1. Size of the discounts and their relationship to interest rates.* Shares of the many CEFs trade at sizable discounts, while some funds (contemporaneously) trade at premiums. The size of the discounts (often in double digits) escapes explanation (Lee et al., 1990).

When a closed-end fund opens, the discount disappears. But when the fund is scheduled to open some time in the future, the discount disappears gradually (see Brauer, 1984).

Empirical tests show a zero time-series correlation between discounts and interest rates (Lee et al. (1991)). This was interpreted by prior literature<sup>16</sup> as proof that management compensation is *not important* in explaining CEF discounts.

*2. Time variation among discounts.* Discounts across different funds exhibit co-movements (“cross-time” correlation) and mean-reverting behavior (Lee et al. (1991)).

The price of CEF shares (and by extension, the CEFs’ discounts) exhibits a cross-time variation that differs from the variation of the underlying assets. Pontiff (1997) finds that their volatility was 60% higher than the volatility of the underlying assets. Discounts correlate with the returns of small firms, even when a fund holds no shares of small firms in its portfolio (Brauer and Chang (1989)).

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<sup>15</sup> One of those puzzles (the “irrationality” of CEF’s original investors) is discussed separately in Appendix.

<sup>16</sup> “...changes in the discounts are not correlated with ...changes in the term structure. This result is counter to the agency cost argument which predicts that when long rates fall the present value of future management fees rise, so discounts should increase” Lee et al. (1991, p.102)

3. *Cross-sectional behavior of discounts.* Discounts exhibit sizable cross-sectional variation, but researchers had difficulty identifying its determinants (see Barclay et al. (1993)). Pontiff (1996) finds that funds with higher dividend payout ratios have lower discounts. Chay and Trzcinka (1999) provide evidence that the CEF premium can be a reliable predictor of the fund's NAV performance for the following two years: a 10% premium (discount) will be compensated for by next year's gain (loss) of 1.8%-2.4% in NAV performance.

4. *Discounts and small investors.* Gemmill and Thomas (2002) show that the proportion of shares held by retail investors in Foreign and Colonial Trust<sup>17</sup> in the period 1970-1999 exhibits a +0.83 correlation with the annual average premium of the fund. "If a linear relationship between the two variables is assumed, when retail investors hold half of the shares, the discount is 5%; when retail investors reduce their holdings to one quarter of the shares, the discount rises to 25%" ( p.2,589).

### *III.2 Interpreting observed empirical regularities*

*Benchmark.* The data<sup>18</sup> in Table I provide the 1990-2001 average values for the size of the discount, the expense ratio, and the payout ratio (sum of dividend payments and capital gains payouts) across equity CEFs, municipal bond CEFs, and taxable bond CEFs. The equity CEFs' average values ( $k=1.57\%$ ;  $\delta=6.75\%$ ;  $d(0)\approx 13.6\%$ ) will serve as our benchmark. We further assume  $\rho = \tau$ , i.e., the benchmark case has no clientele service effects.<sup>19</sup>

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<sup>17</sup> "Foreign and Colonial Trust was the largest UK closed-end fund over this period"(p.2589)

<sup>18</sup> Courtesy of Bill Bradford, Sr. Fee & Expense Analyst, Lipper Inc.

<sup>19</sup> The chosen benchmark case fits most probably the diversified-equity CEFs organized in late 1920's and still lingering around in spite of losing their "raison d'etre" as  $\rho = \tau$  indicates.

Table I<sup>20</sup>

Average data for size of discount, size of expense ratio, and size of payout ratio across equity CEFs; municipal bond CEFs; and taxable bond CEFs for years 1990-2001.

Type of CEF	Average premium	Average expense ratio	Average payout ratio
Equity CEFs	-13.6%	1.57%	6.75%
Municipal Bond CEFs	-5.8%	1.11%	4.14%
Taxable Bond CEFs	+1.4%	1.22%	5.63%

*Size of the discounts.* The value of the discount for different values of parameters  $k, \delta$ , and  $(\tau - \rho)$  can be approximated<sup>21</sup> from formula (10)

$$d(0) = \frac{(\tau + k) - \rho^*(1 - k)}{\tau + k + \delta - \rho^*(1 - k - \delta)} \approx 1 - \frac{\delta}{(\tau - \rho) + k + \delta} \quad (12)$$

For equity CEFs, the average value of parameters formula (12) predicts a discount of 18%, which compares well with the average equity fund discount of 13.6%. (The value of 13.6% will be attained if we assume the value clientele service (i.e.,  $\rho - \tau$ ) to be 45 b.p. per annum.<sup>22</sup>)

Formula (12) does not include  $r$  as a parameter<sup>23</sup>; therefore, the zero correlation between  $r$  and  $d$  is predictable and the past interpretation of zero correlation between  $r$  and  $d$  (see footnote 16 in this paper) were rooted in a logical error.

Brauer's (1984) finding that discounts disappear gradually in funds that are scheduled to open fits well with our conjecture that a CEF's management owns a part of

<sup>20</sup> In Table I premiums are quoted in the usual way, i.e., negative value means that the fund trades below its NAV.

<sup>21</sup> The approximate equality is attained by disregarding values  $\rho^*k$  and  $\rho^*\delta$  in formula (7).

<sup>22</sup> The average discount of municipal bonds CEFs, requires  $\rho - \tau \approx 85$  b.p. and to the average premium of the taxable bonds CEFs requires  $\rho - \tau \approx 1.3\%$ .

<sup>23</sup> The reason for this result is straight forward: the discount is a ratio; both the numerator and the denominator depend upon  $r$ , but the ratio does not depend upon it.

the fund's NAV: a scheduled opening of a CEF changes the allocation of property rights, and managerial "tenure" becomes limited to the period from the announcement to the opening. The gradual disappearance of the discount is the "time decay" of managerial tenure.

*Mean-reversion of discounts and their excess volatility.* Formula (12) explains  $d$  via values of  $k$ ,  $\delta$ , and  $(\tau - \rho)$ . But parameters  $k$  and  $\delta$  rarely change; therefore, changes in discounts (and related phenomena) have to be related to changes in  $(\tau - \rho)$ . A portfolio's liquidity premium  $\rho$  is a priced variable that depend on the characteristics of the individual portfolio and on market-wide liquidity conditions. Pastor and Stambaugh (2003) show that all asset prices are influenced by and respond to these market-wide liquidity conditions. They build a measure for market-wide liquidity, which exhibits mean-reverting behavior (see Figure I in Pastor and Stambaugh (2003)). They also show that small-stock returns exhibit strong correlation with the measure of market-wide liquidity. Changes in market-wide liquidity could generate both time comovement among the discounts and their mean reversion.<sup>24</sup> It can also explain the Brauer and Chang (1989) finding that CEF discounts are correlated with the returns of small firms, even when a fund holds no shares of small firms in its portfolio.

By definition of the discount, the relationship between the price of a CEF share,  $P(0)$ , and its per-share NAV,  $X(0)$ , is  $P(0) = (1 + d) * X(0)$ . The variance of  $d$  is driven mainly by the variance in the market-wide liquidity whereas the variance in NAV is driven mainly by variance in interest rates (for municipal bonds' funds) or broad movements in the stock market (for equity CEFs). Therefore, it is natural to find that the

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<sup>24</sup> Should future empirical research support this speculation, it would provide a rational dimension to the "investment sentiment" risk that was discussed above.

variance of the CEF's price,  $P(0)$ , is much larger than the variance of its holdings,  $X(0)$ . In a somewhat different setting,<sup>25</sup> we have shown that the variance of a CEF's share is larger than the variance of the fund's NAV by 60% (as Pontiff (1997) finds it) under conservative calibration of the mean and variance of  $\rho$ .

Currently our above conjectures are speculative at best. Detailed empirical research is needed to support them. But they bring parsimony in explaining the hitherto dispersed observations.

*Determinants of the cross-sectional variation in discounts.* Formula (12) explains the discounts' cross-sectional variation via cross-sectional variation in  $k$ ,  $\delta$  and  $\rho$ . Further, the variance of discounts should be at least as large as the sum of variances of these variables. We have no data about the liquidity premiums ( $\rho$ ) of different funds, but the cross-sectional variation in the values of  $k$  and  $\delta$  is documented and is sizable (see Table II). As expected, the cross-sectional variation among the discounts is larger than the cross-sectional variation among expense ratios and among payout ratios: the absolute level of the standard-deviation-to-mean ratio is 2.29 for discounts, but only 0.3 for expense ratios and is close to zero for dividends.

Table II: Closed-End Municipal Funds (1998)  
Summary Statistics for 171 funds<sup>26</sup>

Statistics	Premium/discount	Expense Ratio	Payout ratio
Min	-0.2670	0.0039	0.0476
Low 25%	-0.0675	0.0078	0.0513
Mean	-0.0269	0.0104	0.0544

<sup>25</sup> See Cherkes (1999, pp.13-14) where parameter  $\rho$  was allowed to be random.

<sup>26</sup> In Table II discounts are quoted in the usual way, i.e., negative value means that the fund trades below its NAV. The data is given for 171 funds only as some 40 funds miss some of the data in 1998.

Median	-0.0180	0.0087	0.0539
75%	0.0135	0.0128	0.0568
Max.	0.0970	0.0237	0.0678
Std Deviation	0.0618	0.0040	0.0041

The predictions of formula (12) are supported by Pontiff's (1996) findings that an increase in the dividend ratio *decreases* the CEF's discount.

We further speculate that the Chay and Trzcinka (1999) findings (that a 10% premium will be compensated for by next year's gain of 1.8%-2.4% in NAV performance) are caused by differences in holdings of illiquid assets. Consider two funds, A and B. Assume that fund A holds assets of lower liquidity than fund B, and has 1.5% higher per-annum returns due to a higher liquidity premium. Using the data of municipal bonds (see Table I), a difference of  $\rho - \tau \approx 1.5$  is sufficient to attain a 10% premium (when compared to fund B) on fund A's shares. An increase in  $\rho$  by 1.5% would simultaneously increase the annual return (by 1.5%) and increase the premium by a larger number.

*Value of clientele service.* Our model assumes that the trading costs of small investors are larger than those of the large investors; thus the value of clientele service is larger to small investors than to the large ones. As the level of the premium depends on the value of clientele service, an increase in the number of small investors should manifest itself in a higher premium as Gemmill and Thomas (2002) find.

#### ***IV. Property rights allocation within a CEF and the alignment of management incentives***

CEF investors want the fund to invest their money in less-liquid assets via an efficient risk-reward portfolio. In an ideal world, fund managers align themselves with the interests of their investors. In the real world, the situation is more complex.<sup>27</sup>

Yet we conjecture that a CEF managers/investors interests are aligned better within a CEF (when compared to OEFs) due to CEF's unique property rights allocation.

First, we will demonstrate the mechanism that induces managers to invest aggressively in less-liquid assets. Second, we demonstrate the mechanism of managers/investors risk-reward alignment. Lastly, we explain why the majority stockholders of a fund that trades at a discount might find it uneconomical to open their fund. We close the section with discussion of the strand of literature that explains discounts via managerial waste (that is, agency costs).

*Search for low-liquidity assets.* Practitioner literature is replete with descriptions of managerial dread of discounts,<sup>28</sup> with the bylaws of many funds requiring a shareholder vote on fund opening when the discount crosses a certain threshold. Our theory predicts that discounts appear when the capitalized value of clientele service is smaller than the capitalized value of the costs of management. The value of clientele service can be increased by changing the composition of a fund's portfolio toward less-liquid assets. We use formula (12) to show that this shift is not large: for example, the average 1990-2000

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<sup>27</sup> Risk of "incentive misalignment" is not trivial [see Brown et al (1996), and Chevalier and Ellison (1997)]. It is especially important for new funds, small funds, and funds that have "a shot" on the top ranking for the current year. These funds may experience a substantial increase in the variance of their assets (without a parallel increase in expected returns) toward the end of the year. The CEF investors do not face such risk.

<sup>28</sup> "Many fund managers take great pains to prevent their funds' shares from trading at deep discounts or nose-diving at the first sign of bad news. Some funds have even come to market promising annual tender offers at NAV. Other funds buy back their shares in the open market when their prices dip. Still other funds have steady payout policies that distribute anywhere from 7% to 12% of total returns per year." *Morningstar Principia Pro*, 2001.

discount in municipal bond CEFs was 5.9%, which was attained<sup>29</sup> at  $(\rho - \tau) = 0.85\%$ . A 15 b.p. increase in  $\rho$  would decrease the discount to 2.6% and another 15 b.p. ( $(\rho - \tau) = 1.15\%$ ) would actually put the fund into a premium of 1%. This interpretation assumes that investors signal their dissatisfaction with managerial selection of portfolio holdings via increased discounts. Investing in less-liquid assets should increase premiums.

*Better alignment of management incentives.* Formula (3) shows that a CEF's

management "owns"  $\frac{k}{k + \delta}$  % of fund's assets. The managerial stake in fund assets for

the average equity CEF is 18.3% (see Table I). Assuming a \$250MM fund, the managerial stake is about \$45MM. Now assume that the fund managers' risk aversion (with respect to their own wealth) is identical to the risk aversion of the CEF investors, and the \$45MM constitutes the bulk of the fund managers' wealth. The closed-end fund managers are "co-opted" into a single major investor in the fund with an almost 20% (in our example) stake in NAV. The size of their stake and the absence of the threat of a massive fund withdrawal guarantee that managers of the fund will choose an investment profile consistent with their investors' risk-reward preferences. Actually, CEF managers may be too conservative<sup>30</sup>: after all, the value of their tenure is very large.

*Risk of churning.* Table III shows that CEFs have a smaller turnover ratio: 38% for OEFs vs. 28% for CEFs, and the difference is highly significant. Part of this difference is the by-product of the "withdrawal" option given to the OEF investors. But our preliminary calculations show that actual withdrawals can explain, at most, *half* of the 10% gap. The rest may be the OEF "management misalignment cost."

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<sup>29</sup> For the average value of muni bond CEFs' parameters.

<sup>30</sup> Gruber (1996, Table I on p.788) finds that the equity CEFs have a beta of 0.86, vs. 0.99 for OEFs.

*Resistance to opening a CEF: another case of management-investor alignment.* Past literature was puzzled why CEF stockholders are not responsive to outside tender offers even when the fund trades at deep discount (see Lee et al. (1990)). This puzzlement is premised on an assumption that opening the fund would serve the interests of its investors. We apply our framework to show that the actual situation is more complicated. In particular, one should consider the economic interests of a CEF's small investors that value the fund's clientele service.

First, we analyze the best way to change the status of a discounted CEF. We distinguish between converting a CEF into an OEF, and orderly liquidation via a distribution of *net proceeds* pro rata among the shareholders. A failing fund should be liquidated rather than opened. Converting a CEF into an OEF will change a fund's nature as the converted OEF has to shift its holdings away from less-liquid assets, thus defeating the "clientele service" that the fund was originally conceived for, and should be ready for the exit of some investors that were interested in less-liquid assets. The exit (and resulting sale of assets) will impose additional costs on the fund's investors; the latter will be distributed unevenly among the earlier and later "departees." We conclude that opening a CEF is never a good idea for its clientele.

Orderly liquidation of a failing fund may be a good idea if the average fund trades at a price that makes reinvestment of the liquidated fund's net proceeds economical to a client of the old fund. This will happen when the average fund<sup>31</sup> trades at discount. The average fund trading at discount indicates a decreased demand for the clientele service in that asset class; and decreased demand has to be accommodated via exit of some funds,

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<sup>31</sup> We use here "average fund" as shorthand for the fund with an average premium/discount among all CEFs in a particular asset class

shrinking of the asset base of all funds, or a combination of the two options. This is done by a management that responds to discounts by "...promising annual tender offers at NAV. Other funds buy back their shares in the open market when their prices dip. Still other funds have steady payout policies that distribute anywhere from 7% to 12% of total returns per year."<sup>32</sup> When there are too many funds, liquidation of a failing CEF (rather than reorganization of it) might be the only option.

Orderly liquidation of a failing fund when the average fund trades at premium may not serve the interests of clients interested in its services; these clients will have to buy another CEF that currently trades at higher price than their original fund. And they will have to bear the "cost of liquidation." The average fund trading at a premium indicates that there is room for our fund, but under better management: new managers, lower managerial compensation, increase payout, etc. should be considered first. Liquidation of a CEF should be considered as the last option.

We conclude that an outside "raider" will not find many allies among current stockholders when the majority of investors are still interested in the fund's clientele service.

*Agency issue.* An alternative explanation of CEF discounts invokes agency costs (e.g., Barclay et al.): discounts are caused by the inefficient and/or wasteful and/or exploitive "tenure-protected" CEF management. What is the empirical support for this position? Barclay et al. invoke the pecuniary and non-pecuniary benefits given to blockholders in 13 CEFs (like employment of the blockholder by the fund, employment of the

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<sup>32</sup> *Morningstar Principia Pro*, 2001.

blockholder's relatives,<sup>33</sup> etc.). The blockholders in the Barclay et al. sample concentrate in equity fund CEFs: more than 50% of 81 equity CEFs have bondholders; only three blockholders were found in 119 bond CEFs. Equity funds in the Barclay et al. sample had a mean discount of 15.2% (see Barclay et al., Table I, p.269) whereas bond funds had a mean discount of only 0.7%.

The economics of a partial owner<sup>34</sup> causing a 15% discount to a fund of hundreds of million of dollars just to employ himself or his relatives is problematic. Here is another possible explanation: in the Barclay et al. sample, equity funds (81 in number) trade at an average discount of 19.1%. A full 50% of equity funds and less than 3% of bond funds have blockholders. Could it be that the high correlation between the equity-fund discounts and blockholding (found by Barclay et al.) is an artifact of high correlation between blockholding and the equity fund dummy?

Coles et al. (2000) show that “increasing the effective marginal compensation rate of the investment advisor by one standard deviation will increase the premium by about one percent” (p.1411). These findings indicate that managerial effort and talent may influence the size of the premium. But the influence is obviously quite small if a full one standard deviation can change the discount by just 1%, a small amount when the absolute levels of the discounts are considered.

To justify the tenured management as the main “discount-causing culprit” one has to provide the mechanism of managerial abuse. After all, we have an industry that manages a \$100 billion plus portfolio: a 1% per-annum waste is a \$1 billion per-annum

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<sup>33</sup> The mechanism of “managerial wastefulness” is only implied. But the authors did not prove any damage to the investors. It may be that these types of “fringe benefits” are just an “everyday practice” in all fund management firms in general, OEFs as well as CEFs.

<sup>34</sup> Blockholders owned (among themselves) almost a one-fifth of equity funds.

gain/loss. Yet CEF managements generate higher gross average returns, charge expenses comparable to OEFs (see Table III), and do not charge any load<sup>35</sup> payments or 12b-1 fees. We hold, therefore, that the “agency cost” explanation does not show much explanatory power when it comes to the presence of large discounts.

### ***V. Empirical verification***

Our model predicts that CEFs should hold lower-liquidity assets (when compared to same-asset-class OEFs) and generate higher gross returns. We test this prediction on the universe of all U.S. municipal bond mutual funds. We then test the prediction that the cross-sectional variation among CEF discounts is explained by values of the fund management fee (parameter  $k$ ), the fund dividend payout ratio (parameter  $\delta$ ), the liquidity premium required by fund’s marginal investor (parameter  $\tau$ ), and the liquidity characteristics of the fund’s holdings (parameter  $\rho$ ). We report results of all tests below.

#### *V.1 Holdings and returns in municipal bond OEFs and CEFs*

Our theory predicts that CEFs should hold lower-liquidity assets and, accordingly, generate higher average returns than same-asset OEFs. Chordia (1996) compares holdings of equity OEFs vs. equity CEFs and finds that the latter hold much smaller (i.e., less liquid) stocks. We test this prediction on the universe of all CEF and OEF municipal bond funds. Bonds provide a natural laboratory for this exercise as they have a number of “liquidity markers”: higher coupons (for same maturities and comparable credit ratings<sup>36</sup>) in bonds indicate the presence of a liquidity premium; longer maturities are (on average)

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<sup>35</sup> The latter, charged by OEFs may average approximately another full 1% per annum of the assets-under-management. This calculation uses average values of Front-loads and Back-loads and divides them by 5, thus assuming a 5Y (average) holding period; the latter is consistent with the 20% annual average redemption rate.

<sup>36</sup> We control for credit quality of both portfolios, as lower credit quality of the CEF portfolios could (by itself) cause higher returns and higher coupons.

perceived as markers of lower liquidity. There are two more reasons to utilize municipal bonds: muni CEFs constitute almost half of all existing CEFs, and the size of the sample (on 1/1/2000 there were 209 municipal bond CEFs<sup>37</sup> and 904 municipal bond OEFs) is unusually large for CEF-related empirical work.

Table III reports the comparison of average holdings in the CEF and OEF portfolios on 1/1/2000; and the average five-year and ten-year returns for these portfolios. Holdings are compared on average coupons, credit quality, and maturity. We provide the two-sided t-values for differences in averages as well. The results<sup>38</sup> support our predictions.

*Returns.* Gross returns<sup>39</sup> of CEFs are higher by 28 b.p. per annum for a ten-year horizon and 1.54% per annum for a five-year horizon.

	<i>10Y ret- CEFs</i>	<i>10Y-ret. OEFs</i>
Mean	6.35	6.07
Standard Deviation	0.64	0.68
Count	36	355

The differences are highly statistically significant and economically highly important.

Survivorship bias may be at work here: there were 405 OEFs at the end of 1989 and only 355 by end of 1999; there were 38 CEFs at the end of 1989 and 36 by end of 1999. But correction of this bias should only strengthen our result.

*Credit quality.* The credit quality of CEF portfolios is *higher* than those of OEFs. For example, CEFs carry full 13.5% more AAA-rated bonds than do OEFs (54% vs.67.5%) and the difference is statistically significant.

<sup>37</sup>The data comes from *Morningstar Principia Pro*, the Jan. 2000 CEF and OEF CDs. This is the largest sample of CEFs utilized in any empirical work; to compare, Chordia has only 13 equity CEFs in his sample

<sup>38</sup> To assure that our results are not driven by “marginal Funds”, we repeated the same analyses for Funds with assets of 20MM and greater. The results (not reported here) did not change.

<sup>39</sup> Gross returns on NAV are calculated by adding the 1999 expense ratio and (for OEFs) the 12b-1 fees to reported net returns.

*Maturity.* The average maturity of CEF holdings was 4.67 years longer: 19.45 years for CEFs vs. 14.78 years for OEFs. This difference is statistically highly significant.

*Coupons.* The average weighted coupon of the average CEF portfolio was 35 b.p. higher than that of the average OEF portfolio (the difference is statistically highly significant).

## V.2 Explaining the cross-sectional variation among CEF discount

Our model explains the cross-sectional variation among CEF discounts through the values of the management fee ( $k$ ), the payout ratio ( $\delta$ ), the liquidity premium required by the fund's marginal investor ( $\tau$ ), and the liquidity characteristics of the fund's holdings ( $\rho$ ). Below we test a number of hypotheses with respect to these parameters.

From formula (10) we get (by disregarding values  $\rho^*k$  and  $\rho^*\delta$ ):

$$d(0) = \frac{(\tau+k) - \rho^*(1-k)}{\tau+k+\delta - \rho^*(1-k-\delta)} \approx \frac{\tau+k-\rho}{\tau+k+\delta-\rho} \quad (13)$$

That is, discounts<sup>40</sup> are monotone increasing in managerial compensation  $k$  and the marginal investor's liquidity premium  $\tau$ ; and monotone decreasing in the payout ratio  $\delta$  and in the portfolio's liquidity premium  $\rho$ . The influence of  $k$  and  $\rho$  depends crucially on  $\delta$  as the mixed second derivatives are negative.

The municipal bonds' data provide at least three measures of fund cash flows (parameter  $\delta$ ): the 12-month yield, the income ratio, and the average-weighted coupon of the portfolio.<sup>41</sup> The first two measures use the market price of CEF shares as their

<sup>40</sup> Remember that formula(13) gives discounts, not premiums.

<sup>41</sup> *12month Yield*: 12 months income plus any capital gains distributed over the same period, and dividing the sum by its last month's ending market price; income refers only to interest payments from fixed-income securities and dividend payoffs from common stocks. Monies generated from the sale of securities or from options and futures transactions are considered capital gains, not yield. *Average weighted Coupon* is calculated by weighting each bond's

denominators, i.e., they depend on the premium/discount of the fund. They also include (in one way or another) the fund's realized capital gains; the latter varies with market interest rates. Only the average-weighted coupon of the portfolio is not influenced by the market value of CEF shares or by the CEF's realized capital gains. As we need a measure that is "insulated" from market movements (remember that our model defines  $\delta$  as the "constant periodical payment"), we utilize the average-weighted coupon of the portfolio as a measure of  $\delta$ .

Data for the discount ( $d$ ) and for managerial compensation ( $k$ ) are readily available; but measurements of  $\rho$  and  $\tau$  or of their difference,  $\rho - \tau$ , are problematic. To start, we do not have an agreed-upon measure (or even a definition) of liquidity<sup>42</sup> for an asset, or of the liquidity premium  $\rho$  of a fund's portfolio. By the same token, we have no good way to estimate the marginal investor's required liquidity premium (our value  $\tau$ ). The liquidity premium  $\rho$  of a fund's portfolio is a priced variable that depends on the characteristics of the individual portfolio and on market-wide liquidity conditions. In a recent article, Pastor and Stambaugh (2003) build a measure for market-wide liquidity for equity markets and calculate a monthly series of liquidity levels in equity markets for the years 1960-1999. We therefore conjecture that the individual portfolio's  $\rho$  is changing with changes in the Pastor-Stambaugh market liquidity measure.<sup>43</sup> We shall therefore run two separate regressions.<sup>44</sup>

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rate of interest by its relative size in the portfolio. *Income Ratio* reveals the percentage of current income earned per share. It is calculated by dividing the fund's net investment income by its average NAV.

<sup>42</sup> "Liquidity is a broad and elusive concept that generally denotes the ability to trade large quantities quickly, at low cost, and without moving the price." (Pastor and Stambaugh, p.2).

<sup>43</sup> The time series was provided to me by Lubos Pastor.

<sup>44</sup> In each case the size of the sample is defined by the data available from Principia CDs and the available P-S liquidity level series (that ends in 1999)

In Regression I we theorize that the  $\rho - \tau$  difference is influenced mainly by industry-wide factors and we therefore use dummy variables for the years, while utilizing the end-of-year 1996-2001 data.

Regression I:  $d_{ij} = \alpha_i + \beta_1 k_{ij} + \beta_2 \delta_{ij} + \beta_3 D_j + \varepsilon_{ij}$   
 where  $i=1\dots N$ ,  $N$  is the number of CEFs in sample, and  $j=$  Years 1996-2001;

$d_{ij}$  is the discount of fund  $i$  in year  $j$ ,  $\alpha_i$  is the fund-specific intercept;

$\delta_{ij}$  is the dividend of fund  $i$  in year  $j$ , and  $D_j$  is the dummy variable for year  $j$ ;

We used the U.S. municipal CEF annual data (as of Dec. 31 of the year) for years 1996-2001: the number of funds differs from 186 to 209. Columns (1) and (2) run regression I

with  $\alpha_i = \alpha \quad \forall i$ ; column (3) tests for “fund effects” by letting  $\alpha_i$  to be fund-specific.

## Regression I

Dependent Variable: Premium/discount of CEFs

Repressors	(1)	(2)	(3)
Average –weighted coupon	2.28 (8.74)	2.60 (8.73)	2.21 (7.81)
Expense ratio	-2.59 (-5.83)	-2.69 (-4.90)	-2.25 (-4.03)
dummy1996	-4.61 (-7.45)		-18.35 (-9.35)
dummy1997	.067 (1.09)		-13.10 (-6.69)
dummy1998	4.20 (6.92)		-9.48 (-5.01)
dummy1999	-7.90 (-13.27)		-21.63 (-11.79)
dummy2000	-5.62 (-9.36)		-19.40 (-10.51)
Intercept	-13.97 (-8.41)	-18.06 (-9.09)	-9.40 (-7.81)
<b>Summary Statistics</b>			
F( 11, 782)	110.7	53.08	
Prob > F	0.00	0.00	
$\bar{R}^2$	0.406	0.09	0.4060
Number of Observations	1140	1140	1140

(t-values are reported in the brackets)

In Regression II we utilize the Pastor-Stambaugh measure of liquidity (derived from the U.S. stock market data) as an instrumental variable for  $\rho$  and apply it to the quarterly data for Dec. 1996-Dec.1999.

Regression II:

$$d_{ij} = \alpha_i + \beta_1 k_{ij} + \beta_2 \delta_{ij} + \beta_3 L_j + \varepsilon_{ij}$$

where  $d_{ij}$ ,  $k_{ij}$ ,  $\delta_{ij}$  are measured in quarter  $j$ ;  $L_j$  is the Pastor-Stambaugh liquidity level at the end of quarter  $j$ ;  $i=1..N, j=1996.4 - 1999.4$ . Column (1) assumes

$\alpha_i = \alpha \quad \forall i$ ; while column (2) tests for “fund effects” by letting  $\alpha_i$  to be fund-specific.

## Regression II

Dependent Variable: Premium/discount of CEFs

Repressors	(1)	(2)
Average –weighted coupon	3.39 (17.01)	4.93 (17.56)
Expense ratio	-1.95 (-5.84)	0.05 (0.07)
PS liquidity measure	-10.99 (-6.99)	-12.11 (-11.38)
Intercept	-22.94 (-16.54)	-34.98 (-17.27)
Constant Fund Effects	No	Yes

### Summary Statistics

F( 3, 2508)	133.7	
Prob > F	0.00	
$\bar{R}^2$	0.14	0.12
Number of Observations	2512	2319

(t-values are reported in the brackets)

We observe that in all regressions the expense ratio  $k$  [which measures the cost of institutional services] and the dividend ratio  $\delta$  [which measures the investors' ownership on the fund]<sup>45</sup>. When the Pastor-Stambaugh measure of liquidity is introduced in Regression II, it also has the sign consistent with our theory and is highly significant.

## VI. Conclusions

The size of the CEF phenomenon, the inaction of the SEC, and the apparent indifference of investors<sup>46</sup> toward attempts to “open” even deeply discounted CEFs indicate that there is an economic rationale for the existence of the “closed-end fund” as a separate organizational form of fund management. In the Williamsonian tradition of attempting to understand and to explain an existing organizational form as an efficiency-driven design, we suggest here a testable positive theory to explain the CEF phenomenon.

<sup>45</sup> Expense ratio is insignificant and positive in the constant –fund –effects regression of Regression II.

<sup>46</sup> Opening of existing CEFs is a difficult task as investors and regulators do not show much enthusiasm: Barclay et al.( 1993) describe the many difficulties that are common in opening a CEF; Lee et al.(1990) report that “ if the anti-takeover provisions do not work, the managers (of an CEF) can count on the help of the SEC, which...has frequently contributed to raising bidders' costs.” (1990 p.160). They also report that stockholders are not responsive to tender offers by outside raiders.

- The CEF is an institutional solution that provides the small investors<sup>47</sup> with access to the lowest-liquidity assets.
- The assets are “closed” to eliminate the risk of a “fund run” since a massive withdrawal would impose high costs on remaining investors. Managerial tenure is a by-product of “fund closing.” Paradoxically, managerial tenure provides incentives to better serving the clientele and assures a better alignment of management-investor interests.
- The market valuation of a fund’s shares “subtracts” the capitalized value of managerial tenure from a fund’s NAV and adds the capitalized value of the “clientele service” to the NAV. The resulting sum can be higher or lower than the actual NAV.

To support our idea, we report comparative statistics for the U.S. municipal bond CEFs and OEFs and find that gross return of CEF portfolios consistently outperform their OEF counterparts; that CEF managerial fees are same as the OEFs, yet CEFs charge no load fees, 12-b-1 fees, etc.<sup>48</sup>; and that CEFs hold less-liquid asset than their OEF counterparts. We further explain the cross-sectional variation of discounts through variation in the funds’ parameters and show that discounts may appear for certain values of these parameters. We thus explain CEF discounts within the classical rational-and-efficient-markets paradigm.

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<sup>47</sup> “There is ample evidence that closed-end funds are owned and traded primarily by individual investors. ... Using intraday trading data, we have found ... that 64% of the trades in CEFs were smaller than \$10,000.” Lee et al (1991, p.82)

<sup>48</sup> These fees add 1% per annum in costs to investors (assuming a 5Years’ holding period for investment in OEFs).

*Management parameters.* To the degree that a fund's parameters are decision variables of the fund's management, the differences in premiums among same-asset CEFs should be explained via differences in the quality of management. CEFs provide a unique opportunity to estimate the market valuation of managerial quality as every managerial choice is "priced into" the levels of premiums.

*Clientele services.* CEF managements provide (in addition to access to low-liquidity assets) a number of other services<sup>49</sup>: they borrow (municipal bond CEFs borrow at short-term municipal rates, which can be lower than Treasury rates), and they select investment portfolios that are a combination of liquidity, credit, and duration features. All these services are priced into the premium/discount of a fund; the CEF data can be used as a natural laboratory for evaluating a vast array of issues from value added by different decisions of bond portfolio management to investors' attitude towards risk.

*Other sources of clientele service.* This paper is focused on one particular clientele service, namely, provision of access to less-liquid assets. Other sources of clientele service are possible: access to indivisible assets (as in the case of REITs), tax and regulatory arbitrage executed by professionals, access to foreign markets, lower borrowing costs, etc. These services deserve a separate discussion and empirical investigation.

*Need for future research.* The capitalized value of clientele services in general (and ours in particular) is a complex and rarely discussed phenomenon. Our empirical work is hampered by the absence of measurable liquidity characteristics for an individual portfolio and its interaction with market-wide liquidity (a liquidity beta). We have

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<sup>49</sup> The value of these services is included in the valuation of a CEF and will be important variable in explaining the cross-sectional variation among CEFs' premiums/discounts. We are thankful to professor Malkiel for this and many other insightful suggestions.

utilized crude measures of portfolio liquidity (like bonds' coupons and bonds' maturity) which exhibit the ability to explain some of the discount phenomena. But better measures of liquidity could be helpful and are a very promising area for future research.

Table III

**Comparison between Municipal bond OEF and CEF portfolios and expense structures.** [Data for Jan 1, 2000 as reported by Principia]

	#of OEFs that reported data	Average Value For OEFs	#of CEFs reported data	Average Value For CEFs	CEF-OEF difference	t-value of the difference
<b>10Y Gross return</b>	355	7.01%	36	7.29%	0.28%	2.29
<b>10Y net return</b>	355	6.07%	36	6.34%	0.27%	2.32
<b>5 Y Gross return</b>	785	6.81%	190	8.35%	1.54%	19.31
<b>5Y net return</b>	785	5.86%	190	7.3%	1.44%	18.93
%portfolio invested in AAA	884	54.2%	191	67.66%	13.46%	8.13
%portfolio invested in BBB and better	884	91.43%	191	93.45%	2.02%	1.90
% portfolio invested in Not Rated	884	6.64%	191	4.78%	-1.86%	2.05
<b>Average Maturity</b>	776	14.78Y	139	19.45Y	4.67Y	8.89
<b>Av. Weighted Coupon</b>	897	5.72 %	190	6.07%	+ .35%	9.79
<b>Av Effective duration</b>	748	7.13	149	6.81 Y	-0.32	1.85
<b>Turnover ratio</b>	830	38.21 %	188	27.84%	-10.37 %	3.24
Expense Ratio	1809	1.09%	190	1.09%	0%	0.02
Front loads	1809	1.47%	190	n/a	n/a	n/a
Back Loads	1809	1.13%	190	n/a	n/a	n/a
Annual 12b-1 Fees	1809	0.39%	190	n/a	n/a	n/a

## Appendix

How rational are investors in CEF IPOs?

Tradability of CEF shares requires the new fund to be IPOed. By a Market convention, the IPO costs are subtracted from the IPO proceeds and the rest is invested, i.e., the investors pay the “establishing cost” of the new CEF<sup>50</sup>. But the perceived wisdom claims, that”...

[i]nvestors pay a premium for the new funds (*at the time*) when existing funds trade at discount...” (Lee et al. (1991), p. 76). In addition, the post-IPO performance of the new CEF is perceived to be uniformly negative. “(As) the typical fund (*is*) losing 8% of its value over the first 100 trading days, [the] rational investor should wait several months (*after the Initial Public Offering [IPO] date*)<sup>51</sup> before buying into these securities. Anticipating such behavior, prospective issuers and underwriters would have no incentive to bring these offerings to market. Consequently, in rational expectations equilibrium, these funds should not get started at Lee et al. (1991) identify this as the first (and arguably most perplexing) aspect of the closed-end fund puzzle” (Hanley, Lee, Seguin (1996), p. 128). The literature’s conclusion was that investors in a CEF IPO are irrational.

We report elsewhere our empirical findings to refute the “typical fund (*is*) losing 8% “as an artifact of excessive aggregation and of a methodological slip.<sup>52</sup> Here we derive exact conditions under which rational investors should invest in a CEF IPO [vs. investing in a seasoned CEF]; we then empirically verify that at the time of new IPO these conditions are fulfilled.

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<sup>50</sup> Example: assume that a new fund is brought to the Market at an IPO price of \$105 per share and that IPO costs are about 5% ; then, the \$105 are split two ways: \$100 is invested in assets (i.e., the fund’s initial NAV is \$100 per share) and \$5 per share is used to cover the IPO costs.

<sup>51</sup> Round parenthesis with *italics typeset inside indicates* the text added by us to the quote.

<sup>52</sup> Results reported here draw heavily on Cherkes(2003) .

We start with establishing a framework for analyses. Assume a small investor is interested in adding to her investment portfolio \$100 NAV of lowest-liquidity California municipal bonds. As showed above, this makes her a client of CEFs specializing in California municipal bonds. Let there be only two such CEFs, fund A and fund B. Fund A is a newly IPOed fund (offered at IPO premium  $\pi$ ), whereas fund B is a seasoned fund that trades at discount  $d$ .

We assume that there are no differences in the quality of A's and B's fund management; and that A will trade in post-IPO period at the same discount  $d$  as B. Then a rational investor should choose the cheapest route to acquire of \$100 NAV: she should invest in the IPO only when the "costs" of fund A are lower than of fund B. Buying fund A results in expenditure of  $\$(1+\pi)$  for every \$1 NAV. Buying fund B will give the investor \$1 NAV at a cost of  $\$(1+b-d)$ , where  $b$  is the brokerage cost (in %) incurred while buying shares of an existing fund and  $d$  represents the savings from buying \$1NAV at a discount. A rational investor will buy a newly IPOed fund only if  $(1+\pi) < (1+b-d) \Leftrightarrow \pi - b < -d$  (1).

The IPO costs (represented by  $\pi$ ) are within the 4%-6 % range and discount brokerage costs in our sample period (1986-2000) were below 4%, i.e., rational investors invest in CEF IPOs only when existing funds trade at a premium<sup>53</sup>. We tested this result for a number of homogeneous narrow asset classes and found that this requirement of rationality is observed in the Markets: new funds are brought to the market only when seasoned same-asset CEFs trade at a premium. Graph I exhibits the pattern for California munis. [Analogous results for other narrow asset classes are reported in

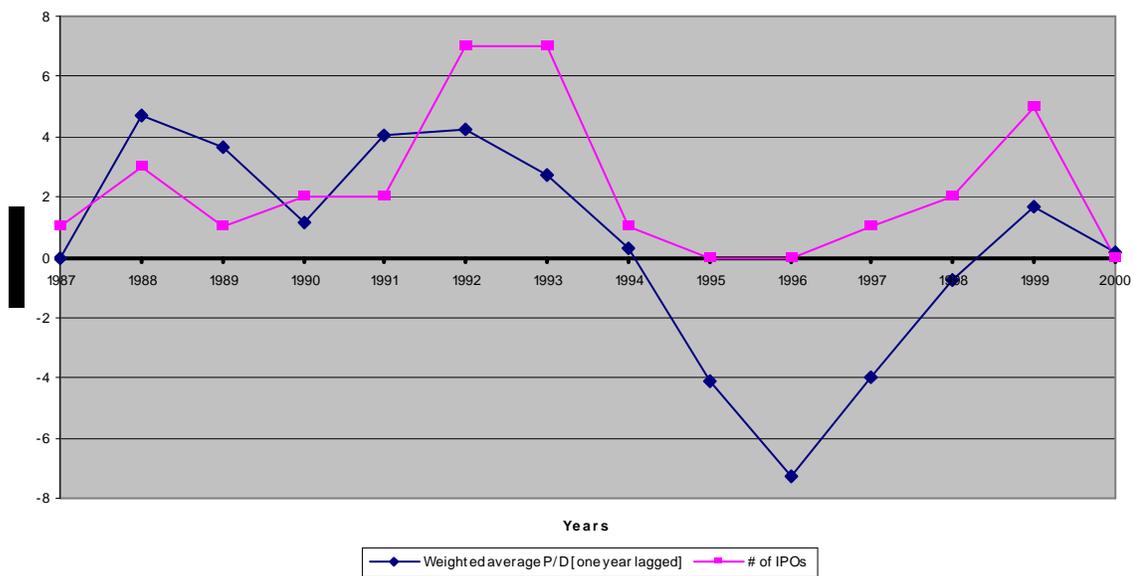
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<sup>53</sup> Here is a numerical example. Assuming  $\pi = 5\%$ ,  $b = 2\%$ , equation (1) gives  $d = -3\%$  (i.e., 3% premium).

Cherkes (2002)<sup>54</sup>.] Investors are indifferent between paying the inflated IPO price and buying seasoned same-asset CEFs at a premium plus brokerage.

This observation provides an economic rationale for the timing of new entries: they occur when seasoned same-asset CEFs trade at premium, i.e., when the demand for intermediation services in a particular asset class is larger than the available amount of services. New entry increases supply of intermediation services. As any search process, it may provide “too much” of the new supply, thus causing the average premium of same-asset CEFs to decrease or even to become negative. But a rational investor cannot avoid the IPO cost if she is interested in acquiring that asset class.

**Graph I- California Muni CEFs**



<sup>54</sup> These classes are California Munis (25 IPOs); New York Munis (22 IPOs), NJ Munis (10 IPOs), Florida munis (15 IPOs); National Muni Bonds (99 IPOs); High-Yield Corporate bonds (32 IPOs); Government bonds (31 IPOs); Multi-Sector Bonds (28 IPOs) and Income Funds (16 IPOs). All together they cover 288 Funds out of 538 IPOs, about 55% of all IPOs in the 1986-2000 periods

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