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Investor Sentiment and the Closed-End Fund Puzzle

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ABSTRACT

This paper examines the proposition that fluctuations in discounts of closed-end funds are driven by changes in individual investor sentiment. The theory implies that discounts on various funds move together, that new funds get started when seasoned funds sell at a premium or a small discount, and that discounts are correlated with prices of other securities affected by the same investor sentiment. The evidence supports these predictions. In particular, we find that both closed-end funds and small stocks tend to be held by individual investors, and that the discounts on closed-end funds narrow when small stocks do well.

FEW PROBLEMS IN FINANCE are as perplexing as the closed-end fund puzzle. A closed-end fund, like the more popular open-end fund, is a mutual fund which typically holds other publicly traded securities. Unlike an open-end fund, however, a closed-end fund issues a fixed number of shares that are traded on the stock market. To liquidate a holding in a fund, investors must sell their shares to other investors rather than redeem them with the fund itself for the net asset value (NAV) per share as they would with an open-end fund. The closed-end fund puzzle is the empirical finding that closed-end fund shares typically sell at prices not equal to the per share market value of assets the fund holds. Although funds sometimes sell at premia to their net asset values, in recent years discounts of 10 to 20 percent have been the norm.

Several past studies have attempted to solve the puzzle by pointing out that the methods used to value the securities in the portfolio might overstate the true value of the assets. Three factors are often cited as potential explanations: agency costs, tax liabilities, and illiquidity of assets. The agency costs theory states that management expenses incurred in running the fund are too high and/or the potential for subpar managerial performance reduces asset value. The tax explanation argues that capital gains tax

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liabilities on unrealized appreciations (at the fund level) are not captured by the standard calculation of NAV. Finally, because some funds hold restricted or letter securities which have trading restrictions, the argument has been made that such assets are overvalued in the calculation of NAV. While each of these explanations is logical and may explain some portion of the observed discounts, we show below that even collectively these factors fail to account for much of the existing evidence.

Our primary purpose is to evaluate empirically an alternative explanation for the closed-end fund puzzle presented by Zweig (1973) and Delong, Shleifer, Summers, and Waldmann (1990) (DSSW). Zweig (1973) suggests that discounts on closed-end funds reflect expectations of individual investors. DSSW develop a model in which rational investors interact in financial markets with noise traders who are less than fully rational. An important feature of their model is the existence of unpredictable fluctuations in "noise trader sentiment," defined as the component of expectations about asset returns not warranted by fundamentals. Investor sentiment can represent trading on noise rather than news (Black (1986)) or trading on popular models (Shiller (1984)). In the case of closed-end funds, fluctuations in investor sentiment can lead to fluctuations in demand for closed-end fund shares which are reflected in changes in discounts. In addition to Zweig's early idea that fund discounts reflect investor sentiment, the DSSW model explains why funds can sell at discounts even if investors are not, on average, pessimistic. Our paper reviews and extends the implications of this model, and then presents empirical evidence largely consistent with these implications.

Before the various explanations of closed-end fund pricing can be evaluated, it is important to provide a more complete description of the facts. There are four important pieces to the puzzle which together characterize the life cycle of a closed-end fund:

1) Closed-end funds start out at a premium of almost 10 percent, when organizers raise money from new investors and use it to purchase securities (Weiss (1989) and Peavy (1990)). Most of this premium is a natural derivative of the underwriting and start-up costs which are removed from the proceeds, thus reducing the NAV relative to the stock price. The reason that investors pay a premium for new funds when existing funds trade at a discount is the first part of the puzzle to be explained.

2) Although they start at a premium, closed-end funds move to an average discount of over 10 percent within 120 days from the beginning of trading (Weiss (1989))[1]. Thereafter, discounts are the norm. For illustrative purposes, Figure 1 shows the year-end discounts on the Tricontinental Corporation (TRICON) fund during 1960–1986. Tricontinental is the largest closed-end stock fund trading on U.S. exchanges, with net assets of over $1.3 billion as of December, 1986. Although there are some periods where the fund sells

[1]The sample in the Weiss study is closed-end funds started during 1985–87. The average discount figure cited relates to stock funds investing in U.S. companies.

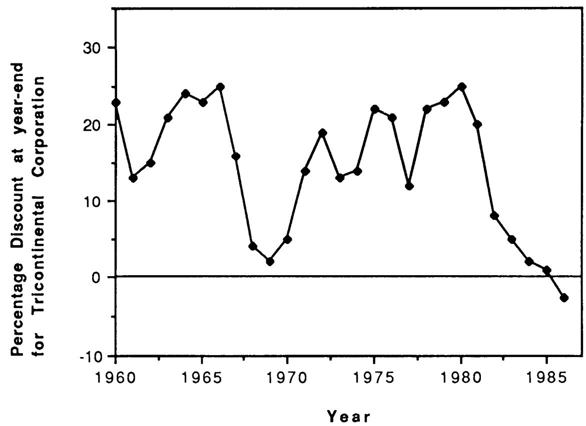

Figure 1. Percentage discount or premium of Tricontinental Corporation at the end of each year during 1960–1986. The percentage discount is computed as 100 × (NAV − SP); where NAV is the per share net asset value and SP is the share price of the fund. The mean (median) of the percentage discount or premium is 14.43 (15.0). The maximum (minimum) value is 25.0 (−2.5) and the standard deviation is 8.56.

at a premium relative to the NAV, most of the time it sells at a discount, which frequently hovers around 20 percent.[2]

3) As Figure 1 illustrates for TRICON, discounts on closed-end funds are subject to wide fluctuations over time. During 1960–1986, year-end discounts for TRICON ranged from 25 percent to a premium of 2.5 percent. It is by no means the case that the discount is a constant fraction of net asset value (or a constant dollar amount). The fluctuations in the discounts appear to be mean reverting (Sharpe and Sosin (1975)). Thompson (1978), Richards, Fraser, and Groth (1980), Herzfeld (1980), Anderson (1986), and Brauer (1988) all document significant positive abnormal returns from assuming long positions on funds with large discounts.

4) When closed-end funds are terminated through either a liquidation or an open-ending, share prices rise and discounts shrink (Brauer (1984), Brickley and Schalheim (1985)). Most of the positive returns to shareholders accrue when discounts narrow around the announcement of termination. A small discount persists, however, until final termination or open-ending.

Our purpose is to understand this four-piece puzzle. In Section I we argue that standard explanations of the puzzle cannot, separately or together, explain all four pieces of the puzzle. We review the DSSW explanation of the puzzle in Section II and discuss some implications of this explanation. Section III covers data and variables description. Section IV presents our tests of the new implications, and Section V deals with some objections. Section VI

[2]Throughout this paper, discounts are expressed in terms of percentage of NAV. Positive discounts reflect stock prices which are below NAV.

presents supplementary evidence bearing on this explanation of closed-end fund discounts, and Section VII concludes.

I. Standard Explanations of the Closed-end Fund Puzzle

Agency costs, illiquidity of assets, and tax liabilities have all been proposed as potential explanations of closed-end fund discounts. However, these arguments, even when considered together, do not explain all four pieces of the closed-end fund puzzle. This section reviews these arguments.

A. Agency Costs

Agency costs could create discounts for closed-end funds if management fees are too high or if future portfolio management is expected to be subpar (Boudreaux (1973)). There are several problems with agency costs as a theory of closed-end fund pricing. First, neither current nor future agency costs can account for the wide fluctuations in the discounts. Management fees are typically a fixed percentage of NAV and certainly do not fluctuate as much as do discounts. The present value of future management fees can in principle fluctuate with interest rates. However, as we show later (Table IX), changes in discounts are not significantly correlated with interest rate changes. Second, agency costs cannot explain why rational investors buy into closed-end funds *initially* at a premium, since they should expect the funds to sell at a discount eventually. For that matter, agency and trading costs cannot explain why new and seasoned funds ever sell at premia. Third, agency costs do not seem to explain much of the cross-sectional variation in discounts. Malkiel (1977) did not find a significant relationship between management fees and/or fund performance and discount levels. By grouping funds into two groups, based on their discounts, Roenfeld and Tuttle (1973) did find, in a very small sample, marginal support for a contemporaneous relationship between fund performance and discounts. However, assuming rational expectations, a more appropriate test is to check for a relation between discounts and *future* NAV performance of funds, not past or current performance. Lee, Shleifer and Thaler (1991) show that there is, if anything, a positive correlation between discount levels and future NAV performance; funds with large discounts tend to have higher subsequent NAV performance than those with low discounts. This result is the opposite of what might be expected from rational discounting of agency costs.

B. Illiquidity of Assets

Two other theories posit that the NAV published by the funds exaggerates the true asset value. The first theory, the *restricted stock hypothesis*, says that funds hold substantial amounts of letter stock, the market value of which is lower than its unrestricted counterpart, and that such holdings are overvalued in the calculation of NAV.[3] This idea can be ruled out immediately as a general explanation of discounts since many of the largest funds that trade at discounts hold only liquid publicly traded securities. For example, TRICON does not have any significant restricted holdings. An examination of the annual financial statements of TRICON reveals that for the years during the period studied, the assets which either required Board of Directors' valuation or were marked as "unidentified" common stocks are always less than 0.5 percent of the total NAV of the fund.

The effect of holding restricted stocks is also mitigated by regulation, which requires the funds to discount such securities in computing NAV to an amount which their Boards of Directors have determined (and publicly attest) is a fair market value equivalent. Nevertheless, there is a small but significant relationship in the cross section between the level of restricted holdings and the level of discounts (see for example Malkiel (1977) and Lee, Shleifer, and Thaler (1991)). Apparently, the market does not believe the funds have adequately discounted these securities. Restricted stock holdings can thus explain a portion of the discount on certain specialized funds, but it offers no explanation for the substantial discounts of large, diversified funds.

Another version of the illiquidity argument, the *block discount hypothesis*, is based on the observation that reported NAV's are computed using the trading price of a marginal share. Since closed-end funds sometimes hold substantial blocks of individual securities, the realizable proceeds from a liquidation would be much lower than the reported NAV. Like the restricted stock hypothesis, this argument runs counter to the evidence that large abnormal positive returns are realized when closed-end funds are open-ended (Brauer (1984), Brickley and Schallheim (1985)). Also, neither theory makes any contribution to explaining the other parts of the puzzle.

C. Capital Gains Tax Liabilities

The NAV of a closed-end fund does not reflect the capital gains tax that must be paid by the fund if the assets in the fund are sold.[4] The tax liability associated with assets which have appreciated in value would reduce the liquidation value of the fund's assets. This theory runs into a serious problem with the evidence in Brauer (1984) and Brickley and Schallheim (1985). These papers show that on open ending, closed-end fund prices move up to net asset values rather than the net asset values falling down to the fund share

[3]Letter, or restricted, stock refers to securities of a corporation which may not be publicly traded without registration under the Securities Act of 1933, because they have not been previously registered. A fund acquires these securities through private placement and agrees to a "letter" contract restricting their resale to the public within a specified time period. These securities can be resold privately with the letter attached.

[4]The fund has a choice of retaining or distributing its net realized capital gains. If the fund distributes these gains, owners of the fund's shares must pay tax on the distributions according to their own personal tax status. If the fund retains a portion of its net realized capital gains, it is required to pay taxes in accordance with the highest marginal personal tax rate. A tax receipt is then issued to the shareholders which is deductible from personal income taxes.

prices, as would be the case if the measured net asset values were too high.[5] Moreover, Malkiel (1977) demonstrates that under fairly generous assumptions, the tax liabilities can account for a discount of no more than 6 percent.[6] Also, the tax theory suggests that discounts should widen when the market rises (since unrealized appreciation tends to increase in a bull market), contrary to the evidence we present below.

To summarize, standard explanations have been marginally successful (for some funds) in explaining Part 2 of our 4-part puzzle, i.e., the existence of discounts. However, the existing theories do not provide satisfactory explanations for the other parts of the puzzle: why funds get started, why the discounts fluctuate over time, and why large positive abnormal returns are realized when the fund is open-ended. Perhaps most important, each of these explanations deals with the puzzle of closed-end funds selling at discounts and fails to explain why sometimes funds sell at premia, particularly when they are started. Even taken collectively, these explanations cannot account for all the evidence. In the next section, we present an alternative explanation that not only accommodates these apparent anomalies, but also yields further testable hypotheses.

II. Investor Sentiment

A. Noise Trader Risk

DSSW (1990) present a model of asset pricing based on the idea that the unpredictability of the opinions of not-fully-rational investors (or noise traders) impounds resale price risk on the assets they trade. In this model, there are two types of investors: rational investors and noise traders. Rational investors form rational expectations about asset returns. In contrast, noise traders' expectations about asset returns are subject to the influence of sentiment: they overestimate the expected returns (relative to the rational expectation) in some periods and underestimate them in others. Each period, rational investors and noise traders trade the assets based on their respective beliefs. Because assets are risky and all investors are risk averse, the equilibrium price reflects the opinions of both the rational investors and the noise traders.

DSSW then make two crucial assumptions. First, they assume that rational investors' horizons are short, so that they care about the interim resale prices of the assets they hold, not just the present values of dividends. This

[5]As pointed out to us by Jeffrey Pontiff, the evidence from open-ended funds is subject to selection bias. Another possibility, which is difficult to test, is that the NAV is properly measured only for the funds that open-end.

[6]The key assumptions in this calculation are the percentage of unrealized appreciation in the assets, the period of time before the asset is sold by the fund, and the holding period of the investor after the sale. Malkiel assumed the unrealized appreciation was 25 percent of the fund's assets and, in the worst case, the asset was sold immediately by the fund and the shares were sold immediately thereafter by the investor (which would maximize his tax liability) to arrive at the 6 percent amount. A more probable estimate, given the 25 percent unrealized appreciation, would be around 2 percent.

assumption is realistic. Portfolio managers are subject to frequent, periodic evaluations which shorten their horizons while individuals often have liquidity needs for selling. Also, the longer a rational investor keeps his trade open the higher are the cumulative transaction costs if either cash or assets have to be borrowed for that trade. Short sales, in particular, are difficult and costly over any long horizon. These costs of arbitrage tend to shorten investors' horizons and make them concerned with interim resale prices (Shleifer and Vishny (1990)).

Second, DSSW assume that noise traders' sentiment is stochastic and cannot be perfectly forecasted by rational investors. In particular, a rational investor cannot perfectly forecast how optimistic or pessimistic noise traders will be at the time he wants to sell the asset. Because rational investors care about the resale prices of assets, the unpredictability of noise trader sentiment impounds an additional risk on the assets they trade. The extra risk is that at the time a rational investor wants to sell an asset, noise traders might be bearish about it, causing its price to be low. As long as a rational investor might want to sell the asset in finite time, the risk of an adverse sentiment shift is every bit as real as fundamental risk of low dividends. This noise trader risk is borne by both rational investors and noise traders.

If different noise traders traded randomly across assets, the risk their sentiment would create would be diversifiable, just as idiosyncratic fundamental risk is diversifiable in conventional pricing models. However, if fluctuations in the same noise trader sentiment affect many assets and are correlated across noise traders, then the risk that these fluctuations create cannot be diversified. Like fundamental risk, noise trader risk arising from the stochastic investor sentiment will be priced in equilibrium. As a result, assets subject to noise trader risk will earn a higher expected return than assets not subject to such risk. Relative to their fundamental values, these assets will be underpriced.

DSSW discuss closed-end funds as an interesting application of their model. Suppose that noise traders' expectation about future returns is subject to unpredictable changes. Some of the time noise traders are optimistic about returns on these securities and drive up their prices relative to fundamental values. For securities where fundamental values are hard to observe, the effects of this optimism will be hard to identify. But in the case of closed-end funds, investor optimism will result in their selling at premia or at smaller discounts. Other times, noise traders are pessimistic about returns on these securities, drive down their prices, and so closed-end funds sell at larger discounts. In this way, stochastic changes in demand for closed-end funds by investors with unpredictably changing expectations of returns cause stochastic fluctuations in the discounts.

In this model, the risk from holding a closed-end fund (and any other security subject to the same stochastic sentiment) consists of two parts: the risk of holding the fund's portfolio and the risk that noise trader sentiment about the funds changes. In particular, any investor holding a closed-end fund bears the risk that the discount widens in the future if noise traders become relatively more pessimistic about closed-end funds. As long as this risk from the unpredictability of future investor sentiment is systematic, i.e., if investor sentiment affects many assets at the same time, this risk will be priced in equilibrium. When investor sentiment risk is systematic, it will affect a wide range of securities which includes, but is not limited to, closed-end funds. Investor sentiment in the DSSW model, therefore, reflects expectations which are market-wide rather than closed-end fund specific.

B. Individual Investor Sentiment

One additional element is needed in applying the DSSW model to closed-end funds—differential clienteles. Specifically, it is necessary to assume that noise traders are more likely to hold and trade closed-end funds than the underlying assets in the funds' portfolios. If the same investors are investing in both the underlying securities and in the fund shares, then any change in investor sentiment will affect both the NAV and the share price, resulting in no change in the discount. Changes in the discount reflect not the aggregate effect of investor sentiment changes but the differential effect of the sentiment of the closed-end fund investing clientele relative to the investing clientele of the underlying assets. In this paper, we speculate that the discount movements reflect the differential sentiment of individual investors since these investors hold and trade a preponderance of closed-end fund shares but are not as important an ownership group in the assets of the funds' investment portfolio.

There is ample evidence that closed-end funds are owned and traded primarily by individual investors. For example, Weiss (1989) found that three calendar quarters after the initial offering of new closed-end funds, institutions held less than 5 percent of the shares, in comparison to 23 percent of the shares of a control sample of IPO's for operating companies. Similarly, we found the average institutional ownership in the closed-end funds in our sample (Appendix I) at the beginning of 1988 to be just 6.6 percent (median 6.2 percent). For the sake of comparison, average institutional ownership for a random sample of the smallest 10 percent of NYSE stocks is 26.5 percent (median 23.9 percent), and 52.1 percent (median 54.0 percent) for the largest 10 percent of NYSE stocks. Using intraday trading data, we have also found that in 1987, 64 percent of the trades in closed-end funds were smaller than $10,000. This number is 79 percent for the smallest 10 percent of NYSE stocks and only 28 percent for the largest 10 percent of NYSE stocks.[7] Collectively, the evidence strongly indicates that closed-end funds are both held and traded primarily by individual investors.

[7]Decile membership is based on total market capitalization at the beginning of each year. Firms are sorted by CUSIP, and every third firm is selected to form the random sample. Inclusion in the final sample is subject to availability of data. There were 44–48 firms in each decile portfolio of the final sample. Percentage institutional ownership is based on the first issue of the *Standard and Poor's Stock Report* in each year after adjusting for known closely-held shares and block holdings. That is, the values reported are percentages of institutional holdings, divided by (100 − percent of closely-held or block shares). The intraday trading data is from the Institute for the Study of Security Markets (ISSM) based at Memphis State University.

This evidence leads us to conjecture that the sentiment that affects closed-end fund discounts should also affect other securities that are held and traded predominantly by individual investors. As the evidence cited above shows, one set of such securities is small firms. If smaller capitalization stocks are subject to the same individual investor sentiment as closed-end funds, then fluctuations in the discounts on closed-end funds should be correlated with the returns on smaller stocks. When enough stocks in addition to closed-end funds are affected by the same investor sentiment, risk from this sentiment cannot be diversified and is therefore priced.

C. Arbitrage

The notion that holding a closed-end fund is riskier than holding its portfolio runs into an obvious objection. Why can't a rational arbitrageur buy the fund selling at a discount and sell short its portfolio? Since the fund costs less than its underlying assets, there is wealth left over after this perfectly hedged transaction, and the dividends that the fund distributes will cover the dividends on the investor's short position. In practice, however, there are several problems with this strategy.

First, if the fund changes its portfolio, the arbitrageur must similarly change the portfolio that is sold short. This may be difficult to accomplish in a timely manner. Second, investors do not get the full proceeds of a short sale: the hedge is not costless.[8] Third, even if these practical problems could be solved, the hedge would not be a pure arbitrage opportunity unless the arbitrageurs have an infinite time horizon and are never forced to liquidate their positions.[9] If, in contrast, an arbitrageur might need to liquidate at some finite time, then he faces the risk that the discount has widened since the time the arbitrage trade was put on. If the discount widens, the arbitrage trade obviously results in a loss. Arbitrageurs would never need to liquidate their positions if they received the full proceeds from the initial short sales, since the initial investment would have been negative, and all future cash flows would be zero. But, since arbitrageurs do not get full proceeds, they might need to liquidate to obtain funds. In such cases, bearing noise trader risk is unavoidable. As long as arbitrageurs do not have infinite horizons, arbitrage against noise traders is not riskless because the discount can widen. Because of this risk, arbitrageurs take only limited positions, and mispricing can persist.

A possible alternative to the "buy and hold" arbitrage is a takeover of a closed-end fund, followed by a sell-off of its assets to realize the net asset value. The theoretical impediment to such takeovers has been identified by Grossman and Hart (1980) who show that free-riding fund shareholders would not tender their shares to the bidder unless they receive full net asset value. Because making a bid is costly, the bidder who pays full NAV cannot

[8]See Herzfeld (1980) for a similar strategy that can be implemented using call options.

[9]For an analysis of the conditions necessary for arbitrage to eliminate irrationality, see Russell and Thaler (1985).

himself profit from the bid, and so no bids will take place. In practice, managerial resistance and regulatory restrictions represent formidable hurdles for the would-be bidder. For example, by 1980 the Tricontential and Lehman funds had each defeated four attempts at reorganization (Herzfield (1980)). More recently, in 1989 the Securities and Exchange Commission helped block the takeover of the Cypress fund. If acquires' profits from closed-end fund takeovers are meager after transaction costs, then it is not surprising that such takeovers have not been more common.

D. Investor Sentiment and the Four Part Puzzle

Changing investor sentiment has a number of empirical implications for the pricing of closed-end funds. Most importantly, because holding the fund is riskier than holding its portfolio directly, and because this risk is systematic, the required rate of return on assets held as fund shares must, on average, be higher than the required return on the same assets purchased directly. This means that the fund must, on average, sell at a discount to its NAV to induce investors to hold the fund's shares. Note that to get this result we do not need to assume that noise traders are, on average, pessimistic about funds: the average underpricing of closed-end funds comes solely from the fact that holding the fund is riskier than holding its portfolio. This theory is therefore consistent with the main puzzle about closed-end funds: they sell at a discount.

The theory is also consistent with the other three pieces of the puzzle. First, it implies that when noise traders are particularly optimistic about closed-end funds (and other assets subject to the same movements in investor sentiment), entrepreneurs can profit by putting assets together into closed-end funds and selling them to the noise traders. In this model, rational investors do not buy closed-end funds at the beginning. On the contrary, if they could borrow the shares they would sell the funds short.[10] It seems necessary to introduce some type of irrational investor to be able to explain why anyone buys the fund shares at the start when the expected return over the next few months is negative. Noise traders, who are sometimes far too optimistic about the true expected return on the fund shares, serve that purpose in the model. In this theory, then, there is no "efficiency" reason for the existence of closed-end funds. Like casinos and snake oil, closed-end funds are a device by which smart enterpreneurs take advantage of a less sophisticated public.

Second, the theory implies that discounts on closed-end funds fluctuate with changes in investor sentiment about future returns (on closed-end funds and other securities). In fact, this theory *requires* that discounts vary stochastically since it is precisely the fluctuations in the discounts that make holding the fund risky and therefore account for average underpricing. If the discounts were constant, then the arbitrage trade of buying the fund and

[10] Peavy (1990) shows that underwriters of closed-end funds buy shares in the aftermarket of support the price. Discussions we had with a professional trader of closed-end funds indicate that short selling of closed-end fund IPO's is extremely difficult.

selling short its portfolio would be riskless even for a short horizon investor, and discounts would disappear.

Third, the theory explains why funds' share prices rise on the announcement of open-ending and why discounts are reduced and then eliminated at the time open-ending or liquidation actually occurs. When it is known that a fund will be open-ended or liquidated (or, as Brauer (1988) points out, even when the probability of open-ending increases appreciably), noise trader risk is eliminated (or reduced), and so is the discount. Notice that this risk is largely eliminated when open-ending or liquidation is announced, since at that time any investor can buy the fund and sell short its portfolio knowing that upon open-ending his arbitrage position can be profitably closed for sure. The risk of having to sell when the discount is even wider no longer exists. The small discount that remains after the announcement of open-ending or liquidation can only be explained by the actual transactions costs of arbitrage (the inability to receive short-sale proceeds or the unobservability of the fund's portfolio) or the effect of some of the standard explanations mentioned earlier. The investor sentiment theory thus predicts that the discounts which remain after the announcement of open-ending or liquidation should become small or disappear eventually.

E. Additional Implications

The investor sentiment explanation of discounts on closed-end funds appears to perform better than alternative theories in explaining the key stylized facts. More interestingly, it has a number of additional implications which have not been derived or tested in the context of other theories of discounts. As with the implications discussed above, the new implications are derived from the idea that discounts on closed-end funds reflect widespread changes in investor sentiment rather than idiosyncratic changes in each fund's management or operations.

The first implication is that levels of and changes in discounts should be highly correlated across funds. Since the same sentiment drives discounts on all funds as well as on other securities, changes in this sentiment should determine changes in discounts.

Second, the observation that funds can get started when noise traders are optimistic about their returns can be taken further. Specifically, to the extent closed-end funds are substitutes, the model predicts that new funds should get started when investors favor seasoned funds as well, i.e., when old funds sell at a premium or at a small discount. This effect might be obscured by short-selling constraints on new funds, and the fact that new funds are not perceived as perfect substitutes for seasoned funds. Nevertheless, we test this implication by examining the behavior of the discounts on seasoned funds when new funds are started.

The third implication of the theory is perhaps the most interesting and surprising. The theory requires that for investor sentiment to affect closed-end fund prices, despite the workings of arbitrage, the risk created by changes in investor sentiment must be systematic. The same investor sentiment that affects discounts on closed-end funds must affect other assets as well which have nothing to do with closed-end funds. For example, returns on some portfolios of stocks might be correlated with changes in the average discount on closed-end funds, controlling for market returns. Portfolios affected by the same sentiment as closed-end funds should do well when discounts narrow and poorly when discounts widen. The theory itself does not specify which securities will be influenced by the same sentiment as closed-end funds. However, as we argued above, smaller capitalization stocks are good candidates since individual investors specialize in holding both smaller stocks and closed-end funds.

Other models of closed-end fund discounts are either silent about these predictions, or else they yield opposite results. The evidence we present below, then, is either orthogonal to alternative theories, or else enables us to differentiate between them and the investor sentiment explanation of discounts.

III. Data and Variable Description for the Basic Analysis

Our closed-end fund data were collected from two main sources. Information on annual discounts and net asset values, as well as background information on each fund, was obtained from the 1960 to 1987 editions of Wiesenberger's *Investment Companies Services* annual survey of mutual funds. We were also able to obtain the year that each fund started from these sources.[11] A total of 87 funds were initially identified through this source, of which 68 were selected for monthly analysis because they were known to have CUSIP identifiers.[12] For these funds, we collected the weekly net asset value per share, stock price, and discount per share as reported by the *Wall Street Journal* (WSJ) between July, 1956 and December, 1985 (inclusive). Each week, generally on Monday, the WSJ reports Friday closing prices, NAV, and discounts. To convert the data into a monthly series, the Friday which was closest to each month end was taken, so each observation is within 3 days of the last day of the month.[13] The NAV per share information from the WSJ

[11] More detailed information, such as the composition of the TRICON portfolio, were obtained by examining the financial statements of the fund. Also, to ensure that funds which were open-ended during our period of study were included in the count of fund starts, we checked funds reported in Wiesenberger against the list of funds in Brickley and Schallheim (1985) as well as Brauer (1984).

[12] We are indebted to Greg Brauer for providing us with this list of funds.

[13] The use of a monthly interval allows for comparison with other macroeconomic variables. Various validity checks were employed both during the data collection and later analysis to ensure the integrity of this data. The inputting of a NAV and stock price, for example, generated an automatic discount calculation on the input screen which was checked against the figure reported in the WSJ. After input, univariate statistics were computed on all large funds to check for outliers, and unusual observations were traced back to the WSJ. Occasional inaccuracies in the WSJ figures were corrected through appeal to numbers reported in adjacent weeks. There were two weeks for which the WSJ did not appear to have reported this data. In constructing the monthly series the next closest Friday's close was used.

was then combined with the number of shares outstanding at the end of each month (obtained from the monthly master tape of the Center for Research of Security Prices (CRSP)) to arrive at the total net asset value for each fund.

For several of the tests which follow we constructed a value-weighted index of discounts (VWD) both at the annual and monthly levels as follows:

$$\mathrm{VWD}_t = \sum_{i=1}^{n_t} W_i \ \mathrm{DISC}_{it},$$

where

$$\left\{\begin{array}{l} W_i = \dfrac{\mathrm{NAV}_{it}}{\sum_{i=1}^{n_t} \mathrm{NAV}_{it}}, \qquad \mathrm{NAV}_{it} = \text{net asset value of fund } i \text{ at end of period t} \\ \mathrm{DISC}_{it} = \dfrac{\mathrm{NAV}_{it} - \mathrm{SP}_{it}}{\mathrm{NAV}_{it}} \times 100, \\ \mathrm{SP}_{it} = \text{stock price of fund } i \text{ at end of period t} \\ n_t = \text{the number of funds with available } \mathrm{Disc}_{it} \text{ and } \mathrm{NAV}_{it} \text{ data at the} \\ \qquad \text{end of period t} \end{array}\right.$$

We also computed changes in the value-weighted index of discounts (ΔVWD). For this measure, we computed VWD in a similar fashion, except we required that each fund included in the index must have the DISC and NAV data available for months t and t − 1, so that monthly changes in the index are computed over the same asset base. In other words, we require common membership in adjacent months. We then defined ΔVWD to be:

$$\Delta\mathrm{VWD}_t = \mathrm{VWD}_t - \mathrm{VWD}_{t-1}$$

The change in the value-weighted index of discounts (ΔVWD) was computed both annually and with monthly data. For the monthly series, we computed this variable several ways. In the first case we excluded funds which specialize in foreign securities, specifically the ASA Fund and the Japan Fund. In the second case we excluded bond funds (funds which invest primarily in debt securities). The results were similar irrespective of the ΔVWD measure used. The reported findings were based on ΔVWD computed using both foreign and domestic stock funds (i.e., excluding bond funds but including both the ASA Fund and the Japan Fund). This time-series spanned 246 months (7/65 to 12/85).

Of the original sample of 68 funds, 18 were either missing data from the WSJ or did not have shares information available on CRSP and 30 others were bond funds. This left a total of 20 stock funds which participated in the monthly ΔVWD series (see Appendix I for listing). Of these remaining funds, some had relatively short life spans, others may occasionally have missing data points, so the actual number of funds included in computing VWD and ΔVWD varied from month to month. The stock fund ΔVWD series had monthly memberships ranging from 7 funds to 18 funds. In the vast majority

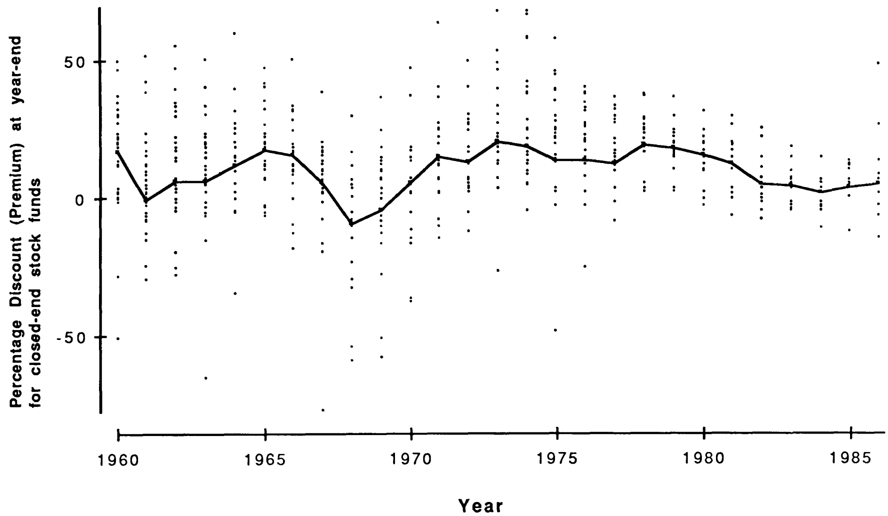

Figure 2. Percentage discount or premium at the end of the year for all closed-end stock funds during 1960–1986. The percentage discount is computed as 100 × (NAV − SP); where NAV is the per share net asset value and SP is the share price of the fund. The sample includes all 46 stock funds reported in the *Wiesenberger Investment Companies Services* Annual survey during this period. The discount on a value-weighted portfolio of these funds is represented by the solid line.

of months, at least 10 funds were in the index. We show later that the key findings in this paper are relatively insensitive to the choice of funds which are included in the value-weighted index.

IV. Evidence

A. Co-movements in Discounts of Different Funds

The investor sentiment model predicts that the discounts on closed-end funds will be correlated. Figure 2 shows the levels of discounts for all closed-end stock funds at the end of each year during 1960–1986. The clear impression is that discounts on individual funds are highly correlated. In fact, the average pairwise correlation of *year-end discounts* for domestic funds is 0.497 (0.607 for diversified domestic funds). Individual pairwise correlations range from insignificant with specialized funds to above 0.8 for some diversified domestic funds. The average pairwise correlation of *annual changes* in discounts among domestic stock funds is 0.389.

The same conclusion emerges from an examination of monthly pairwise correlations. Tables I and II present the monthly correlations of both levels and changes in discounts for several major funds. The ten funds in these tables have the highest number of available observations over the study period. With the notable exception of American South African (ASA) Fund and the Japan Funds (two foreign funds), and perhaps Petroleum Resources (a fund specializing in oil and gas stocks), the levels of discounts on different

Table I

Correlation of Monthly Discounts of Individual Funds

Correlation between *levels of discounts at month end* for nine individual funds, the discount on a value-weighted portfolio of all closed-end stock funds (VWD) and the total value of all New York Stock Exchange firms, NYVAL (7/65 to 12/85). The pairwise Pearson product-moment correlation and p-value for a two-tailed test of the null hypothesis of zero correlation are shown, as is the number of observations.

	AdExp	ASA	CentSec	GenAm	Japan	Lehman	Niag	Petr	TriCon	VWD
AdExp	—									
ASA	0.266 0.0001 225	—								
CentSec	0.654 0.0001 159	−0.286 0.0003 155	—							
GenAm	0.737 0.0001 242	0.065 0.3279 227	0.596 0.0001 159	—						
Japan	0.430 0.0001 239	0.235 0.0004 225	0.512 0.0001 158	0.395 0.0001 241	—					
Lehman	0.830 0.0001 240	0.303 0.0001 225	0.693 0.0001 159	0.785 0.0001 242	0.643 0.0001 239	—				
Niag	0.596 0.0001 242	0.106 0.1104 227	0.266 0.0007 158	0.633 0.0001 244	0.533 0.0001 241	0.753 0.0001 242	—			
Petr	0.378 0.0001 243	0.165 0.0129 226	0.159 0.0447 159	0.254 0.0001 243	−0.084 0.1947 240	0.230 0.0002 241	0.198 0.0019 243	—		
TriCon	0.651 0.0001 241	0.075 0.2630 226	0.651 0.0001 157	0.459 0.0001 243	0.533 0.0001 240	0.666 0.0001 241	0.671 0.0001 243	0.279 0.0001 242	—	
VWD	0.810 0.0001 243	0.427 0.0001 228	0.539 0.0001 159	0.711 0.0001 245	0.651 0.0001 242	0.893 0.0001 243	0.767 0.0001 245	0.281 0.0001 244	0.805 0.0001 244	—
NYVAL	−0.019 0.7721 243	0.477 0.0001 228	−0.860 0.0001 159	−0.254 0.0001 245	−0.053 0.4130 242	−0.046 0.4714 243	−0.084 0.1891 245	−0.016 0.7976 244	−0.316 0.0001 244	−0.056 0.2787 246

funds show a high level of correlation.[14] The average pairwise correlation of month-end discounts for domestic funds is 0.530 (0.643 for diversified domestic funds). The average pairwise correlation of monthly changes in discounts

[14]The reasons for the low correlations of discounts of foreign and domestic funds may have to do with special influences on foreign funds, such as exchange and trading controls, and possibly with different investor sentiments about foreign funds. ASA also has unique risks in that it specializes in South African gold stocks.

Table II

Correlation of Changes in the Monthly Discounts of Individual Funds

Correlation of *changes in the monthly discounts* between nine individual funds, a value-weighted portfolio of all closed-end stock funds (ΔVWD) and the monthly return on a value-weighted portfolio of all New York Stock Exchange firms, VWNY (7/65 to 12/85). The pairwise Pearson product-moment correlation and *p*-value for a two-tailed test of the null hypothesis of zero correlation are shown, as is the number of observations.

	AdExp	ASA	CentSec	GenAm	Japan	Lehman	Niag	Petr	TriCon	ΔVWD
AdExp	—									
ASA	−0.054 0.3687 207	—								
CenSec	0.424 0.0001 155	0.037 0.6530 149	—							
GenAm	0.301 0.0068 237	−0.622 0.3687 211	0.063 0.4374 155	—						
Japan	−0.028 0.6732 232	0.0189 0.7870 208	−0.0311 0.7030 153	0.0181 0.7831 235	—					
Lehman	0.304 0.0001 235	0.061 0.3808 210	0.339 0.0001 155	0.406 0.0001 238	0.037 0.6700 233	—				
Niag	0.173 0.0075 237	0.082 0.236 211	0.178 0.028 153	0.188 0.0034 241	0.118 0.0719 235	0.263 0.0001 238	—			
Petr	0.269 0.0001 239	0.051 0.4650 209	0.056 0.4884 155	0.247 0.0001 239	0.173 0.0081 234	0.173 0.0077 236	0.249 0.0001 239	—		
TriCon	0.358 0.0001 235	−0.171 0.0133 209	0.238 0.0033 151	0.242 0.0002 239	0.053 0.4187 233	0.309 0.0011 236	0.247 0.0001 239	0.201 0.0018 237	—	
ΔVWD	0.419 0.0001 239	0.384 0.0001 213	0.300 0.0001 155	0.435 0.0001 243	0.165 0.0109 237	0.629 0.0001 240	0.413 0.0001 243	0.381 0.0001 241	0.561 0.0001 241	—
VWNY	0.159 0.0138 239	−0.143 0.037 213	0.199 0.0131 155	0.059 0.3638 243	−0.241 0.0002 237	0.1061 0.3229 240	0.225 0.0004 243	−0.027 0.6760 241	0.120 0.0629 241	0.013 0.8446 245

among domestic stock funds is 0.248 (0.267 for diversified domestic funds). That this comovement is captured by the VWD variable is seen in the strong correlation of this variable to the discounts of each individual fund. This is true even for the two foreign funds.

It seems clear from Tables I and II that discounts of different domestic funds tend to move together. In fact, these high correlations between discounts justify the construction of the value-weighted discount. The positive correlations are consistent with the hypothesis that discounts on different funds are driven by the same investor sentiment. Tables I and II also illustrate the point that neither the levels nor the changes in discounts on closed-end funds are related very strongly to levels of stock prices or stock returns. The correlation between the returns on the value-weighted market index (VWNY) and the changes in the value-weighted discount index (ΔVWD) is not significantly different from zero. A similar result was obtained by Sharpe and Sosin (1975). Thus, if discounts are driven by movements in investor sentiment, this sentiment is not strongly correlated with the aggregate stock market returns. As we argued above, these movements reflect the differential sentiment of individual investors.

B. When Do Funds Get Started?

The investor sentiment approach to the pricing of closed-end funds predicts that new funds get started when old funds sell at premiums or at small discounts. Testing this hypothesis presents several problems. First, over most of the period we examine, very few funds get started. Although this fact makes sense given that funds almost always trade at a discount during this period, it makes testing more difficult. Second, it takes time to organize and register a fund, which means that funds can start trading much later than the time they are conceived. These delays also raise the possibility that fund offerings are withdrawn when market conditions change, creating a bias in the time series of fund starts. Third, new funds tend to be brought to market with features which distinguish them from existing funds. In the early 1970's the funds which got started were primarily bond funds and funds specializing in restricted securities, types that had not previously existed. In the bull market of 1985–87, numerous foreign funds and so called "celebrity funds" (funds managed by well-known money managers) came to market. The former offered easy access to markets in specific foreign countries, and the latter offered an opportunity to cash in on the expertise of famous managers. To the extent seasoned funds and existing funds are not seen as perfect substitutes, new funds could get started even when seasoned funds sell at discounts.

In this paper, we do not delve deeply into fund organization and marketing issues but rather present some simple statistics. Figure 3 plots the number of stock funds started each year against the VWD at the beginning of the year. Note that fund starts tend to be clustered through time. Periods when many funds start roughly coincide with periods when discounts are relatively low. Table III compares the value-weighted discounts on seasoned funds in years when one or more new stock funds begin trading and in years where no stock funds begin trading. Between 1961 and 1986, there are 12 years in which one or more stock funds get started and 14 years in which no stock funds start.

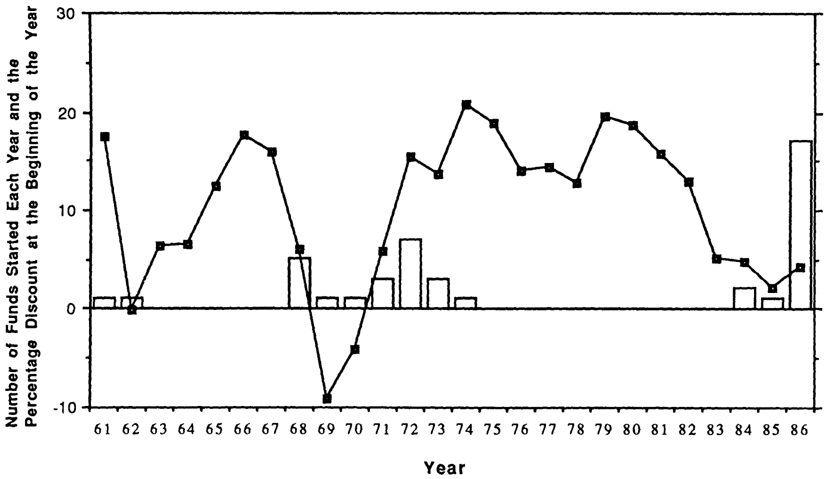

Figure 3. The number of closed-end stock funds started and the discount on stock funds at the beginning of the year. This graph shows the number of closed-end stock funds started during the year and the percentage discount on a value-weighted portfolio of closed-end stock funds at the beginning of each year during 1961 to 1986. The line graph represents the percentage discount at the beginning of the year. The bar graph represents the number of stock funds started during the year.

The average beginning-of-year discount in the former years is 6.40 percent, and the average beginning-of-year discount in the latter years is 13.64 percent. The difference between the average discounts in the two subsamples of years is significant at the 1 percent level. This result lends some support to the argument that new funds get started when discounts on old funds are lower, though the discounts are nontrivial even in the years with new start-ups. Given the caveats discussed above, the evidence on start up of new funds appears at least consistent with the investor sentiment hypothesis.

C. Discount Movements and Returns on Portfolios of Stocks

In this subsection, we present evidence on perhaps the least obvious prediction of the theory, namely that changes in the discounts on closed-end funds should be correlated with returns on baskets of stocks that may have nothing to do with the funds themselves. In particular, we look at portfolios of firms with different capitalizations, under the theory that the individual investors are significant holders and traders of smaller stocks, and so changes in their sentiment should affect both closed-end funds and smaller stocks. Since we have established that discounts on different funds move together, we use the change in the value weighted discount (ΔVWD) as a proxy for discount changes. Our measure of market returns are returns on the value-weighted index of NYSE stocks. Finally, the portfolios of stocks we consider are ten size-ranked portfolios. The first portfolio (Decile 1) are the 10 percent of all stocks that have the smallest equity value on NYSE, and the tenth

Table III

Statistical Comparison of the Value-Weighted Discount at the Beginning of the Year for Years with Fund Starts and Years without Fund Starts

Statistical comparison of the value-weighted discount at the beginning of the year for years in which *one or more closed-end stock funds* were started versus the years in which no stock funds started.**

	Years in which one or more stock funds started	Years in which no stock funds started
Mean value-weighted discount at the beginning of the year	6.40	13.64
Number of years	12	14
t-statistic for a test of a difference in means between two random samples assuming unequal variance	−2.51**	
t-statistic for a test of a difference in means between two random samples assuming equal variance	−2.63**	
z-statistic for the Wilcoxon rank sum test of a difference in means between two random samples	−2.24**	

** Significant at the 1% level in one-tailed tests (5% in two-tailed tests).

portfolio (Decile 10) are the 10 percent with the largest equity value. The portfolio rebalancing algorithm used to compute decile portfolio returns follows Chen, Roll and Ross (1986). Membership of each decile was determined at the beginning of each year and kept constant for the rest of the year. The returns of each firm in the decile were weighted by its beginning-of-month market capitalization. In case of missing returns, a firm was excluded from the portfolio for the current and following month.[15]

Table IV presents the results of time series regressions of returns of decile portfolios on market returns and on changes in VWD. As in previous studies, we find that all portfolios have market betas in the neighborhood of 1, with the smallest firms having a beta of 1.3 and largest firms having a beta of

[15]Since discounts are reported as of each Friday's close, the use of full monthly returns introduces a potential timing problem. We correct for this by computing the monthly market returns and the returns of the decile portfolios using the exact dates on which the discounts are computed. Slightly weaker results than those of Table 4 would obtain if full monthly returns are used, although the coefficient on ΔVWD would still be significant in all deciles at the one percent level (two-tailed), except for Decile 9, which is significant at the two percent level. Special thanks to Raymond Kan for suggesting this improvement.

Table IV

The Time-Series Relationship between Returns on Size-Decile Portfolios, the Market Return, and Changes in Closed-End Fund Discounts

The time-series relationship (7/65 to 12/85) between monthly returns on decile portfolios (dependent variables), changes in the monthly discount on a value-weighted portfolio of closed-end stock funds (ΔVWD), and the monthly return on a value-weighted portfolio of New York Stock Exchange firms (VWNY). Decile 10 contains the largest firms, Decile 1 the smallest. Membership in each decile is determined at the beginning of year and kept constant for the rest of the year. Returns of each firm are weighted by the beginning-of-month market capitalization. In case of missing returns, a firm is excluded from the portfolio for the current and following month. The dependent variable in the last row is the excess return of small firms over large firms, computed by subtracting Decile 10 returns from Decile 1 returns. The number of observations is 245. *t*-statistics are shown in parentheses.

Return on the decile portfolio	Intercept	ΔVWD	VWNY	Adjusted R^2
1	0.0062	−0.0067	1.238	58.7
(smallest)		(−4.94)	(18.06)	
2	0.0042	−0.0049	1.217	70.3
		(−4.83)	(23.66)	
3	0.0036	−0.0039	1.202	74.0
		(−4.20)	(26.09)	
4	0.0033	−0.0038	1.163	79.7
		(−5.07)	(30.64)	
5	0.0027	−0.0029	1.148	81.8
		(−4.12)	(32.90)	
6	0.0024	−0.0028	1.124	85.1
		(−4.65)	(37.08)	
7	0.0013	−0.0015	1.134	89.4
		(−3.03)	(45.30)	
8	0.0015	−0.0015	1.088	91.5
		(−3.45)	(51.32)	
9	0.0003	−0.0010	1.057	94.8
		(−3.14)	(66.93)	
10	−0.0005	0.0010	0.919	95.4
(largest)		(3.84)	(71.34)	
1—10	0.0067	−0.0077	0.319	13.5
		(−4.93)	(4.05)	

0.93. Beta estimates are almost identical when these regressions are run without the VWD variable. For all portfolios, we also find evidence of a correlation between returns and changes in the VWD holding market returns constant. For Decile 10, the largest firms, we find that stock prices do poorly when discounts narrow. For the other nine portfolios, stocks do well when discounts shrink.[16] The signs of the effects are as expected. When individual

[16] In Table IV, the American South-Africa (ASA) Fund is included in the calculation of the VWD. The results do not materially change if this fund is excluded.

investors become optimistic about closed-end funds and smaller stocks, these stocks do well and discounts narrow. When individual investors become pessimistic about closed-end funds and smaller stocks, smaller stocks do badly and discounts widen.[17]

For Decile 1, a drop of one percent in the monthly value weighted discount index is accompanied by an extra return of 0.67 percent per month. Since the median absolute change in the monthly discount index over our study period is 1.40, this means in a typical month the discount factor is associated with a monthly fluctuation of 0.94 percent in the Decile 1 returns. The median monthly absolute return for Decile 1 firms over this period is 3.912 percent. Thus, in a typical month, approximately 24 percent of the monthly small firm returns is accountable by discount changes, even after controlling for general market movements. For Deciles 2 through 9, the effect is in the same direction but weaker. The effect on the returns of Decile 10 firms, while statistically significant, is of a different sign and much smaller; in a typical month, about five percent of the total return is accountable by discount changes.[18]

The coefficients on the change in VWD are monotonic in portfolio size. For the smallest stocks, which typically have the highest individual ownership, the comovement with closed-end funds is the greatest. For larger capitalization stocks, which have lower individual ownership, this comovement is weaker. Finally, the largest stocks, which by the end of this period had over 50 percent institutional ownership, seem to move in the opposite direction from the discounts. We have replicated these findings using equal-weighted rather than value-weighted market returns and found the same monotonicity of coefficients. When an equal-weighted market index is used, however, the five portfolios of largest firms all show negative comovement with the value-weighted discount, while the five smaller portfolios all have positive coefficients. These results are consistent with the view that what is relevant about size in our regressions is individual ownership. Firms which are smaller (larger) than "average" comove positively (negatively) with discounts on closed-end funds because they have a higher (lower) concentration of individual investors than the "average" firm in the market index.

A final piece of evidence germane to this analysis comes from the seasonal pattern of discounts. Brauer and Chang (1990) present the striking result that prices of closed-end funds exhibit a January effect even though prices of the funds' portfolios do not. We confirmed this result in our data: the mean

[17]The evidence presented thus far is inconsistent with the unmeasured capital gains tax liability hypothesis of discounts. This theory predicts that when stocks do well, closed-end funds should accrue unrealized capital gains, and discounts should in general widen, holding the turnover rates on fund assets constant. However, Table II shows that the correlation between returns on the market and changes in discounts is about zero (the statistically insignificant correlation is negative which goes against the tax theory). Table IV also indicates that discounts narrow when small stocks do well which is also inconsistent with the tax explanation.

[18]Based on $(1.40 \times 0.10)/2.534$, where 2.534 is the median absolute return on the Decile 10 portfolio.

January ΔVWD is significantly negative, meaning discounts shrink in January. Interestingly, Ritter (1988) documents that 40 percent of the year-to-year variation in the turn-of-the-year effect is explained by the buy-sell activities of individual investors. These findings, of course, accord well with the notion that closed-end fund prices are affected by individual investor trading, some of which occurs at the end of the year, and not just by fundamentals. However, to ensure that Table IV results are not restricted to the turn-of-the-year, we performed the same regressions with January and December observations removed. The coefficients on ΔVWD remained significant for all ten deciles at the one percent level and the monotonicity is preserved.

To summarize, the evidence suggests that discounts on closed-end funds narrow when smaller stocks do well. This correlation is stronger, the smaller the stocks. These results are consistent with the hypothesis that individual investor sentiment is particularly important for the prices of smaller stocks and of closed-end funds. In the next section, we test the robustness of this finding.

V. Further Evidence on Size Portfolios

A. Do Closed-end Funds Hold Small Stocks?

Our finding that smaller stocks do well when discounts on closed-end funds narrow runs into an objection. Suppose that closed-end funds holdings are concentrated in smaller stocks which are thinly traded. Then prices used in the calculation of net asset value are often stale, whereas closed-end fund prices are relatively fresh. This means that when smaller stocks do well, closed-end funds that hold these stocks appreciate, but the net asset value does not rise by as much as it should because some of the smaller stock prices used to compute the NAV are stale. Reported NAV's could also be stale if closed-end funds report changes in NAV sluggishly. The effect would be the same as if assets were infrequently traded. In their case, the discount narrows (i.e., the stock price of the fund moves up relative to its NAV) precisely when smaller stocks do well. The key finding of the previous section could then result from the mismeasurement of the net asset value.

This objection relies on the critical assumption that closed-end funds invest in smaller stocks (so their stock prices move together with the prices of smaller firms). This assumption is suspect in light of Brauer and Chang's (1990) finding that the portfolio holdings of closed-end funds do not exhibit a January effect. To evaluate this assumption more directly, we examine the portfolio of TRICON. Table V describes TRICON's holdings, distributed by decile, every 5 years starting in 1965. It is clear from this table that TRICON's holdings are concentrated in stocks in the largest two deciles, which, together with short-term holdings and cash equivalents, represent about 80 percent of the fund's holdings. Short-term holdings and stocks in the top 5 deciles typically represent over 90 percent of the fund's earning assets.

Table V

Composition of the Tricontinental Corporation Investment Portfolio

Composition of the investment portfolio of Tricontinental Corporation (Tricon) at the end of the year, distributed by the total market capitalization of the individual investments. To construct this table, each holding in the Tricon portfolio for each of the years listed was identified from the financial statements of the fund. For the majority of holdings, market capitalization was obtained through the CRSP tapes; market capitalization for the remainder were traced to Moody's Security Manuals and manually checked against Decile cutoffs for each year. Values are shown in thousands of dollars. Decile cutoffs for each year are the same as those used on earlier regressions and are obtained from CRSP. Cash and short-term holdings include government T-bills and corporate debt instruments, net of short-term liabilities of the fund. Other holdings represent equity securities for which the market capitalization was not readily obtainable.

	1985		1980		1975		1970		1965	
Decile 1	0.0	0.0	0.0	0.0	2902.4	0.5	3644.7	0.6	8486.8	1.5
Decile 2	0.0	0.0	3316.5	0.4	548.5	0.1	7514.0	1.2	5856.0	1.0
Decile 3	2793.8	0.2	0.0	0.0	3507.9	0.6	125.8	0.0	0.0	0.0
Decile 4	0.0	0.0	7000.0	0.8	2051.2	0.4	1575.0	0.3	0.0	0.0
Decile 5	2477.9	0.2	19125.0	2.2	9840.5	1.7	9715.5	1.6	8016.2	1.4
Decile 6	4575.0	0.4	38519.2	4.4	5903.5	1.0	14304.3	2.4	0.0	0.0
Decile 7	63575.5	5.3	58238.9	6.6	28283.5	5.0	21934.8	3.7	23832.0	4.3
Decile 8	118981.2	10.0	88204.4	10.1	53320.2	9.4	51241.0	8.5	76452.2	13.7
Decile 9	306874.7	25.7	181298.3	20.7	69407.0	12.2	49787.5	8.3	82263.8	14.7
Decile 10	558993.8	46.8	391753.9	44.7	344500.4	60.7	371398.4	61.7	336612.2	60.2
Short-term holdings & cash equivalents	128745.1	10.8	67978.2	7.8	41905.7	7.4	60690.5	10.1	17940.0	3.2
Other holdings	8143.2	0.7	20890.9	2.3	5474.4	1.0	9702.1	1.6	0.0	0.0
Total value of portfolio	1195160.3	100.0%	876325.3	100.0%	567645.2	100.0%	601633.6	100.0%	559459.2	100.0%

Table VI

The Time-Series Relationship between Returns on Size-Decile Portfolios, the Market Return, and Changes in the Discount of Tri-Continental Corporation.

The time-series relationship (7/65 to 12/85) between monthly returns on decile portfolios (dependent variables), changes in the monthly discount of Tri-Continental (TriCon) and the monthly return on a value-weighted portfolio of New York Stock Exchange firms (VWNY). Decile 10 contains the largest firms, Decile 1 the smallest. Membership in each decile is determined at the beginning of year and kept constant for the rest of the year. Returns of each firm is weighted by the beginning-of-month market capitalization. In case of missing returns, a firm is excluded from the portfolio for the current and following month. The dependent variable in the last row is the excess return of small firms over large firms, computed by subtracting Decile 10 returns from Decile 1 returns. The number of observations is 241. *t*-statistics are shown in parentheses.

Return on the decile portfolio	Intercept	TriCon	VWNY	Adjusted R^2
1	0.0062	−0.0026	1.263	56.0
(smallest)		(−2.74)	(17.52)	
2	0.0044	−0.0021	1.236	68.9
		(−2.98)	(23.11)	
3	0.0039	−0.0017	1.214	72.9
		(−2.70)	(25.46)	
4	0.0036	−0.0013	1.174	78.3
		(−2.41)	(29.39)	
5	0.0030	−0.0011	1.156	81.0
		(−2.40)	(31.96)	
6	0.0025	−0.0014	1.135	84.6
		(−3.41)	(36.28)	
7	0.0014	−0.0009	1.142	89.4
		(−2.76)	(44.99)	
8	0.0016	−0.0010	1.097	91.7
		(−3.54)	(51.41)	
9	0.0004	−0.0007	1.062	94.8
		(−3.21)	(66.21)	
10	−0.0006	0.0005	0.916	95.4
(largest)		(2.94)	(69.80)	
1−10	0.0069	−0.0031	0.347	8.1
		(−2.85)	(4.20)	

In contrast, the fund typically holds less than 4 percent of its assets in stocks from the bottom five deciles. Since the stocks in the top two deciles are virtually never mispriced because of nontrading, and since the stocks in the top five deciles are rarely mispriced, it is hard to believe that TRICON's portfolio is subject to large mistakes in the calculation of net asset value because of nontrading or sluggish reporting.

In Table VI we again regress decile returns on VWNY and changes in discounts as in Table IV, but this time changes in TRICON's discount are used instead of the changes in the value-weighted discount (ΔVWD). The results are very similar to those in Table IV although parameter estimates are closer to zero, presumably because of a larger idiosyncratic component to TRICON's discounts. Nonetheless, it remains the case that smaller stocks do well when TRICON's discount narrows even though TRICON is holding virtually no small stocks. This finding is inconsistent with the hypothesis that our results can be explained by nontrading or delayed reporting.[19] Incidentally, TRICON itself is a Decile 8 stock, and its comovement with small stocks cannot be explained by the size of its own market capitalization.

B. The Stability of Results over Time

A further concern about our analysis is whether the results are stable over time. In Table VII we reproduce the results from Table IV except we split the sample in the middle (September 1975). For the earlier subsample, the results are stronger than in Table IV, with both the significance and the monotonicity of coefficients reemerging. For the second half, the results are significantly weaker. Although the coefficients on the change in the value-weighted discounts are negative for the first nine decile portfolios and positive for the tenth, their magnitude and statistical significance are much smaller than in the first half of the sample.

What can cause this instability of coefficients over time? One possibility is that the variation in the VWD was smaller in the later subperiod, yielding less explanatory power. Indeed, the standard deviation of ΔVWD falls from 2.40 to 1.95 from the first subperiod to the second. However, there is a more basic economic reason why the second period results might be different—the steady increase in institutional ownership of small firms. As we mentioned earlier, 26.5 percent of the shares of the smallest decile firms were held by institutions by 1988. An examination of a random sample of the smallest decile firms in 1980 revealed that institutions held only 8.5 percent of the shares. In just 8 years, institutions have more than tripled their holdings in first decile firms. At the same time, institutions have continued to avoid closed-end funds, presumably because money managers are reluctant to delegate money management. One possible interpretation of the evidence, then, is that in the second half of our sample, individual investors became relatively less important in determining stock prices, particularly for the stocks of smaller firms. As a result, individual investor sentiment, which continues to be reflected in the discounts on closed-end funds, is no longer as strongly reflected in the pricing of smaller stocks.

[19] We also regressed the difference between the small and large firm returns (Decile 1 returns minus Decile 10 returns) against market movements and the change in discounts for each of ten major funds. For all ten funds, the coefficient on the discount variable was negative, significantly so for eight of the funds. Thus the relationship between small firm excess returns and discount changes is relatively insensitive to the choice of the fund. However, the t-statistics on $\Delta DISC_i$ for individual funds are lower than the t-statistic on ΔVWD in Table IV, suggesting the portfolio approach was successful in removing idiosyncratic variations in the individual fund discounts.

Table VII

Stability of the Time-Series Relationship between Returns on Size-Decile Portfolios, the Market Return, and Changes in Closed-End Fund Discounts

Analysis of the stability of the time-series relationship between monthly returns on decile portfolios (dependent variables), changes in the monthly discount on a value-weighted portfolio of closed-end stock funds (ΔVWD) and the monthly return on a value-weighted portfolio of New York Exchange firms (VWNY). Decile 10 contains the largest firms, Decile 1, the smallest. Membership in each decile is determined at the beginning of year and kept constant for the rest of the year. Returns of each firm is weighted by the beginning-of-month market capitalization. In case of missing returns, a firm is excluded from the portfolio for the current and following month. The dependent variable in the last row is the excess return of small firms over large firms, computed by subtracting Decile 10 returns from Decile 1 returns. The number of observations for the first period is 122, the second period is 123. *t*-statistics are shown in parentheses.

Return on the decile portfolio	First 123 months (7/65 to 9/75)				Second 123 months (10/75 to 12/85)			
	Intercept	ΔVWD	VWNY	Adj.R^2	Intercept	ΔVWD	VWNY	Adj. R^2
1	0.0054	−0.0101	1.355	63.2	0.0079	−0.0022	1.140	54.9
(smallest)		(−5.50)	(13.83)			(−1.08)	(12.08)	
2	0.0015	−0.0070	1.303	71.1	0.0078	−0.0022	1.129	70.3
		(−4.89)	(16.97)			(−1.52)	(16.79)	
3	0.0016	−0.0057	1.269	75.6	0.0064	−0.0014	1.137	72.5
		(−4.60)	(19.18)			(−1.00)	(17.80)	
4	0.0022	−0.0050	1.206	80.2	0.0048	−0.0022	1.123	79.1
		(−4.88)	(21.99)			(−1.98)	(21.16)	
5	0.0010	−0.0042	1.193	83.1	0.0050	−0.0010	1.104	80.5
		(−4.59)	(24.27)			(−0.95)	(22.29)	
6	0.0014	−0.0038	1.184	85.6	0.0041	−0.0016	1.060	84.7
		(−4.58)	(26.79)			(−1.81)	(25.71)	
7	0.0006	−0.0021	1.184	88.8	0.0025	−0.0009	1.080	90.3
		(−2.90)	(31.04)			(−1.31)	(33.44)	
8	0.0016	−0.0018	1.123	91.3	0.0017	−0.0012	1.053	91.8
		(−2.98)	(35.67)			(−1.89)	(36.56)	
9	0.0000	−0.0013	1.084	94.3	0.0009	−0.0007	1.027	95.6
		(−2.82)	(44.58)			(−1.52)	(50.93)	
10	−0.0002	0.0014	0.902	95.5	−0.0010	0.0004	0.937	95.4
(largest)		(4.16)	(50.18)			(1.11)	(50.12)	
1—10	0.0056	−0.0115	0.4530	25.2	0.0089	−0.0027	0.2038	2.5
		(−5.47)	(4.04)			(−1.12)	(1.87)	

To test this conjecture, we formed a portfolio consisting of all NYSE firms, other than closed-end funds, which had less than 10 percent institutional ownership in 1985.[20] We look at these firms in 1985 because over time institutional holdings have increased, and so firms that have less than 10

[20]More precisely, we required that the total of institutional and closely-held shares, as reported by the January issue of the *Standard and Poor's Stock Report*, be less than 10 percent of a firm's outstanding common shares.

Table VIII

The Time-Series Relationship Between Returns of Firms with Low Institutional Ownership, the Market Return, and Changes in Closed-End Fund Discounts

The time-series relationship between the monthly returns on a portfolio of firms with low institutional ownership (the dependent variable), changes in the monthly discount on a value-weighted portfolio of closed-end stock funds (ΔVWD), and the monthly return on a value-weighted portfolio of New York Stock Exchange firms (VWNY). The dependent variable is the equally-weighted mean monthly return on a portfolio of firms whose total institutional ownership of common stocks outstanding is 10% or less. Membership in the portfolio is based on the total shares held by institutions and insiders as reported in the January, 1985 edition of the *S&P Stock Report*. A total of 52 firms is in the portfolio. Number of observations is 245, 122, and 123, respectively, for the three time periods. *t*-statistics are shown in parentheses.

Time Period	Intercept	ΔVWD	VWNY	Adjusted R^2
All months	0.0012	−0.0035	0.744	59.8
(7/65—12/85)		(−4.30)	(18.67)	
First 123 months	−0.0020	−0.0042	0.790	60.9
(7/65—9/75)		(−3.74)	(13.50)	
Second 123 months	0.0051	−0.0025	0.677	57.5
(10/75-12/85)		(−2.17)	(12.60)	

percent institutional ownership in 1985 are likely to have even lower institutional ownership before 1985. In other words, the ownership structure of these firms is similar to that of closed-end funds. In 1985, there were only 56 such firms on NYSE, of which we found CUSIP numbers for 52. Interestingly, 37 (71 percent) of these stocks are public utilities which are not fundamentally related to closed-end funds in any obvious way. It is also of interest that only 8 (15 percent) of these firms are in the smallest size decile and 26 firms (50 percent) are in Deciles 5 and higher, so this is not a portfolio of small firms. Given our conjecture that individual ownership, rather than size per se, causes comovement with closed-end fund discounts, we expect a positive correlation between the returns of these stocks held largely by individuals and the changes in discounts on closed-end funds.

Table VIII presents the regression of the portfolio returns of individual-owned firms on market returns and the change in the value-weighted discount. For the whole period, and for both of the two subperiods, the coefficients on ΔVWD are significant, even after controlling for market movements. Firms held primarily by individuals do well, controlling for the market, when discounts on closed-end funds narrow. This finding corroborates our explanation of the weaker correlation between changes in discounts and returns on smaller stocks in the second subperiod. Specifically, individual investors, whose sentiment closed-end fund discounts capture, became less important in holding and trading small firms. Thus, the weaker results in Table VII for the second subsample, as well as Table VIII results for individual-owned firms, both support the individual investor sentiment interpretation of the evidence.

VI. Are Discounts a Sentiment Index?

We have interpreted the discount on closed-end funds as an individual investor sentiment index. This section presents further evidence to substantiate this interpretation. First, we examine the relationship between this index and the risk factors identified by Chen, Roll, and Ross (1986). If the discounts are highly correlated with measures of fundamental risk, then our interpretation may be suspect. Second, we check whether the discounts are related to the net withdrawals from open-end funds and to the volume of initial public offerings of stocks other than closed-end funds. The latter tests are comparisons of discounts with other indices of investor sentiment.

A. Relationship of Discount Changes to Other Macroeconomic Factors

One question raised by our empirical evidence is whether the sentiment factor that we identify with the VWD is a new factor or whether it just proxies for macroeconomic factors previously identified in the literature. Chen, Roll and Ross (1986) present a number of macroeconomic variables that affect stock returns in time-series regressions and expected returns in cross-section regressions. They interpret the variables to be risk factors. The variables include "innovations" in: industrial production, risk premia on bonds, the term structure of interest rates, and expected inflation. Table IX presents the monthly correlations of changes in these factors with changes in the value-weighted discount (ΔVWD).

The main pattern that emerges from this table is that changes in discounts are not highly correlated with changes in "fundamental" factors. The correlations with "hard" macroeconomic variables such as production are very small. There is some correlation (0.157) between the changes in the discount and changes in the expected inflation rate (DEI). When expected inflation rises, so does the discount. We know of no fundamental explanation for this finding. Notice that changes in discounts are not correlated with the unanticipated change in the term structure (UTS). 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.

Another way to see whether the discount is an independent factor is to add this variable to an equation explaining returns using the other risk factors. Table X presents results of regressions of the monthly difference in returns between smallest and largest deciles of firms on changes in various factors. The results show that, even when changes in Chen, Roll, and Ross's "fundamental" factors are controlled for, changes in the VWD still have a pronounced and significant effect on the difference in returns between small and large firms. In fact, in Model 7, which includes the value-weighted NYSE index, the Chen, Roll, and Ross factors, and the change in the value-weighted discount, the discount variable has the highest *t*-statistic. The value-weighted discount seems to be a factor with an independent influence on returns. Even if changes in investor sentiment are (weakly) correlated with changes in "fundamental" factors, they still have a large influence of their own.

Table IX

Correlation between Changes in the Value-Weighted Discount and Innovations in Various Macroeconomic Variables

Correlation between the monthly change in discount on a value-weighted portfolio of closed-end stock funds, innovations in various macroeconomic variables, and the excess return earned by small (Decile 1) firms over large (Decile 10) firms for the period 7/65 to 12/85. The pairwise Pearson product-moment correlation and *p*-value for two-tailed test of the null hypothesis of zero correlation are shown. The number of observations is either 245 or 246. The macroeconomic variables are obtained from Chen, Roll, and Ross (1986) and are briefly described here. ΔVWD is the monthly change in the discount on a value-weighted portfolio of closed-end stock funds. DECSIZ is the monthly return on the smallest decile firms (Decile 1) minus the monthly return on the largest decile firms (Decile 10). EWNY and VWNY are the returns on equal-weighted and value-weighted portfolios of NYSE firms, respectively. MP(t + 1) is the monthly change in industrial production, as measured by log(IP(t + 1)) − log(IP(t)), where IP(t) is the seasonally unadjusted production at month t. YP(t + 12) is the yearly change in industrial production as measured by log(IP(t + 12)) − log(IP(t)). UPR(t) is the unanticipated change in risk premia at month t, measured by UBAA − LGB where UBAA is the return of under Baa bonds at month t, and LGB is the return on long term government bonds at month t. UTS(t) is the unanticipated change in term structure at month t, as measured by LGB − TB where LGB is the return on long term government bonds at month t and TB is the Treasury-Bill return of month t as observed at the end of month t − 1. DEI(t) is the change in expected inflation measured by EI(t + 1) − EI(t) where EI is the expected inflation for month t as at month t-1 computed by subtracting expected real interest of month t (Fama-Gibbons (1984)) from the T-Bill return of month t. UI(t) is unanticipated inflation measured by I(t) − EI(t) where I(t) is the realized inflation for month t (CRSP SBBI), and EI(t) is the expected inflation for month t as at month t − 1.

	DECSIZ	EWNY	VWNY	MP	YP	UPR	UTS	DEI	UI
ΔVWD	−0.268	−0.093	−0.0126	−0.003	−0.006	−0.053	−0.052	0.157	0.057
	0.0001	0.1489	0.8446	0.9571	0.9303	0.4099	0.4207	0.0137	0.3721

B. Evidence from Open-End Funds Redemptions

Malkiel (1977) found that discounts on closed-end funds narrow when purchases of open-end funds outstrip redemptions. His interpretation of this finding is similar to our own—similar market forces drive the demand for both open- and closed-end funds.

To examine this issue more closely, we have extended Malkiel's sample through the entire 246 months of our study period (7/65 to 12/85), and performed a similar analysis. After February 1982, there is an enormous increase in net purchases of open-end funds. Since this appears to be a regime change relative to the previous experience, we have estimated our regressions separately for two periods: 1965–1981 and 1965–1985. The results are presented in Table XI.

The results in Table XI confirm Malkiel's finding that discounts increase with net redemptions from open-end funds. The ratio of redemptions to sales is significant in both time periods, and the difference in redemptions and sales is significant if the last 3 years of the sample are excluded. Although

Table X

The Relationship between Small Firm Excess Returns, Macroeconomic Innovations, and Changes in the Value-Weighted Discount

The time-series relationship (7/65 to 12/85) between the excess return earned by small (Decile 1) firms over large (Decile 10) firms, innovations in various macroeconomic variables and the monthly change in discount on a value-weighted portfolio of closed-end stock funds shown as ΔVWD. The number of observations is 245 and *t*-statistics are shown in parentheses. The macroeconomic variables are obtained from Chen, Roll, and Ross (1986) and are briefly described here. The dependent variable is the monthly return on the smallest decile firms (Decile 1) minus the monthly return on the largest decile firms (Decile 10). EWNY and VWNY are the returns on equal-weighted and value-weighted portfolios of NYSE firms, respectively. MP(t + 1) is the monthly change in industrial production, as measured by log(IP(t + 1)) − log(IP(t)), where IP(t) is the seasonally unadjusted production at month t. YP(t + 12) is the yearly change in industrial production as measured by log(IP(t + 12)) − log(IP(t)). UPR(t) is the unanticipated change in risk premia at month t measured by UBAA minus LGB where UBAA is the return of under Baa bonds at month t, and LGB is the return on long term government bonds at month t. UTS(t) is the unanticipated change in term structure at month t as measured by LGB − TB where LGB is the return on long term government bonds at month t and TB is the Treasury-Bill return of month t as observed at the end of month t − 1. DEI(t) is the change in expected inflation measured by EI(t + 1) − EI(t) where EI is the expected inflation for month t as at month t − 1 computed by subtracting expected real interest of month t (Fama-Gibbons (1984)) from the T-Bill return of month t. UI(t) is unanticipated inflation, measured by I(t) − EI(t) where I(t) is the realized inflation for month t (CRSP SBBI), and EI(t) is the expected inflation for month t as at month t − 1.

Model	Intercept	VWNY	EWNY	YP	MP	DEI	UI	UPR	UTS	ΔVWD	Adj. R^2
1	0.0086	—	—	0.0150	0.4212	0.768	−3.793	0.789	0.480	—	12.1
				(0.23)	(3.07)	(0.16)	(−1.98)	(4.26)	(2.84)		
2	0.0090	—	—	—	0.4256	0.851	−3.774	0.799	0.489	—	12.5
					(3.14)	(0.18)	(−1.98)	(4.44)	(2.99)		
3	−0.0002	—	0.7400	—	0.3572	−6.210	−0.391	−0.129	−0.464	—	43.8
			(11.61)		(3.28)	(−1.64)	(−0.25)	(−0.78)	(−3.00)		
4	0.0064	0.2973	—	—	0.4439	−2.004	−2.989	0.518	0.166	—	15.2
		(2.92)			(3.32)	(−0.43)	(−1.57)	(2.57)	(0.85)		
5	0.0084	—	—	—	0.4332	3.347	−3.643	0.731	0.463	−.0068	17.9
					(3.28)	(0.73)	(−1.97)	(4.16)	(2.91)	(−4.08)	
6	−0.0005	—	0.7264	—	0.3670	−3.907	−0.344	−0.173	−0.471	−.0060	48.1
			(11.82)		(3.49)	(−1.06)	(−0.23)	(−1.09)	(−3.16)	(−4.53)	
7	0.0055	0.3294	—	—	0.4546	0.317	−2.77	0.415	0.103	−.0072	21.2
		(3.34)			(3.51)	(0.07)	(−1.51)	(2.12)	(0.54)	(−4.40)	

Table XI

The Relationship between Net Redemption on Open-End Funds, the Market Return, and Changes in the Value-Weighted Discount

The time-series relationship between net redemption on open-end funds (dependent variable), the monthly return on a value-weighted portfolio of New York Stock Exchange firms (VWNY), and changes in the monthly discount on a value-weighted portfolio of closed-end stock funds (ΔVWD). The net redemption on open-end funds is measured two ways: by the monthly ratio of net redemptions to sales on open-end funds (R/S) and by the monthly net redemption on open-end funds expressed as a percentage of total fund assets at the beginning of the month (NRED). R/S is computed as redemptions/sales. NRED is computed as (redemptions-sales)/total fund assets. Monthly redemptions, sales, and fund assets data are obtained from the Investment Companies Institute and represent all open-end funds with long-term investment objectives (i.e., exclude money market and short-term municipal bond funds). *t*-statistics are shown in parentheses.

Model	Dep. Var.	Intercept	VWNY	ΔVWD	Adj. R^2	No. of Obs.
PANEL A—7/65 to 12/85						
1	R/S	0.855	−1.864	0.029	4.9	245
			(−3.03)	(2.35)		
2	NRED	−0.005	−0.044	0.0001	3.0	245
			(−3.05)	(0.38)		
PANEL B—7/65 to 2/82						
1	R/S	0.949	−1.417	0.034	4.5	199
			(−2.18)	(2.53)		
2	NRED	−0.001	−0.009	0.0003	3.6	199
			(−1.73)	(2.50)		

the overall explanatory power of these regressions is low, these results lend further credence to the view that changes in closed-end fund discounts reflect changes in individual investor sentiment. In this case, the evidence suggests that the investors whose sentiment changes are also investors in open-end funds. These tend to be individual rather than institutional investors.

C. Evidence from Initial Public Offerings

Another domain in which individual investors are important is the initial public offerings of corporations other than closed-end funds (IPO's). The investor sentiment hypothesis suggests that these IPO's should be more prevalent in times when individual investors are optimistic, so the stocks will fetch high prices relative to their fundamental values. While institutional investors are more important buyers of IPO's than they are of closed-end funds (Weiss (1989) estimates that, on average, 23 percent of IPO stocks are held by institutions three quarters after the offering). Individuals still account for over 75 percent of buying of IPO's, and we expect their sentiment to affect the timing of these offerings.

To measure the intensity of IPO activity we use the annual number of IPO's from Ibbotson, Sindelar, and Ritter (1988). We regress this measure of

Table XII

The Relationship between Number of IPO's, the Dividend-to-Price Ratio on S&P500, and the Value-Weighted Discount at the Beginning of the Year

The time-series relationship between the annual number of Initial Public Offerings (dependent variable), the dividend to price ratio of S&P500 stocks at the beginning of the year expressed as a percentage (Div/Price), and the level of the value-weighted discount on a portfolio of closed-end funds at the beginning of the year (VWD_{t-1}). The computation of the dividend to price ratio on the S&P500 index follows Fama and French (1988). The number of observations is 20. *t*-statistics are shown in parenthesis.

Intercept	VWD_{t-1}	Div/Price	Adjusted R^2
456.9	−19.3	—	40.9
	(−3.76)		
230.1	−21.8	61.8	41.5
	(−3.90)	(1.09)	

IPO volume on the beginning of the year value-weighted discount. Of course, IPO activity might be responsive to fundamentals as well. For example, firms might go public to raise capital when the future looks particularly bright. To control for this factor, we also include the dividend price ratio of the S&P 500, a measure of the expected growth rate of dividends. The regressions are run on an annual rather than a monthly basis to alleviate the strong serial correlation in monthly IPO's, although monthly results are similar. The results are displayed in Table XII and Figure 4.

The first regression shows that in fact IPO volume is highly correlated with the VWD. The coefficient is significant at the 1 percent level, and the adjusted R-square of the regression is 41 percent. The significance of this relationship is also apparent from Figure 4. When the value-weighted discount shrinks from 15 percent to zero, the number of IPO's in the subsequent year rises by approximately 300 which is roughly one standard deviation. The second regression shows, to our surprise, that the dividend price ratio on the S&P 500 index does not affect the pace of the IPO activity. The regressions seem to suggest that individual investor sentiment is important in determining when companies go public, but the expected growth rate is not. The IPO evidence is consistent with our interpretation of discounts on closed end funds as a measure of individual investor sentiment.

VII. Conclusions and Implications

In this paper, we tested the theory that the changing sentiment of individual investors toward closed-end funds and other securities explains the fluctuations of prices and discounts on closed-end funds. In this theory, discounts are high when investors are pessimistic about future returns and low when investors are optimistic. Average discounts exist because the unpredictability

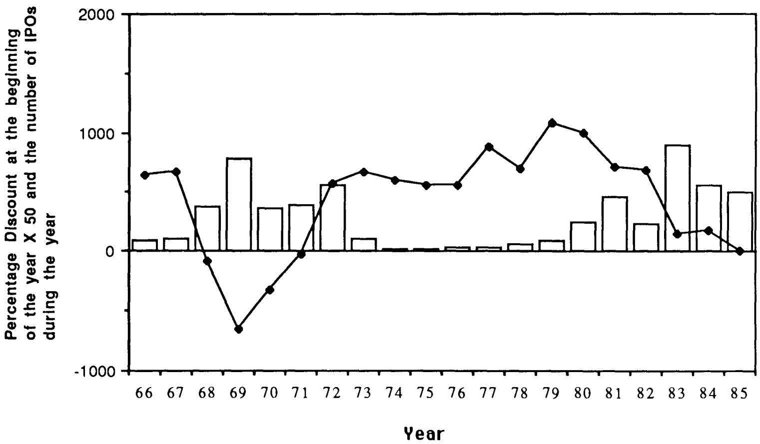

Figure 4. The number of IPO's and the discount at the beginning of the year. This graph shows the number of Initial Public Offerings (IPO's) during the year and the percentage discount on a value-weighted portfolio of closed-end funds at the beginning of the year during 1966 to 1985. The line graph represents the value-weighted discount at the beginning of the year $\times$ 50. The bar graph represents the number of IPO's during the year (Source for IPO data: Ibbotson, Sindelar and Ritter (1988)).

of investor sentiment impounds a risk to holding a closed-end fund in addition to the risk inherent in the fund's portfolio. The theory appears to be consistent with the published evidence on closed-end fund prices, and several new predictions of the theory have been confirmed. The evidence suggests that discounts on closed-end funds are indeed a proxy for changes in individual investor sentiment and that the same sentiment affects returns on smaller capitalization stocks and other stocks held and traded by individual investors.

The basic conclusion of this paper is that closed-end fund discounts are a measure of the sentiment of individual investors. That sentiment is sufficiently widespread to affect the prices of smaller stocks in the same way that it influences the prices of closed-end funds. Changing investor sentiment makes funds riskier than the portfolios they hold and so causes average underpricing of funds relative to fundamentals. Since the same investor sentiment affects smaller stocks and so makes them riskier, *smaller stocks must also be underpriced relative to their fundamentals*. The result that small firms appear to earn excess returns is, of course, well-known in finance as the small firm effect. Thus, if our theory is correct, the small firm effect may be, in part, clientele related. Interestingly, the theory also predicts that the portion of the small firm effect due to noise trader risk will diminish as individual investors become less significant traders in small firm shares. The fact that the small firm effect has diminished in recent years lends intriguing support to this idea.

While our findings do not imply risk-free arbitrage opportunities, they do point to the existence of nonfundamental risks within the market. The fact that such risks are priced yields two important implications:

1. Securities subject to such risks will trade, on average, at discounts from their fundamentals.
2. Movements in security prices (i.e., stock returns) may be attributable to movements in investor sentiment.

The noise trader model of DSSW does not limit underpricing to smaller firms or firms held primarily by individuals since all firms subject to sentiment fluctuations should trade at discounts relative to their fundamentals. However, the clientele of closed-end funds is such that our empirical results pertain only to such firms. There may, of course, be other sentiment measures (institutional investor sentiment?) that affect security prices. Changes in such sentiments would influence returns on the segments of security markets favored by the investors in question and so lead to systematic mispricing.

APPENDIX I

List of the twenty closed-end stock funds used in constructing the monthly changes in the value-weighted index of discounts (earlier name in parentheses)

ASA Ltd. (American South African)
Abacus Fund, Inc.
Adams Express Co.
Advance Investors Corp.
American International Corp.
Carriers and General Corp.
Dominick Fund, Inc.
Eurofund International, Inc. (Eurofund, Inc.)
General American Investors, Inc.
MA Hanna Co.
International Holdings Corp.
Japan Fund, Inc.
Lehman Corp.
Madison Resources, Inc. (Madison Fund, Inc.)
Niagara Shares Corp.
Petroleum and Resources Corp. (Petroleum Corp. of America)
Surveyor Fund, Inc. (General Public Service Corp.)
Tricontinental Corp.
United Corp.
United States and Foriegn Securities Corp.

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