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Do Investors Care About Sentiment'

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DO INVESTORS CARE ABOUT SENTIMENT?

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Lee, Shleifer and Thaler (1991) (LS&T) claim they have uncovered a new influence (factor), small investor sentiment that affects the risk of common stocks.[1] Furthermore, they believe that this factor is especially important in explaining the return pattern of closed-end funds and small stocks. They claim that firms with high sensitivity to this factor must earn an extra return as compensation for this extra risk (market price of risk positive). Finally they argue that this factor can be measured by the change in the discount on closed-end funds.

Determining which factors explain the return of individual securities is one of the key issues in investment research. Which of these factors are priced is the fundamental issue of asset pricing theory. Thus their claims, if correct, make an important contribution to our understanding of how capital markets function.

In this paper we explore whether investor sentiment (as measured by the change in the discount on closed-end funds) is an important factor in the return-generating process for common stocks and whether one set of firms closed-end funds with greater sensitivity to this factor offer, and can be expected to offer, a higher expected return. Our results do not support any of the contentions of LS&T. We first explore the importance of sentiment on the return-generating process (RGP). Initially we show that the discount on closed-end funds does not enter the RGP more frequently than a set of indexes constructed in an analogous manner from a set of firms not subject to small investor sentiment (large institutionally-held industrial firms). In fact, the frequency with which the discount for closed-end funds enters the return-generating process is not much different from what would be expected by chance. Second, we show that if the indexes are

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1 Also see Chen, Kan and Miller (1993a, 1993b) and Chopra, Lee, Shleifer and Thaler (1993a, 1993b).

measured as industry return indexes rather than discounts, they enter the return-generating process more frequently. Industry return indexes are used as a reference because industry return indexes are not considered systematic factors. Third, when we examine the pattern of sensitivity to the change in the discount of closed funds across size categories using the same two-factor model employed by LS&T, we get a pattern like theirs. However, using a more general multi-factor model, this pattern disappears. Finally, we relate the sentiment index to a set of empirically derived factors. We show that the empirically derived factors are not affected by sentiment.

When we examine expected returns we find results consistent with the results obtained by an examination of the return-generating process. We show that closed-end funds do not have higher average return than would be expected given their sensitivities to a multi-index model. Thus, there is no evidence that firms with higher sensitivity to the change in discount on closed ends give a higher return.

The paper is divided into three sections. In the first section we discuss the return-generating process, the sample data, and index construction. In the second section we present evidence on whether sentiment affects the return-generating process. In the third and last section we provide evidence on whether sentiment risk is priced.

I. THE RETURN-GENERATING PROCESS, DATA, SAMPLES AND INDEX CONSTRUCTION

In this section we discuss the return-generating process (RGP), the data, the samples we employ, and the construction of the investor sentiment index.

A. The Return-Generating Process

In order to measure the importance of adding sentiment to the RGP we need to specify a base RGP that doesn't include sentiment. We used two different base RGPs. First, because LS&T use a one-index model as a base to which they added sentiment, we employed a similar one-index model. The one-index model is

$$R_{it} = \alpha_i + \beta_{ij} R_{jt} + e_{it}$$

where

1. R_{it} is the return in month t of a security or portfolio i in excess return form.
2. R_{jt} is the return on index j in period t in excess return form.[2]
3. β_{ij} is the sensitivity of stock or portfolio i to index j.
4. e_{it} is the residual of stock or portfolio i in period t.
5. α_i is the non-systematic mean return for stock or portfolio i.

We do not believe that a one-index model is an appropriate RGP, but rather we rely on recent literature that finds evidence for a four-index or at most a five-index model.[3] The multi-index return-generating process can be represented as

$$R_{it} = \alpha_i + \Sigma_j \beta_{ij} R_{jt} + e_{it}$$

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[2] When the index is the difference in return of two portfolios, the risk-free rate cancels out.

[3] See Elton, Gruber and Blake (1996a)(1996b), Fama and French, (1993), Connor and Korajczyk (1986).

We employ a four-index form of the model developed and tested in Elton, Gruber and Blake (1996a) and (1996b). The indexes we employ are the excess return on the S&P 500, an index that represents the return on a portfolio of small (low capitalization) stocks minus the return on a portfolio of large capitalization stocks, an index that represents the return on a portfolio of "growth" stocks minus the return on a portfolio of "value" stocks, and an index of the excess return on a portfolio of bonds.[4]

B. Data

Data came from six sources. All security returns, including market returns on closed-end funds, are from the monthly CRSP tape. Index returns for the S&P index and the value weighted CRSP index, and returns on size deciles, were also from CRSP. The small minus large index and value growth indexes were from Prudential Bache. The bond index is from Shearson-Lehman. Finally, open-end mutual fund data was provided by MICROPAL.

Net asset value came from two sources: for closed-end funds it was provided to us by Lipper; for industrial companies it was taken from the Compustat tapes.

C. Samples

To test the return-generating process we used three samples of individual security returns and three samples of portfolio returns. The first individual security return sample was made up of the 586 NYSE stocks that had continuous return history from January 1969 to December 1994. To guard against a concern that this sample is not representative of the full population, we also

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[4] Empirical tests of this model versus alternative models are contained in Elton, Gruber and Blake (1997). In interpreting some of the results presented in this paper, it might help the reader to recognize that the growth-value index is highly correlated with the market-to-book ratio Fama and French (1993), among others, have employed in their research.

constructed a sample of all stocks listed on CRSP that had a minimum of three years of history between January 1980 and December 1994. This sample had 4,967 firms. Closed-end funds and utility stocks were excluded from the two stock samples. The final sample of individual security returns consisted of the 99 utility stocks which had a complete history of data from January 1969 to December 1994. We used this sample because LS&T argued that utility stocks have low institutional ownership and were therefore subject to sentiment.

The three portfolio samples consisted of two sets of passive and one set of active portfolios. The first set of passive portfolios were the CRSP size deciles. These were selected because of their use by LS&T and the more general use of size portfolios in testing return-generating process. The second set of passive portfolios were 28 industry return indexes. These indexes were constructed by sorting our 586 industrial firms into groups by two-digit SIC code. Then, for all industries with more than five members, a value-weighted return index was constructed.[5] The active portfolio was a sample of 267 mutual funds that had data from January 1979 to January 1993 and listed common stock investment as their investment objective.

These portfolios are especially interesting because mutual funds have an incentive to offer funds that span the set of important indexes. If sentiment is an index that investors care about, then the mutual fund industry should offer an array of funds with different loadings on this factor. If they did not, then a mutual fund would gain a large inflow of funds if they offered differential sensitivity to it, and other funds would likely follow suit. Thus, examining mutual fund returns is a useful way of examining which factors are important.

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5 Industry return has also been used in tests of RGP, e.g. Gibbons Ross and Shanken (1989).

D. Index Construction

Since our sample period does not coincide with that of LS&T, it was necessary to reconstruct their sentiment indexes. We followed their procedure in index construction almost exactly. The indexes are value-weighted. The discount is the net asset value minus the stock price over the net asset value times 100. When the monthly change in the discount was calculated, we maintained a common number of firms at the start and end of the month. Thus, if a firm would have entered our index during the month of January, it was not used in calculating the change in discount for January but was in February. The primary change we made from the LS&T procedure was to exclude from the index funds in their first six months of their existence.[6] We did this because of evidence that during this period the discount on closed-end funds is affected by arbitrage and price stabilizing actions of investment bankers and behaves differently from the discount of other closed-end funds. We calculated two measures of the discount on closed-end funds, one for stock funds and one for bond funds. Both are interesting to study. The discount on equity closed-end funds is the primary measure used by LS&T. It has the disadvantage that "sentiment" can affect both market value and net asset value. Thus LS&T went to some lengths to try to argue that the equity closed-end funds held large stocks whose price was determined by institutions not subject to "sentiment." Bond funds do not have these problems. Bond markets are dominated by institutional traders. Furthermore, arbitrages are fairly easily undertaken and the possibility of price discrepancies is constantly monitored. Thus, it is hard to argue that individual

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[6] There is one other change. LS&T used weekly data on discounts to approximate monthly data. Then they used discounts on the Friday closest to month-end to calculate the month-end discount. This was necessary because their data on net asset value came from the *Wall Street Journal* which only reports it as of Friday. We used Lipper data on net asset value in order to be able to compute the discount at the end of the month.

bonds are subject to "sentiment." The discount on closed-end bond funds is thus a purer measure of what the equity market will pay for a set of assets whose value is unaffected by "sentiment." Our indexes contained many more funds than those constructed by LS&T for there were more funds in existence during the more recent period of our study. Over our period we had a maximum of 32 stock closed-end funds and 38 bond closed-end funds. Since LS&T used an equity sentiment index, we will emphasize the results for this index.

Later we will compare the performance of these closed-end fund indexes to a set of indexes that were constructed in an analogous manner but using data for industrial firms. We selected the four industries with the largest number of firms in our sample, where industries were determined by two-digit SIC code. For these industries we ranked firms by market capitalization. We then selected from each industry the twenty largest firms that had over 50% institutional ownership. If "sentiment" is related to irrational behavior of small investors, then these firms should be unaffected by sentiment. Since for industrial firms net asset value (i.e., book value) is only available quarterly, these indexes are computed quarterly.

Finally, we constructed a set of return indexes. These indexes were value-weighted and comprised the same firms that we used in constructing the discounts. For comparison purposes, all indexes that could be computed monthly were also computed on a quarterly basis.

II. DOES SENTIMENT AFFECT THE RETURN-GENERATING PROCESS?

Modern asset pricing theory proves that for sensitivity to a factor to be priced it is necessary for the factor to be a systematic influence. Identifying systematic influences is a complex process. The return on any industry portfolio will enter the return-generating process for some securities. In fact, the return on most random portfolios of securities would also enter the return-generating process for some set of securities. Thus, to see if sentiment as measured by the change in the discount on closed-end funds (called ΔD-EF for equity funds or ΔD-BF for bond funds) is systematic it is necessary to compare its importance in the return-generating process to some factors most investigators would not believe are priced. Industry return indexes are a natural candidate. Industry return indexes will surely enter the return-generating process for most firms in the industry they were constructed from and likely for many firms in closely related industries. One test we will use for examining the importance of sentiment in the return-generating process is to see how often it is significant in time series estimates of this process relative to a set of industry return indexes computed for both the closed-end fund sample and other industries.

Before we compare the significance of ΔD-EF or ΔD-BF with the significance of industry return indexes, it is useful as an intermediate step to compare the significance of the change in discount on closed-end funds with the significance of the change in discount for a set of industry indexes constructed in such a way that sentiment is unlikely to play a role. As discussed earlier, the comparison group is the change in discount on a value weighted portfolio of 20 large firms, which exhibited high institutional ownership, drawn from each of four industries.[7] Sentiment is supposed to affect small firms with low institutional ownership. Because of large firm size and high institutional ownership, these industry indexes should not be affected by a sentiment index.

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[7] The sample was the 20 largest firms from each industry which had over 50% institutional ownership.

A. The Significance of Sentiment

As stated earlier, we used several samples of individual securities and portfolios to judge the importance of factors in the return-generating process. Tables 1 and 2 show the number of times that a factor is significant at the 5% level for each of the six candidates for a factor in the return-generating process. The candidates examined are the change in discount on equity funds, the change in discount on bond funds and the change in discount for each of the four industry samples. Table 1 presents the results for individual securities, while Table 2 presents the results for portfolios of securities. In both Tables 1 and 2, Panel A shows the results for the two-index model (the S&P plus one of the six ΔD's) while Panel B shows the results for the five-index model (the S&P, small minus large, value minus growth, a bond index plus one of the six ΔD's). Panels C and D parallel Panels A and B except that the indexes measuring change in discounts have been replaced with return indexes.[8]

Consider first the results for individual securities shown in Panel A of Table 1. For individual security returns, ΔD-EF is important in fewer cases than any other ΔD's. In fact, the 35 significant betas for the sample of 586 industrial firms is five more than would be expected by chance, and the zero for utilities is five less than would be expected by chance. All other ΔD's come in more often than ΔD-EF. Part of this is likely to arise because these indexes are better proxies for other variables omitted from the return-generating process. For the stock sample ΔD-BF enters the return-generating process more often than ΔD-EF but still enters the return-

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[8] We checked to see whether using monthly rather than quarterly data affected the number of times ΔD-EF and ΔD-BF were significant. The results were essentially the same. We also repeated the analysis excluding the firms in the industries for which we constructed industry indexes. Again, the results were essentially unchanged.

generating process less frequently than the industrial indexes. For the utility sample it enters the return-generating process much more frequently. LS&T excluded all bond funds from the results they reported for their sentiment index. However, as discussed earlier, ΔD-BF could be viewed as a sentiment index.

Panel B shows the results when the ΔDs are added to a four-index base model. This model has been shown to work about as well as any return-generating process in other studies.[9] ΔD-EF is significant a few more times with the five-index model but is still not significant much more than one would expect by chance across the two stock samples. Furthermore, with one exception, once again all the other ΔDs are significant more often than ΔD-EF. If we were to select another index in the return-generating process it would be one of the other ΔDs. Note also that in Panels A and B the change in the discount on equity funds is significant a smaller percentage of the time for utility stocks than it is for industrial stocks. This is exactly the opposite of the conjecture of LS&T. Once again, ΔD-BF is significant more often than ΔD-EF. In all samples it enters the return-generating process about as often as the change in industry discounts.

The results for portfolios (Panels A and B of Table 2) are similar. When the two-index model is used (Panel A), ΔD-EF enters the return-generating process about the number of times we would expect by chance and less than the number of times the other ΔDs enter except for ΔD-BF for the 28 industry portfolios. When the five-index model is used, ΔD-EF is significant less times than the other ΔD's with two exceptions in one sample.

When the five-index model is examined, many of the ΔDs are significant slightly more than would be expected by chance. However, they enter much less often than other indexes enter when

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[9] See Fama and French (1993) and Elton, Gruber and Blake (1996a, 1996b and 1997).

the five-index model is estimated. For the mutual fund sample, the S&P index enters significantly 265 times, the small minus large 155 times, the value growth 148 times, and the bond index 107 times. This is much larger than the number of times any of the ΔDs are significant. For the size and SIC groups the index with the least significance from the base four-index model is significant about the same number of times as the most significant ΔD, but which of the indexes is least significant varies across samples.

The question remains as to whether the ΔD's are measuring a fundamental influence (sentiment) or are simply acting as a proxy for either industry return or omitted variables. The ΔDs are of course correlated with industry returns (given the way ΔD is constructed, the correlation is negative). For the industry sample the book values will change very slowly over time. Thus ΔD will be primarily affected by the change in market value. This is reflected in the correlation of the value-weighted return indexes and the ΔD. For the four industrial ΔD's these correlations are -.54, -.53, -.77 and -.41 respectively. Likewise the book value for the bond closed-end funds will change less than the market value and fairly independently of the market value. Thus one would expect a high correlation between industry return of the bond closed-end funds and ΔD and the simple correlation is -.52. Since equity market movements affect both the market and book value for equity mutual funds, we would expect a lower correlation for this sample and returns, and this is what we observe (-.38). However, the question still remains whether even the limited significance of ΔD in the return-generating process is primarily due to the effect of industry returns on the ΔD's. To test this, we construct a value-weighted industry return index for each of our four industries.

The results are shown in Panels C and D of Tables 1 and 2 for the two- and five-index models. First, compare the results for the two-index ΔD model and the two-index return model (Panels A and C). In all but one case the industry return index is significant more often than the ΔD term. This is true whether the sample is individual security returns or a portfolio of returns. Now compare the five-index models. Once again, whether the sample is individual securities or portfolios, the return index in general has more significant coefficients than did the ΔDs. The evidence in total supports the notion that it is industry return indexes that explain security or portfolio returns and even the limited significance of the ΔD's is primarily because they are a proxy for a return index.

However, whether one looks at ΔDs or industry returns, the number of times they are significant does not support the presence of a systematic risk that is priced in the market.

B. Does another variable proxy for sentiment?

Others have argued that ΔD-EF might be important but have its presence masked because it is correlated with a variable which is accepted as systematic and included in the return-generating process.

For example, ΔD-EF might be an important reason why size or growth minus value enter the return-generating process. To test this we regressed ΔD-EF against the base four model. The adjusted R^2 was negative. Thus it is not an explanation for size or growth minus value. When we regressed ΔD-BF against the four-index model, the adjusted R^2 was .24. The significant coefficient was associated with the growth minus value index. As discussed elsewhere, the growth minus value index is highly related to a market book index. ΔD is also a market book index for a particular industry. Thus its relationship to an aggregate market book index is hardly surprising or meaningful.[10]

C. Sentiment and Size

One of the major ways to judge the contribution of a set of indexes to the return-generating process is to use portfolios formed on the basis of size as the unit of observation in time series tests. Size portfolios have been used as the unit of observation by Fama and French (1992) and Gibbons, Ross and Shanken (1989), among others, and play a key role in the testing of sentiment by LS&T. Thus it is worthwhile to examine this sample in more detail.

As discussed earlier, we used as our ten size portfolios the CRSP size deciles ordered from smallest to largest formed from NYSE stocks. Also, to better allow comparison with the LS&T results, in this section we follow their procedure and use a Value Weighted New York Stock Exchange index (VWNY) as the market index rather than the S&P index used in other parts of this study.[11]

In Tables 3, 4 and 5 we present the results for the period October 1979 through December 1994. Panel A of Table 3 shows the results of a regression of the return for each decile on the change in the discount of closed-end equity funds (ΔD-EF) and the VWNY index (a two-factor RGP). The first column is the beta on the ΔD-EF, the second column is the t value, and the third column is the R^2. These results are comparable to Table VII of LS&T, although they report

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[10] This section and the one that follows tend to support the arguments made by Chen, Kan and Miller (1993) that the small firm effect and the equity premiums payable are in fact two separate and distinct phenomena.

[11] All tables were also constructed with the S&P Index substituted for the NYSE, and both the results and conclusions are virtually identical.

results for the period 1975-1985. Note that the R^2's are close to those found by LS&T. The pattern of regression coefficients are also suggestive of the LS&T results. The smallest stocks have negative weights; the largest decile stocks positive weights. Like LS&T, we find the regression coefficient in general increase as we examine larger firms. In fact, the rank correlation between deciles and the regression coefficients on ΔD-EF is .71. As in the latter period studied by LS&T, none of the regression coefficients on ΔD-EF from any of the 10 size portfolios are statistically different from zero. LS&T interpret these results as indicating that there is a sentiment index and that different size firms have different sensitivity to it.

In Table 3 we also report analogous results for the five-index regression. The goodness of fit (particularly for the small stocks) is much better than in the case of the two-index model. Note that the relationship between the regression coefficient on ΔD-EF and the size deciles is actually reversed. Large companies tend to have negative loadings and small companies positive loadings (the Spearman rank correlation is -.71).

The pattern of coefficients that LS&T argued supported sentiment as an influence is reversed when a more realistic return-generating process is used. This occurs even though the correlation of ΔD-EF with a size variable, or in fact any of the variables in the return-generating process, is quite low.

Examining the betas on sentiment in the two-index model, LS&D speculate that the index ΔD-EF is a proxy for a systematic sentiment index that affects small stocks and large stocks differently. The index supposedly works because of the individual ownership of small stocks and of closed end mutual funds. An alternative explanation is that ΔD-EF is simply a proxy for other relationships which are part of a more realistic RGP. If this is true, there should be nothing special about the variable ΔD-EF but the variable ΔD constructed for any industry not affected by sentiment could also proxy for the omitted variables. We first examined ΔD computed for stocks in the transportation industry. Recall that the index was constructed from large stocks with high institutional ownership so that it should be unrelated to investor sentiment if it exists. The results are shown in Panel B of Table 3. Note first that in a two-index model the results parallel, and in fact better fit the LS&T sentiment story, than the results using ΔD-EF. The R^2 are higher (better fit), the pattern is stronger, from minus to plus, as we go to larger stocks, all of the coefficients are statistically different from zero, and the rank correlation between the sensitivity to ΔD-TR and size decile is higher (.96). There is nothing unique about ΔD-EF; in fact, looking at the influence of ΔD for an industry gives stronger results. When we look at the role of ΔD-TR in a five-index model we again see results directly analogous to what we saw with ΔD-EF. The explanatory power of the model goes way up. None of the regression coefficients on ΔD-TR are statistically different from zero, and the relationship between deciles and the coefficient of ΔD-TR becomes negative (Spearman rank correlation of -.28) and is not significant.

Once again the ΔD variable appears to be acting as a proxy for omitted influences and the effect of this variable seems to disappear when a more robust model of the return-generating process is used.

In Table 5 we present the rank correlation between size and the change in the discount for other industries and for a closed-end bond fund sentiment index. Except for chemicals, the results are all analogous to those found for ΔD-EF. Chemicals show the opposite sign for the change in discounts computed for other industries.

As discussed earlier, ΔD may simply be proxying for return. If ΔD-EF is simply a noisy measure of industry return, then we should get similar but stronger results if we replace the change in discount for any industry with the index of return for that industry. We do this in Table 4. The entries in these Panels directly parallel the entries in Panel A and B of Table 3. Note the sign of the relationship is reversed since ΔD moves in the opposite direction of returns. (The two measures are highly negatively correlated as discussed earlier.)

When we examine the results for the two-index RGP in Panel A of Table 4, we find the reversal of signs for the largest stocks, higher t values than in Panel A of Table 3 (although only two are significant) and higher R^2. When a two-index model is used, the return for closed-end equity funds better explains returns than the change in the discount for these funds. When we examine the five-index model we find much better explanatory power than in the two-index case. We also find that the significance of the industry return index has markedly decreased. In the two-index case the Spearman rank correlation between size and the regression coefficient on industry return is -.915, while in the five-index case it is -.006. Using return indexes produces the same type of results we found for the change in discount, but the results are even stronger.

When we examine an index of the return on transportation stocks we get analogous results. In the two-index case the return on the transportation index explains the return in deciles better than the return on closed ends funds and the pattern of coefficients is more pronounced than when the change in the discount is used. When the five-index model is used, all of the return indexes and all of the change in discount indexes work poorly.

In summary, when a two-index model is employed we get a strong pattern in the beta on the second index using either the change in the discount or return. However, few of the coefficients are significant. Using data from equity or bond mutual funds works no better, and in fact is inferior to using data from a transportation index. There is nothing special about the index constructed from closed-end equity funds. When a five-index model is employed, we see that the change in discount and the return indexes no longer show strong pattern across size deciles found with the two-index models.

D. Sentiment and Empirically Derived Factors

In the earlier section we used as a return-generating process four pre-specified factors. An alternative way to specify the return-generating process is to empirically derive factors. We used as our empirical derived model the factors described in Connor and Korajczyk (1986).[12] These factors are derived from the variance covariance matrix using principal components analysis. Table 6 shows the simple correlation of the equity sentiment index with the first five empirically derived factors. The largest value is .06 with factor 5. Each of the factors has a higher correlation with each of the industry indexes than it has with the equity sentiment index.

We regressed each factor against the four-index base model with and without equity sentiment. For all five factors except the first the adjusted R^2 was lowered when sentiment was included in the regression (for the first factor it was unchanged). For each factor the F test associated with adding a sentiment index to the base model finds the sentiment index result in no improvement at the 5% level. Thus equity sentiment does not appear to be related to empirically derived factors.

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12 We thank Bob Korajczyk for supplying us with the factors. The data ends in December, 1992, which is slightly shorter than our sample period in the rest of the study.

The fact that equity sentiment is not related to empirically derived factors is powerful evidence that sentiment is not in the RGP. The concern with empirical factors has always been that one can have too many factors. Since one is unsure what they represent a factor can occur and not have any economic significance. However, it is hard to understand how a factor which is supposed to have economic significance like sentiment could possibly enter the return-generating process and yet not be related to empirical factors.

One argument that has been put forth is that closed-end mutual funds sell at a price below net asset value because they must offer a higher rate of return since they are riskier and this risk is unrelated to other fundamental characteristics determining return. In the next section we examine this conjecture.

III. DISCOUNTS ON CLOSED END FUNDS AND EXPECTED RETURNS

Over our sample period the return earned on stock closed-end funds exceeded the return earned on their net asset value. (This latter number is the return that would have been earned by investors if the fund was an open-end fund.) The extra return was primarily due to a decrease in the average discount from about 20% to 10% during the period. However, examining raw return ignores differences in the systematic risk of the funds. When we employ the four-index model to adjust for systematic risk, we find that the risk-adjusted return (α) for closed-end stock funds is -.174% per month, while for closed-end bond funds it averages -0.161% per month.

If in constructing this model we had ignored a systematic source of risk that impacted fund returns (for example, sentiment), then the risk-adjusted return ignoring this factor should be positive, not negative. This holds because the investor would receive an extra return to compensate for the omitted risk.[13] If sentiment risk was a systemic factor impacting holders of closed-end funds, then including a sentiment index should cause the risk-adjusted return to decrease. In fact, including ΔD-EF for stock and ΔD-BF for bond funds causes the risk-adjusted returns (α) for each type of fund to increase, not decrease.[14] Looking at risk-adjusted returns provides no evidence that sentiment risk impacts expected returns in a manner consistent with sentiment risk being a source of risk to fund holders.

The analysis just discussed depends somewhat on the period selected. Another way to analyze the issue is to see if, given the characteristics of closed-end funds, one should expect an extra return due to sentiment risk. As we show below, the return to investors on closed-end funds is not only a function of the return on net asset value, but also a function of both the discount and change in the discount. In order to examine the effect of a discount, we must first relate the return on the shares of a closed-end fund to the return on net asset value. Then we can examine the excess return and risk of investor return and NAV return to see if closed end funds can offer an extra return to investors as compensation for sentiment. We discuss the difference, first assuming that the risk of investor return and NAV return is the same. We then show that the actual differences in risk between NAV return and market return make it even more likely that sentiment risk is not priced.

As shown below, the return on the shares in a closed-end fund can be related to the return on the underlying assets.

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13 This assumes that the sensitivities are positive, which they are, and that the market price of risk is positive for sentiment which is the argument of LS&T.

14 The α on stock funds increases from -.1740% to -.161%, while for bond funds it goes from -.161% to +.0012%.

Define

1. R_I as the return to an investor in a closed-end fund

2. R_{disc} as the return (or rate of change) on the discount

3. R_{NAV} as the return on the net asset value

4. P_t as price at time t

5. D_t as the dividend at time t

6. N_t as net asset value at time t

7. d_t as the discount at time t

The return to the investor and the return on the NAV from time zero to one, and the return on the discount are given respectively by

$$R_I = \frac{P_1 + D_1 - P_o}{P_o}$$

$$R_{NAV} = \frac{N_1 + D_1 - N_0}{N_0}$$

$$d_1 = \frac{N_1 - P_1}{N_1}$$

From these definitions it follows that investor return is related to the return on the NAV as follows:

$$(1 + R_I) = (1 + R_{NAV}) \left(\frac{1 - d_1}{1 - d_o} \right) + \frac{D_1 \, d_1}{P_o}$$

While the discount will vary from year to year, the expected value of a change in the discount must be zero. If it were to be negative (positive) an investor would have to expect the price of the fund to grow (decline) continuously relative to the net asset value of the firm until the price was much larger (smaller) than net asset value. Taking the expected value of both sides and setting the expected value of the change in the discount to zero, we have

$$E\,(R_I) = E(R_{nav}) - \frac{D_1 \, d_1}{P_o}$$

From this equation we see that if the price of the fund is below the net asset value of the fund (the fund sells as a discount) then the expected return to investors exceeds the expected return on fund assets. This occurs because the discount allows the dividend stream to be purchased at a lower price.

Before we examine the implications of this equation for the effect of sentiment risk on risk-adjusted returns (α), we have to state some general properties we would expect to find for the α's on closed-end funds.

The shares of closed-end funds are traded assets. With a properly defined asset pricing model, the average alpha on traded assets should be zero. Of course, for any period the average alpha may be above or below zero. If sentiment risk were priced, ignoring it should result in obtaining a larger, and in fact positive, alpha for closed-end funds. The issue to be discussed is whether given the expected return relationship defined above we should reasonably expect a positive or negative alpha on investor returns if alphas are measured ignoring sentiment risk. If we should expect a negative alpha, it would be inconsistent with sentiment risk and would suggest the negative alpha we found empirically in the previous section was not due to our having selected an abnormal period.

We first discuss this under the assumption that the sensitivities (risks) of the market return and NAV return are the same. Shortly we will explore the impact of differences in sensitivities. When sensitivities are the same, the only difference in expected alphas on NAV and market return comes about because of the discount. The alphas on NAV returns in the period discussed earlier were negative. But this is a general result not restricted to this period of time, as there is ample evidence that open-end funds have negative alphas post-expenses. Thus the negative alpha on NAV returns is reasonable, and is consistent with a large body of evidence.[15]

Furthermore, the size of the NAV alpha we found is similar in magnitude to the alpha found on open-end funds. The issue is whether the discount is likely to be sufficient to make the expected market alpha positive as it would have to be if sentiment risk affected the return and alpha of closed-end funds.

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[15] One could argue that closed-end funds should have different α's than open-end. There are arguments that would lead to larger or smaller alphas on closed-end funds relative to open-end funds. One argument of why it should be larger is that closed-end funds do not have to worry about redemptions and therefore hold cash (the use of futures eliminates this problem). An argument for smaller alpha is that closed-end funds do not have the market discipline of inflows and outflows due to performance and therefore are less performance-oriented.

The discount in our sample period is about 12% for equity funds on average and 3% for bond funds. Of greater importance, these numbers are consistent with the discounts found over long time periods. For an expected return of 10.6% for stock and a 5.1% expected bond return (numbers roughly consistent with Ibbotson (1997)), the $E(r_{mkt})$ would be expected to exceed $E(r_{NAV})$ by 1.3% for stock funds and .10% for bond funds.[16] The possible increase in alpha due to the discount is smaller in magnitude than the annualized negative alphas on NAV returns found for both open and closed-end funds. Therefore, even under these extreme assumptions we would not expect to observe positive alphas on investor return as required by the sentiment story.[17]

The empirical evidence shows that the sensitivities for market return are different than for NAV return, unlike the assumption made above. They are different in a direction that lowers the alpha on market return and thus makes the pricing of a sentiment index even more unlikely. We will now discuss the fact that there is a logical reason why this should be true.

In Table 7 we report the average sensitivities (betas) associated with investor return and NAV return from our four-index model. For stock funds the sensitivity of the NAV return and investor return to the S&P index are virtually the same. However, the sensitivity varies on each of the other indexes. We believe that the direction of the difference in each of these indexes is consistent with the relationship between sensitivities and firm characteristics found in general and that the direction of the differences found in our sample period is extremely plausible.

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16 These numbers are computed by using equation (1).

17 Although we are assuming in this section that the betas on the investor's return are the same as on NAV, if they are set by the betas on the NAV the discount would impact them. Inserting any asset pricing model for $E(r_{NAV})$ in equation (1) shows that betas and alphas should be adjusted by the same percentage. Since the alpha on NAV is negative, under the assumptions just discussed the alpha on investor return would be even more negative.

The investor return has a much higher sensitivity (beta) to the small minus large return variable than does the NAV return. To analyze this we examined whether the beta on the small-large return index was related to the size of firms. We first divided the 586 stocks in our common stock sample into 20 groups, with the first group containing the 1/20th of the stocks with the smallest total equity capitalization and the 20th group the 1/20th of the stocks with the largest capitalization. The return on each group was calculated using an equally weighted portfolio of the stocks within the group. Time series data was then used to regress the return on each group against our four-index model. The beta on the small-large variable was then regressed (in cross section) on the natural logarithm of the average capitalization of the firms in each group. The results were as follows:

$$\beta_{S\text{-}L} = 1.856 - .191 \ln(size) \qquad R^2 = .954$$

There is obviously a very strong relationship between the sensitivity to the small minus large index and the size of the companies involved. Companies which are smaller in size have a larger beta in our model.

Examining the NAV beta for the small minus large index shows that the assets on closed-end equity funds have a beta equal to the largest 20% of industrial firms in our sample. This is consistent with the argument made by LS&T that closed-end funds hold relatively large firms. The closed-end stock funds are well below average in size (total capitalization), and in fact would rank in the lowest 40%, in size, of our sample of industrial firms. Thus the closed-end stock funds are smaller in size than the companies they hold. The difference in size, combined with the negative sign on size, explains why investor returns have a larger beta than NAV returns. The same relationship holds for closed-end bond funds, but it is even more pronounced (bond funds are smaller and NAV returns act more like large firms).

The relationship of the sensitivity of the growth-value variable is also plausible, given the characteristics of funds. We repeated the process we employed to discover the relationship between the small minus large beta and size to discover the relationship between the growth minus value beta and the ratio of market-to-book. We formed twenty portfolios by ranking the 586 stocks on their market-to-book ratio for each portfolio, and then regressed the growth minus value beta for each portfolio from our four-index model against the ln of the market-to-book ratio. The results were as follows:

$$\beta_{G-V} = -.255 + .370 \ln (market/book) \qquad R^2 = .89$$

There is strong evidence that firms which have higher market-to-book ratios have larger betas with respect to our growth minus value return index.

The sensitivity to the growth minus value beta computed on NAV would imply an average market-to-book ratio on the assets of closed-end equity funds of 1.35. The market-to-book ratio on closed-end equity funds is .90. Thus the closed-end equity funds have a smaller market-to-book ratio than the assets they hold. Given the relationship just described, this would imply that the sensitivity on the growth-value index should be smaller for investor returns than NAV returns. In fact, this is what we find (see Table 7). Similar results hold for closed-end bond funds.

The final sensitivity to examine is the sensitivity to the bond factor. We related this sensitivity to dividend yield. We once again used the same procedure as in the previous two cases. Our 586-stock sample was divided into 20 portfolios based on dividend yield (the dividend-to-price ratio). Then the sensitivity of each portfolio to the bond variable was regressed (cross sectionally) against the average dividend yield for each portfolio. The results were

$$\beta_{bond} = -.255 + 3.434 \ (Dividend/Price) \qquad R^2 = .297$$

While this relationship is weaker than those found for the size and growth betas, it is still significant at the 1% level.

To maintain the tax advantage afforded to mutual funds, closed-end funds must pay out 95% of their income from dividends and capital gains received each year. This results in larger dividend yields for closed-end funds than the stocks or bonds they hold and thus gives them more bond-like characteristics and a higher beta with our bond variable.

The three sensitivities that are different on investor return than NAV return for closed-end stock funds are consistent with the difference between the characteristics of the closed-end stock funds and the characteristics of the assets they hold. Thus the negative alpha on market returns cannot be explained by unreasonable betas. The question remains: can we go further and make definitive statements about the riskiness of the investor return and NAV return? The relative smallness of the closed-end funds and the empirical evidence supporting a positive premium required for small size would imply that the investor return is riskier than NAV return and investors require a higher expected return on shares than on NAV. The growth minus value beta for investor returns being closer to value and the evidence that value stocks must offer a higher return is again consistent with the investor return being riskier. The closed-end stock funds also have higher sensitivity to the bond index. The evidence here is also for a positive market price.

Thus the characteristics of closed-end stock funds suggest that the investor return is riskier than the NAV return.

The results for closed-end bond funds are even clearer. For bond funds the beta on bonds is about the same for investor return as NAV return. However, the sensitivity to the S&P return is much higher for investor return than NAV return. This is to be expected since the equity is traded. Since higher sensitivity to the S&P requires a higher return, the difference in required return for investors relative to NAV is likely to be even higher for bond funds. However, the small discount means this difference in risk will not be compensated for and the alpha is negative, unlike what would be required for a sentiment story.

Let us summarize what we have learned in this section. NAV alphas are negative. This is consistent with the findings on open-end mutual funds. Since closed-end funds have prices and returns freely determined in the open market, if we have identified the correct return-generating process they should have alphas equal to zero. If sentiment risk is important, and if we leave it out, closed-end funds should have positive alphas. They do sell at discounts. They do offer higher average investor return than average NAV return. However, after the adjustment for our four sources of systematic risk, the α on investor return is less than the alpha on NAV return. Furthermore, examining the pattern of betas on investor return compared to NAV return shows that a non-positive alpha is to be expected. The evidence is clear that the alpha from a four-index model is negative and these results are inconsistent with the existence of a priced sentiment index.

CONCLUSION

In this article we explore whether sentiment could reasonable be expected to be a factor affecting expected return. Modern asset pricing theory require that only sensitivity to systematic factors in the return-generating process be priced. We first explored whether sentiment was a factor in the return-generating process. We showed that a sentiment index computed from closed-end funds enters the return-generating process no more often than indexes computed in the same way from large firms which have high institutional ownership in other industries. We next showed that sentiment indexes enter the return-generating process less often than industry return indexes. Since industry return indexes are not considered priced indexes, this makes it less likely that sentiment indexes are priced. In doing all of this analysis we employed both a two-index model similar to that of the LS&T, and a five-index model which also included a size and growth variable. The presence of these additional variables in general changed the relationship of sentiment indexes and industry return indexes in the return-generating process.

As another test of the role of sentiment indexes in the return-generating process, we examined whether sentiment was related to empirically derived factors. We used the Connor and Korajczyk factors. The simple correlation of the sentiment indexes derived from closed-end funds was less than .03 for any of five factors found by Connor and Korajczyk. Sentiment is not related to any of the systematic factors derived from the variance-covariance matrix of security returns.

We examined whether the index is priced. For traded assets the alpha from a properly defined asset pricing model should be zero. If we leave out sentiment, and sentiment is important in the asset pricing model, then the alphas should be positive. We show that the alpha investors receive has historically been negative. Furthermore, examining the risk to investors relative to the risk on NAV indicates that the negative alpha is to be expected. The discount on closed-end funds is insufficient to provide a positive alpha, and there is no evidence supporting sentiment as part of the return-generating process or asset pricing model.

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Table 1. Number of Times Individual Security Sensitivities are Significant at the 5% Level

The table shows the number of times the individual security sensitivities are significant at the 5% level in regressions of the excess returns of the securities against various models. The indices in the 2 index model are the excess return on the S&P500 index plus the index shown. The 5 Index model contains the excess return on the S&P500 index, the difference in return between a small cap portfolio and a large cap portfolio based on Prudential-Bache indices, the difference in return between a high growth portfolio and a value portfolio based on Prudential-Bache indices, the excess return on the Shearson Lehman Government Corporate bond index, and the index shown. The models in panels A and B contain ΔD, which represents the change in the value weighted discount index, where the index is given by the difference between the book value and the market value divided by the book value for the 4 industries and the the difference between the net asset value and market value divided by the net asset value for the closed end funds. The models in panels C and D contain value weighted Industry returns. Returns and discount changes are of a quarterly frequency. The sample period is from 1980 through 1994.

	Discounts				Returns			
	A. 2 Index Model		B. 5 Index Model		C. 2 Index Model		D. 5 Index Model	
	585 Industrial Stock Sample	99 Utility Stock Sample	585 Industrial Stock Sample	99 Utility Stock Sample	585 Industrial Stock Sample	99 Utility Stock Sample	585 Industrial Stock Sample	99 Utility Stock Sample
Closed End Stock Funds	35	0	48	2	58	1	55	3
Closed End Bond Funds	53	36	74	34	71	73	82	30
Transportation	155	4	69	3	255	5	103	6
Industrial Machinery	85	3	63	0	202	37	63	2
Electronics	103	5	67	4	172	49	100	25
Chemicals	90	4	99	25	87	9	70	6

Table 2. Number of Times Portfolio Sensitivities are Significant at the 5% Level

The table shows the number of times the portfolio sensitivities are significant at the 5% level in regressions of the excess returns of the portfolios against various models. The indices in the 2 index model are the excess return on the S&P500 index plus the index shown. The 5 Index model contains the excess return on the S&P500 index, the difference in return between a small cap portfolio and a large cap portfolio based on Prudential-Bache indices, the difference in return between a high growth portfolio and a value portfolio based on Prudential-Bache indices, the excess return on the Shearson Lehman Government Corporate bond index, and the index shown. The models in panels A and B contain ΔD, which represents the change in the value weighted discount index, where the index is given by the difference between the book value and the market value divided by the book value for the 4 industries and the the difference between the net asset value and market value divided by the net asset value for the closed end funds. The models in panels C and D contain value weighted industry returns. Returns and discount changes are of a quarterly frequency. The sample period is from 1980 through 1994.

	Discounts						Returns					
	A. 2 Index Model			B. 5 Index Model			C. 2 Index Model			D. 5 Index Model		
	267 Mutual Funds	10 Size Portfolios	28 SIC Portfolios	267 Mutual Funds	10 Size Portfolios	28 SIC Portfolios	267 Mutual Funds	10 Size Portfolios	28 SIC Portfolios	267 Mutual Funds	10 Size Portfolios	28 SIC Portfolios
Closed End Stock Funds	15	0	2	24	0	4	35	9	3	20	0	3
Closed End Bond Funds	45	4	1	43	1	4	75	2	4	41	0	4
Transportation	100	10	18	40	0	6	133	10	19	52	1	11
Industrial Machinery	33	2	9	30	1	3	144	10	21	51	4	9
Electronics	31	3	12	27	0	8	47	9	16	40	1	8
Chemicals	35	3	5	45	4	8	64	3	9	28	3	6

Table 3. Regression Results of CRSP Market Capitalization Deciles Against Index Models and the Change in the Industry Value Weighted Discount

The table shows results from regressions of returns of the CRSP market capitalization deciles against the 2 index and 5 index models. The 2 index model is the excess return on the S&P500 index and the change in the industry value weighted discount. The 5 index model is the excess return on the S&P500 index, the difference in return between a small cap portfolio and a large cap portfolio based on Prudential-Bache indices, the difference in return between a high growth portfolio and a value portfolio based on Prudential-Bache indices, the excess return on the Shearson Lehman Government Corporate bond index, and the change in the industry value weighted discount. Beta(ΔD-EF) is the beta on the change in the closed-end equity funds value weighted discount. Beta(ΔD-TR) is the beta on the change in the transportation industry value weighted discount. Returns and discount changes are of a quarterly frequency. The sample period is from 1980 through 1994.

	A. Closed End Stock Funds						B. Transportation					
	2 Index			5 Index			2 Index			5 Index		
Decile	Beta(ΔD-EF)	t-stat	R-sq	Beta(ΔD-EF)	t-stat	R-sq	Beta(ΔD-TR)	t-stat	R-sq	Beta(ΔD-TR)	t-stat	R-sq
1	-0.110	-0.292	0.564	0.185	1.000	0.905	-0.200	-3.300	0.656	-0.014	-0.440	0.908
2	-0.177	-0.697	0.706	0.020	0.170	0.946	-0.132	-3.750	0.759	0.001	0.030	0.948
3	-0.141	-0.707	0.795	0.018	0.170	0.951	-0.076	-2.570	0.807	0.033	1.860	0.952
4	-0.018	-0.100	0.843	0.110	1.300	0.967	-0.075	-2.950	0.857	0.017	1.130	0.963
5	-0.035	-0.222	0.855	0.097	1.310	0.971	-0.063	-2.850	0.871	0.017	1.390	0.971
6	-0.092	-0.644	0.876	0.010	0.940	0.972	-0.068	-3.370	0.891	0.004	0.350	0.970
7	-0.003	-0.028	0.905	0.088	1.300	0.972	-0.067	-4.280	0.926	-0.017	-1.480	0.971
8	-0.108	-1.037	0.924	-0.035	-0.460	0.967	-0.046	-3.050	0.930	-0.007	-0.570	0.967
9	-0.034	-0.496	0.964	0.015	0.270	0.977	-0.025	-2.540	0.967	-0.010	-1.020	0.978
10	0.028	0.541	0.973	-0.014	-0.510	0.993	-0.022	2.920	0.973	-0.002	-0.419	0.992

Table 4. Regression Results of CRSP Market Capitalization Deciles Against Index Models and the Change in the Industry Return

The table shows results from regressions of returns of the CRSP market capitalization deciles against the 2 index and 5 index models. The 2 index model is the excess return on the S&P500 index and the change in the industry value weighted return. The 5 index model is the excess return on the S&P500 index, the difference in return between a small cap portfolio and a large cap portfolio based on Prudential-Bache indices, the difference in return between a high growth portfolio and a value portfolio based on Prudential-Bache indices, the excess return on the Shearson Lehman Government Corporate bond index, and the change in the industry value weighted return. Beta(return) is the beta on the change in the industry value weighted return. Returns are of a quarterly frequency. The sample period is from 1980 through 1994.

	A. Closed End Stock Funds						B. Transportation					
	2 Index			5 Index			2 Index			5 Index		
Decile	Beta(return)	t-stat	R-sq	Beta(return)	t-stat	R-sq	Beta(return)	t-stat	R-sq	Beta(return)	t-stat	R-sq
1	0.250	0.767	0.566	-0.217	-1.340	0.904	0.600	4.720	0.685	-0.028	-0.310	0.908
2	0.920	1.820	0.718	0.073	0.730	0.946	0.469	5.720	0.806	0.057	1.030	0.947
3	0.291	1.700	0.801	0.039	0.440	0.950	0.363	5.430	0.855	0.054	1.060	0.950
4	0.234	1.540	0.844	-0.005	-0.060	0.962	0.303	5.130	0.886	0.022	0.520	0.962
5	0.199	1.510	0.860	-0.011	-0.170	0.970	0.276	5.450	0.901	0.038	1.050	0.970
6	0.246	2.050	0.882	0.057	0.930	0.972	0.260	5.620	0.915	0.043	1.250	0.971
7	0.155	1.540	0.907	0.007	0.110	0.970	0.224	6.160	0.941	0.075	2.370	0.973
8	0.194	2.200	0.926	0.070	1.110	0.966	0.123	3.210	0.931	-0.016	-0.470	0.967
9	0.078	1.320	0.964	0.014	0.290	0.977	0.057	2.230	0.966	0.000	-0.010	0.977
10	-0.092	-2.110	0.974	-0.023	-0.930	0.992	-0.089	-5.120	0.979	-0.019	-1.380	0.992

Table 5. Spearman Rank Correlation Between Decile and Regression Coefficient

The table shows the Spearman rank correlation coefficient between the rank of the CRSP market capitalization decile and the coefficient on either the change in the industry value weighted discount or the coefficient on the industry return. The coefficients are computed from a regression of the excess returns of the CRSP decile against the 2 index and 5 index models and the change in the industry value weighted discount or the industry return. The indices in the 2 index model are the excess return on the S&P500 index and the indicated index. The 5 Index model contains the excess return on the S&P500 index, the difference in return between a small cap portfolio and a large cap portfolio based on Prudential-Bache indices, the difference in return between a high growth portfolio and a value portfolio based on Prudential-Bache indices, the excess return on the Shearson Lehman Government Corporate bond index, and the indicated index. Returns and discount changes are of a quarterly frequency. The sample period is from 1980 through 1994.

	A. Industry VWD		B. Industry Return	
	2 Index	5 Index	2 Index	5 Index
Transportation Equipment	0.960	-0.280	-1.000	-0.212
Industrial Machinery	0.850	-0.080	-0.975	-0.733
Electronics	0.790	0.100	-0.987	-0.188
Chemicals	-0.850	-0.300	-0.685	-0.018
Equity Sentiment	0.710	-0.710	-0.915	-0.006
Bond Sentiment	0.880	-0.400	-0.248	-0.188

Table 6. Correlation Matrix of Change in Sentiment Indices and Five Stock Market Factors

The table shows the correlations between changes in the closed-end fund value weighted discount or changes in the four industry value weighted discounts and five stock market factors. The data is of a quarterly frequency. The sample period is from June 1980 through December 1992. The factors are those developed by Connor and Korajczyk (1986).

	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
C.E. Sentiment	-0.02	-0.05	0.02	-0.01	0.06
Transportation	-0.55	0.28	-0.42	0.20	0.14
Industrial Machinery	-0.60	-0.26	0.02	0.13	0.21
Electronics	-0.79	-0.01	-0.24	0.29	0.36
Chemicals	-0.64	-0.53	-0.05	0.46	0.28

Table 7. Closed End Sample Four Index Regression Results

The table shows average values from regressions of excess returns of the closed-end stock and bond samples against the the excess return on the S&P500 index, the difference in return between a small cap portfolio and a large cap portfolio based on Prudential-Bache indices, the difference in return between a high growth portfolio and a value portfolio based on Prudential-Bache indices, and the excess return on the Shearson Lehman Government Corporate bond index. The stock sample consists of 32 funds. The bond sample consists of 38 funds. Returns are of a monthly frequency. The sample period is from 1980 through 1994.

	α	$\beta_{S\&P}$	β_{Sm-Lg}	β_{Gr-Vl}	β_D	R^2
Stock Funds						
Investor	-0.1740	0.758	0.505	-0.119	0.384	0.52
NAV	-0.1894	0.752	0.371	0.168	0.147	0.76
Bond Funds						
Investor	-0.1611	0.191	0.172	-0.411	0.934	0.34
NAV	-0.0299	0.053	0.069	-0.062	0.979	0.77