CLOSED-END FUND STUDY

The Connection Between Current Discounts and Future Returns

1988 - 2009

SECURITIES ANALYSIS CENTER OF THE UNIVERSITY OF OREGON BUSINESS SCHOOL

Ben Salm, *Managing Director*

Professor George Racette, *Faculty Advisor*

Howard Yang, **Jae-Rak Lee, Jason Green,** *Student Team*

June 2010

A Long-Term Historical Study of the Returns of Closed-End Funds

The Connection Between Current Discounts and Future Returns

Based on the success of various accounts we managed during 2000-2005 that focused on discounted closed-end funds, we began managing a partnership to capitalize on what appeared to be a steady relationship between large discounts and high subsequent total returns. The results were almost entirely satisfactory. In 2008, we decided to investigate whether this relationship had historically persisted over time. Surprisingly, we found no evidence that anyone had ever engaged in such an investigation before. The only CEF index we found, in fact, was a 30-fund index calculated by Herzfeld Advisors in Miami, and provided weekly in Barrons.

Academic studies were scarce, and we found none dedicated to answering the simple question:

Do large discounts lead consistently to higher total returns?

So we set about constructing our own indexes of closed-end funds. We quickly found that nearly all the databases with information about closed-end funds threw out the data when funds went out of existence (either through liquidation, merger, or conversion into an open-end fund). And so we decided to do the best we could by taking all 600+ closed-end funds in existence in 2008, and collecting all relevant data on these funds back as far as we could.

A summary of the results we found from our study:

- Historically, for US closed-end funds, discounts to NAV have been highly correlated with subsequent total returns.
- Results are statistically significant across time, and across different closed-end fund types.
- A simple investment strategy based on discounts demonstrates impressive long-term results:
  - 20% annualized return
  - 0.7 beta to the S&P 500
  - 13% annualized alpha to the S&P 500
- Matisse Capital sponsored this study, and applies these insights, along with others, to our management of the Matisse Discounted Closed-End Fund Strategy.

Our primary data source, Bloomberg, had reliable information on closed-end funds back to 1988, and so that is where we began our index. For each of the 600 funds, we collected month-end prices, month-end NAVs, all distribution history, and any capital change information, back to the inception of the fund. We then painstakingly calculated a month-by-month total return for each fund, along with each fund's month-end premium or discount to NAV. We checked the accuracy of this information using multiple methods.

We then constructed several indexes from our data. First, we constructed an index of all the closed-end funds in our study, equally-weighted, and rebalanced monthly. For someone investing concurrently with this index, the methodology would be to buy any newly issued closed-end funds at their first month-end, and use that opportunity to rebalance. The total number of closed-end funds owned would grow each month throughout the time period from 1988-today (initially 52). The total return of this index was extremely close to the total return one would expect from investing in a balanced account (minus the expense ratio of the closed-end funds), giving us confidence that survivorship bias was not affecting our overall total returns, and that we had not made any major methodological errors (Through the end of April 2011, the entire universe of CEFs has annualized at 8.09%, as compared to 9.03% for a 60/40 blend of the S&P 500 and BarCap Agg rebalanced monthly).

Next, we constructed sub-indexes, testing our hypothesis that discounts were correlated with future returns in the aggregate. Our first clue that we were "onto something" came when we found that investing equally only in all discounted funds (rebalancing monthly) gave an annualized return north of 12%, while investing equally only in all premium funds resulted in an annualized LOSS of about 2%.

For further investigation, we split the universe into discount quintiles monthly. The returns by quintile were astonishing: in nearly 80% of the individual *months*, the most discounted quintile outperformed the least discounted (nearly always funds trading at a premium) quintile! The regularity of the data was also striking: when we linked the return series (effectively, this would track the returns to a strategy of owning a particular discount quintile for a month, equal-weighted, then rebalancing at the end of that month, resulting in some replacement of funds that had drifted out of that quintile), we found that in 49% (!) of all rolling twelve-month periods, the returns decreased *monotonically* from the most discounted to the least discounted quintiles. In 91% (!) of all rolling three-year periods, the returns decreased monotonically.

Further, the returns from any one of the quintiles were highly correlated to the returns of a balanced portfolio, with beta (to the S&P 500) lower than 1 in every case. From an investment perspective, the idea of generating a tremendous amount of alpha from a highly diversified portfolio, with a beta nearly always lower than 1, and extremely regular results, is highly attractive indeed!

How much alpha? The results of investing in only the most discounted quintile of closed-end funds, from 2/26/1988-3/31/2011, are as follows:

Annualized return:	+19.97%
End value of $10,000 in strategy:	$668,998
Annualized return of S&P 500:	+9.70%
End value of $10,000 in S&P 500:	$84,830
Annualized return of bonds:	+7.11%
End value of $10,000 in bonds:	$48,945
Correlation to S&P 500:	0.71
Beta to S&P 500:	0.72
Annualized Alpha to S&P 500:	+12.65%
Annualized standard deviation:	15.3%
Annualized std dev of S&P 500:	15.0%
Percentage of rolling 12-month periods the strategy has beaten a 60/40 balanced account:	87%

We are certainly aware that our study has flaws, the principal one being survivorship bias. In addition, it would not be possible to know precisely ahead of time what a fund's discount at the end of a trading day would be, and so one would not know precisely what quintile it would fall into. Further, there are liquidity constraints, and closing prices may not be available the following day. We've attempted to address some of these issues within the context of our data.

First, regarding survivorship bias, we have been running the quintiles "live" since 2005, therefore retaining the results of funds that go out of existence. The results have been indistinguishable from the pre-2005 results from a statistical perspective. Further, we note that survivorship bias ought to be less of an issue with closed-end funds than it is with open-end funds, since closed-end fund assets are much more effectively "captive". A poor-performing fund manager can much more easily continue to run his fund forever, rather than being forced to close it due to asset flight. (We've seen many examples of this!) In fact, survivorship bias may work the *opposite* way in closed-end funds, since many funds go out of existence by being liquidated or converted *at NAV*. To the extent such funds "would have" been in our widest-discounted quintile index, they might have contributed positively to overall index results, given the large positive contribution to total return that would have come from the elimination of the discount to NAV. Even if a 1-2% "survivorship bias haircut" were applied (2% is the largest effect I've ever seen in a study of open-end funds), the results would still be stunning.

Second, regarding the uncertainty about which quintile a fund would fall into at the end of a trading day, we note that the results are so broad (the widest quintile in our study has contained over 100 funds since 2004, and over 50 funds since 1994) that they are unlikely to be affected by a handful of funds on the border between quintiles.

Third, regarding liquidity, we are well aware that this is a concern for our study. There is in fact a (small) correlation between market cap and size of discount, with smaller funds trading at wider discounts. Even for the medium-size and larger funds, one would be hard-pressed to construct and trade a portfolio of closed-end funds with over $1 billion. However, our index evidence suggests that the alpha being captured is overwhelmingly “discount alpha” rather than “liquidity alpha”. We removed the smallest 20% of funds and re-split the remaining funds into quintiles monthly back to 1988, and found that the alpha and other characteristics were indistinguishable from the original index data.

The performance of the discounted closed-end funds within Matisse since 2006 (up 10.1% annually, with 4.4% alpha to the S&P 500 as of 6/30/2014) provides actual on-the-ground evidence that the returns are achievable on a fairly steady asset base around $10 million. Since 2006, our turnover has been roughly 150% per year, and the average discount at which we’ve purchased funds has been over 13%, while the average discount at which we’ve sold funds has been less than 9% (as of 6/30/2014). These factors suggest that approximately half of the alpha from the long-term study has come from the careful “cultivation” of a portfolio of discounted closed-end funds, harvesting the least discounted and planting new discount seeds constantly.

The following pages contain the actual study performed by the Securities Analysis Center of the University of Oregon Business School in its final, unaltered form.

Investment professionals have long hypothesized that the magnitude of closed end fund (CEF) discounts and premia impact future performance of the fund. Armed with over twenty years of monthly forward looking return data for 626[1] CEFs, we set out to determine if discounts really do impact future fund performance. In addition to answering the general question of "do discounts matter?" we used our data set to examine whether returns to groups of funds with discounts or premiums are significant and correlated to stock and bond market returns.

Methodology

In order to determine if CEF pricing impacts future performance and to what extent, we utilized both analysis of variance (ANOVA), specifically the Duncan test, and regression analysis. For both tests we organized the monthly return data into quintiles based on level of discount, quintile 0 being the greatest discount. This allowed us to isolate and compare funds with varying levels of discounts over various time periods. For each test, we define statistical significance to be at the 95% confidence level.

ANOVA and Duncan

Analysis of Variance/Duncan testing allowed us to test for equality of means among different groups. By sorting the data into quintiles, we were able to test this equality for 1, 3, 6, 9, and 12 month forward looking returns. Ultimately, these tests allow us to determine if funds with the greatest discounts today, return more in future periods than funds with a smaller discount or trading at a premium, on average.

To represent both short and long term investment horizons, we focused our attention on one, six and twelve month forward looking returns, respectively. We also tested three different time periods: all months (1988-2009), pre 2000 and post 2000. As you will see, each time period yielded similar results. We also focus on quintiles 0 and 4 to concentrate on the tails of the distribution, for maximum long and short profit potential.

Regression Analysis

Regression analysis techniques allowed us to regress excess monthly fund returns against excess monthly market returns. Using these techniques we were able to observe not only the average return to each quintile each month, but also the Alpha and Beta for multiple subsets of CEFs over various quintiles and time periods. This allowed us to examine not only what degree of excess return and systematic risk were present, but also whether or not the Alpha's and Beta's were consistent and significant across the time periods. In the following tables, statistical measures which were found to be statistically insignificant are highlighted in yellow.

ABOUT THE DATA

The data set consists of over 85,000 observations for funds in three different asset classes: debt, equity, and asset allocation. Of these, the distribution is as follows: 59,348 debt, 21, 634 equity, and 4,025 asset allocation. These asset classes consist of 13 unique

[1] Sample size of funds increases from 15 to 626 over sample period.

fund strategies. Of these strategies, there are the following observations: 39,125 are debt, 21,895 are equity, and 9,451 are government/corporate.

Over all time periods, the numbers of observations for equity funds in Q0 are disproportionate when compared to the other quintiles. In each time period, observations in this quintile are approximately three times that of any other quintile. The opposite is true for the debt and municipal funds. The observations in Q0 for these funds are roughly one half of the observations found in each other quintile. This holds for all time periods.

ANOVA TESTING

To begin to answer the question "Do discounts matter?" we began by analyzing our entire data set as a whole. As an initial test, we performed Duncan tests on the monthly return data for all of the funds over the entire sample period, stratified by quintile.

Duncan Results
All Funds
All Months

Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	Time period
All Funds	1 Month	0.0143593	-0.0031939	84637	5	All months
All Funds	6 Month	0.065267	0.004097	81515	5	All months
All Funds	12 Month	0.108521	0.007243	77805	5	All months

As can be seen, the results indicate that on average, funds with the deepest discounts (funds in quintile 0) outperform funds with the greatest premium, both on a short term and longer term basis. The average spread between quintiles is 170, 600, and 1000 basis points for the 1, 6, and 12 month investment period, respectively. It is important to note that these spreads increase over the investment period and that the returns are decreasing monotonically from deepest discount through greatest premium funds.

In order to determine if these results may have changed over time, we performed the same tests on all of the funds prior to 2000 and post 2000. As the tables below indicate, the results from the tests yield similar results as the test performed on the entire sample period.

Duncan Results
All Funds
Pre 2000

Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	Time period
All Funds	1 Month	0.016728	-0.002521	28076	5	< 2000
All Funds	6 Month	0.082794	0.007138	28076	5	< 2000
All Funds	12 Month	0.161679	0.034652	28076	5	< 2000

Duncan Results All Funds Post 2000						
Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	Time period
All Funds	1 Month	0.0131909	-0.0035273	56556	5	> 2000
All Funds	6 Month	0.056116	0.002503	53434	5	> 2000
All Funds	12 Month	0.078702	-0.008201	49724	5	> 2000

One important note is that the spreads in the pre 2000 period are 190 bps, 750 bps, and 1270 bps for the 1, 6, and 12 month holding periods, respectively. These are slighter higher than the All Months period. In contrast, the post 2000 period spreads are slightly lower than the All Months period, at 160 bps, 535 bps, and 870 bps for the 1, 6, and 12 month periods, respectively. And so it appears that the effect was noticeably greater in the period prior to 2000.

In order to determine if these results would vary across different types of funds, we sorted the data set into seven unique groups based on fund focus and performed the same Duncan tests as above. As will be shown below, test results varied based on the type of fund. Equity, debt, asset allocation, municipal, and government/ corporate funds all yielded the similar results; funds with the deepest discounts outperformed, on average, funds with premiums. This was true for both pre and post 2000 periods.

Duncan Results Equity Funds All Months							
Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Equity	1 Month	0.016111	-0.004702	21458	4	<.0001	All months
Equity	6 Month	0.076827	-0.004703	20583	4	<.0001	All months
Equity	12 Month	0.134905	-0.008788	19533	4	<.0001	All months

Duncan Results Equity Funds Various Months							
Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Equity	1 Month	0.014615	-0.00526	13593	3	<.0001	> 2000
Equity	6 Month	0.065291	-0.001963	12718	4	<.0001	> 2000
Equity	12 Month	0.10021	-0.02401	11668	4	<.0001	> 2000
Equity	1 Month	0.018575	-0.003865	7864	3	<.0001	< 2000
Equity	6 Month	0.094674	-0.008525	7864	3	<.0001	< 2000
Equity	12 Month	0.18537	0.01106	7864	4	<.0001	< 2000

As was determined with the All Funds testing, funds in Q0 tend to outperform funds in Q4, across all time periods. Over the entire sample period, the mean return spreads are 205 bps, 815 bps, and 1440 bps for the respective 1,6, and 12 month investment period. These mean return spreads are significantly higher than the all funds spreads.

As can be seen in the tables above, the number of Duncan groupings declined from five to three and four. At first glance this may indicate statistical insignificance. In all situations however, with the exception of pre 2000 one and six month investment periods, the each tail (Q0 and Q4) is statistically unique. The pre 2000 test concluded that the means for Q0 for the one and six month investment period are not statistically unique from the other quintiles. In addition, the pre 2000 12 month spread is around 1700 bps, versus 1200 bps for the post 2000 12 month period.

Duncan Results
Debt Funds
All Months

Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Debt	1 Month	0.0115836	-0.0024635	58938	5	<.0001	All months
Debt	6 Month	0.048968	0.007654	56901	5	<.0001	All months
Debt	12 Month	0.074882	0.013097	54493	5	<.0001	All months

At 140 bps, 410 bps, and 615 bps, the spreads for the 1, 6 and 12 month investment period, respectively are substantially lower than the spreads for the equity funds. As was the case with the equity funds, the spreads continue to be monotonic and slightly larger for the pre 2000 time periods.

Duncan Results
Debt Funds
Various Months

Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Debt	1 Month	0.0112033	-0.0025693	39975	4	<.0001	> 2000
Debt	6 Month	0.046422	0.0026848	37938	5	<.0001	> 2000
Debt	12 Month	0.061381	-0.001251	35530	4	<.0001	> 2000
Debt	1 Month	0.0125658	-0.0022218	18962	5	<.0001	< 2000
Debt	6 Month	0.055272	0.012764	18962	5	<.0001	< 2000
Debt	12 Month	0.105776	0.041901	18962	5	<.0001	< 2000

As we have seen in the previous tests, funds in Q0 consistently outperform, on average, funds in Q4. We can see a similar situation in the number of Duncan grouping in the post 2000 test results. As was the case with the equity funds, Q0 and Q4 are in individual groups, and thus remain independent and statistically different than the other quintiles.

Duncan Results Asset Allocation Funds All Months							
Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Asset Allocation	1 Month	0.017011	-0.006082	3983	3	<.0001	All months
Asset Allocation	6 Month	0.07259	-0.01184	3778	3	<.0001	All months
Asset Allocation	12 Month	0.10054	-0.02391	3532	4	<.0001	All months

Duncan Results Asset Allocation Funds Various Months							
Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Asset Allocation	1 Month	0.015236	-0.011102	2874	3	<.0001	> 2000
Asset Allocation	6 Month	0.05355	-0.03769	2669	2	<.0001	> 2000
Asset Allocation	12 Month	0.0385	-0.07488	2423	3	<.0001	> 2000
Asset Allocation	1 Month	0.022164	0.002974	1108	2	<.0001	< 2000
Asset Allocation	6 Month	0.12245	0.03345	1109	3	<.0001	< 2000
Asset Allocation	12 Month	0.24768	0.09055	1108	3	<.0001	< 2000

Each test on the asset allocation funds resulted in a low number of Duncan groupings. For each investment period, in each time period, the mean returns in Q0 and Q4 were not statistically different from other quintiles. With that said, large alpha spreads can be found in all time periods, especially in the pre 2000 time period. For example, in the pre 2000 12 month investment period the alpha spread is over 1500 bps! Despite these large spreads, we do not have much confidence in these figures, due to the insignificance of the tests.

Municipal funds, what are roughly two thirds of all debt funds, return on average more in Q0 than in Q4. The spreads between theses quintiles range between 160 bps and 730 bps and appear to increase monotonically over the investment period. As we have seen before, the greatest spreads can be found in the pre 2000 time period.

Duncan Results Municipal Funds All Months							
Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Municipals	1 Month	0.0135762	-0.003074	38863	5	<.0001	All months
Municipals	6 Month	0.054244	0.004368	37564	5	<.0001	All months
Municipals	12 Month	0.079944	0.010512	36038	5	<.0001	All months

Duncan Results Municipal Funds Various Months							
Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Municipals	1 Month	0.0138148	-0.0029913	26636	5	<.0001	> 2000
Municipals	6 Month	0.054047	0.002126	25337	5	<.0001	> 2000
Municipals	12 Month	0.07017	0.000197	23811	5	<.0001	> 2000
Municipals	1 Month	0.012903	-0.00326	12226	5	<.0001	< 2000
Municipals	6 Month	0.054786	0.009109	12226	5	<.0001	< 2000
Municipals	12 Month	0.104445	0.030784	12226	5	<.0001	< 2000

When the Duncan tests were performed on the government/corporate, commodity and corporate/preferred funds, the results were quite different. As demonstrated in the tables below, the low number of Duncan groups and the relatively high P Values indicate that the mean returns for each quintile are statistically indifferent. In other words, there is no evidence here that heavily discounted commodity and corporate preferred funds perform better than funds of the same type with less of a discount. While the spreads between quintiles are attractive, we do not have much confidence in the results due to statistical insignificance.

Duncan Results Government/Corporate Funds All Months							
Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Government/Corporate	1 Month	0.009237	-0.001593	9384	3	<.0001	All months
Government/Corporate	6 Month	0.041064	0.009011	9056	3	<.0001	All months
Government/Corporate	12 Month	0.071872	0.007412	8666	3	<.0001	All months

Duncan Results Government/Corporate Funds All Various Months							
Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Government/Corporate	1 Month	0.009017	-0.002851	5969	2	<.0001	> 2000
Government/Corporate	6 Month	0.035406	0.000726	5641	2	<.0001	> 2000
Government/Corporate	12 Month	0.054398	-0.024257	5251	4	<.0001	> 2000
Government/Corporate	1 Month	0.011425	-0.001903	3414	3	<.0001	< 2000
Government/Corporate	6 Month	0.054587	0.009436	3414	4	<.0001	< 2000
Government/Corporate	12 Month	0.10544	0.057383	3414	3	<.0001	< 2000

Duncan Results
Commodity Funds
All Months

Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Commodity	1 Month	0.02095	0.00084	259	1	0.5021	All months
Commodity	6 Month	0.07831	-0.0024	254	2	0.3334	All months
Commodity	12 Month	0.14567	0.00819	248	2	0.1239	All months

Duncan Results
Corporate/Preferred Funds
All Months

Fund Focus	Inv. Period	Quintile 0	Quintile 4	N	# Groups	P Value	Time period
Corporate/Preferred	1 Month	0.008819	-0.001146	5069	2	0.0025	All months
Corporate/Preferred	6 Month	0.032922	0.015487	4844	1	0.2494	All months
Corporate/Preferred	12 Month	0.047642	0.000136	4574	2	<.0001	All months

ANOVA Summary

As can be seen in the above ANOVA testing, there are several important things to note. First, there the results indicate consistent outperformance in Q0 versus Q4. In general, the largest spreads between the two quintiles can be found in the equity funds[2]. The average spread is roughly twice that of the bond fund spread, at the 12 month holding period. Second, tests performed on the commodity funds and corporate/preferred funds yielded insignificant results. Lastly, the spreads between Q0 and Q4 are greatest in the pre 2000 time period. For the most part this is true for all funds, regardless of fund focus.

REGRESSION ANALYSIS

After completing the ANOVA/Duncan testing and concluding that in most cases discount levels do impact future fund performance, we turned to regression analysis to determine the relationship of these returns to the stock and bond indices and to answer two fundamental questions. First, are the returns levered (Beta) to overall market moves? Second, are the excess returns (Alpha) present and significant?

As with the ANOVA testing, our first tests were broad, all encompassing. We started by regressing average excess fund returns (one data point per month), by quintile, against the excess returns of four distinct benchmarks[34].

[2] Due to insignificant statistical results, Government/Corporate, Commodity, and Corporate/Preferred Funds do not apply.
[3] Sixty-Forty consists of a weighting of 60% S&P 500 and 40% Bonds.
[4] Bond Index is BARCAP Aggregate Bond Index

Regression Results All Funds vs. S&P 500 All Months						
S&P 500	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00930	0.7100	0.49	248	260	All Months
Q4	-0.00754	0.4232	0.24	80	260	All Months

Regression Results All Funds vs. R2000 All Months						
R2000	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00950	0.6052	0.55	314	260	All Months
Q4	-0.00738	0.3500	0.25	87	260	All Months

In both the S&P 500 and R2000 regressions, the alpha spreads were 168 bps per month. In both regressions the R-Squared in Q0 were remarkably high, while the betas of Q4 were relatively low.

Regression Results All Funds vs. Bond Index All Months						
Bond	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.01047000	0.92160	0.05	14	260	All Months
Q4	-0.00743000	0.79873	0.05	15	260	All Months

Regression Results All Funds vs. Sixty-Forty All Months						
Sixty-Forty	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.0083200	1.1597	0.50	262	260	All Months
Q4	-0.0081800	0.7043	0.25	88	260	All Months

With the exception of the sixty-forty regression, where the Q0 beta was relatively high at 1.15, each regression indicated that the funds with the deepest discounts (those in quintile 0) performed better than funds in Q4. For example, the regression of All Funds vs. S&P 500 indicates that funds with the deepest discounts return, on average, .93% per month more than can be explained by the given beta. A beta of .71 suggests that the 93 basis points in outperformance can be achieved with less volatility than the S&P 500. To the contrary, CEF's with the highest premium, return on average less than can be explained by beta.

As with the ANOVA testing, we sorted the data set by fund focus, and performed regression on these groups of funds against the same indices as in the All Funds regressions. The results are demonstrated below.

Equity Funds

Regression Results Equity Funds vs. S&P 500 All Months						
S&P 500	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00928	0.9816	0.28	3439.18	8828	All Months
Q4	-0.01080	0.9664	0.16	815.88	4196	All Months

As can be seen, the results are similar to the All Funds regression performed above. Over the entire time period funds with the greatest discounts return, on average 92 basis points per month more than can be explained by the beta of .98.

To determine if these results have varied over time, we sorted the data into two time periods; pre 2000 and post 2000. As shown in the table below, the results mirror the results found in the Equity Funds vs. S&P 500, All Months regression.

Regression Results Equity Funds vs. S&P 500 Various Months						
S&P 500	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00336	0.9473	0.18	745.56	3336	<2000
Q4	-0.01753	1.0546	0.10	190.02	1679	<2000
Q0	0.01315	1.0121	0.34	2820.61	5492	>2000
Q4	-0.00685	0.9511	0.23	754.25	2517	>2000

Below are the results for the regressions for Equity Funds vs. Russell 2000, Sixty-Forty, and the Bond benchmarks over the three different time periods.

Regression Results Equity Funds vs. R2000 All Months						
R2000	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00884	0.8464	0.32	4136.34	8828	All Months
Q4	-0.01097	0.7646	0.16	808.99	4196	All Months

Regression Results Equity Funds vs. R2000 Various Months						
R2000	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00821	0.8110	0.22	930.49	3336	<2000
Q4	-0.01303	0.8297	0.10	194.51	1679	<2000
Q0	0.00934	0.8596	0.37	3291.12	5492	>2000
Q4	-0.00098	0.7406	0.22	718.25	2517	>2000

Our initial literature research indicated there was a relationship between CEF returns and small cap stocks. Despite the Q0 post 2000 alpha being insignificant in the Equity Fund vs. R2000 regressions, we can conclude that no special relationship to the R2000 was formed in our results. The results are similar to the results for the S&P 500. For each time period in the equity funds vs. R2000 regression, the alpha spread between Q0 and Q4 is roughly 200 bps.

Regression Results
Equity Funds vs. Sixty-Forty
All Months

Sixty-Forty	Alpha	Beta	R-Square	F-Value	N	Time Period
Q0	0.00778000	1.59089	0.28	3382.67	8828	All Months
Q4	-0.01196000	1.54482	0.16	799.47	4196	All Months

Regression Results
Equity Funds vs. Sixty Forty
Various Months

Sixty-Forty	Alpha	Beta	R-Square	F-Value	N	Time Period
Q0	0.00354000	1.39626	0.16	654.05	3336	<2000
Q4	-0.01694000	1.52593	0.09	167.13	1679	<2000
Q0	0.01118000	1.69177	0.35	2907.51	5492	>2000
Q4	-0.00859000	1.57364	0.23	771.14	2517	>2000

As we have found in other regressions, when equity funds are regressed against the sixty-forty index the Q0 alpha, on average, is more than the alpha of funds in Q4. In addition, as was the case with the regressions against the S&P 500 and R2000, we found that the alpha spread between Q0 and Q4 remains at approximately 200 bps. The interesting thing to note is that the betas are significantly higher in these tests, indicating that the returns are highly levered to the market.

Regression Results
Equity Funds vs. Bond Index
All Months

Bond	Alpha	Beta	R-Square	F-Value	N	Time Period
Q0	0.01181000	0.45175	0.00	27.63	8828	All Months
Q4	-0.00904000	0.58356	0.00	15.55	4196	All Months

Regression Results
Equity Funds vs. Bond Index
Various Months

Bond	Alpha	Beta	R-Square	F-Value	N	Time Period
Q0	0.01367000	0.24234	0.00	3.18	3336	<2000
Q4	-0.00862000	0.42105	0.00	2.63	1679	<2000
Q0	0.01054000	0.58631	0.01	27.95	5492	>2000
Q4	-0.00953000	0.70149	0.01	15.9	2517	>2000

While the alpha spread in equity fund vs. bond index regression remains at roughly 200 bps, the betas are much lower than we have seen in other tests. This may suggest that equity CEF's are not highly levered to the general bond market. A note of caution about this suggestion is the low R-Squared and F-value in both the pre and post 2000 time periods. This suggests that further investigation may be in order.

Debt Funds

Regression Results Debt Funds vs. S&P 500 All Months						
S&P 500	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00830	0.3045	0.09	638.04	6758	All Months
Q4	-0.00618	0.2789	0.06	727.39	11588	All Months

Regression Results Debt Funds vs. S&P 500 Various Months						
S&P 500	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00601	0.2102	0.04	78.12	1886	< 2000
Q4	-0.00842	0.1469	0.02	77.39	3526	< 2000
Q0	0.00966	0.3298	0.10	538.82	4872	>2000
Q4	-0.00442	0.3186	0.07	621.21	8062	>2000

Based on the test results and the low betas, CEF debt funds do not appear to be highly levered to the S&P 500. When regressed against the S&P, funds in Q0 returned, on average, roughly 145 bps more than funds in Q4, across all time periods.

Regression Results Debt Funds vs. Bond Index All Months						
Bond	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00600000	1.41769	0.11	806.22	6758	All Months
Q4	-0.00750000	0.87712	0.03	359.97	11588	All Months

Regression Results Debt Funds vs. Bond Index Various Months						
Bond	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00777000	1.24500	0.13	293.76	1886	<2000
Q4	-0.00782000	0.75343	0.05	166.09	3526	<2000
Q0	0.00517000	1.49079	0.10	556.2	4872	>2000
Q4	-0.00740000	0.92455	0.03	229.44	8062	>2000

A trend that is evident in the debt funds vs. bond index regressions is the consistently higher betas in Q0 when compared to Q4. For example, compare the beta of Q0 and Q4 in the all months test. This indicates that the Q0 returns are more levered to the market returns.

Regression Results Debt Funds vs. Sixty-Forty All Months						
Sixty-Forty	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00780000	0.56798	0.11	866.3	6758	All Months
Q4	-0.00669000	0.49124	0.07	860.93	11588	All Months

Regression Results Debt Funds vs. Sixty-Forty Various Months						
Sixty-Forty	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00548000	0.41565	0.07	131.51	1886	<2000
Q4	-0.00880000	0.27275	0.03	110.67	3526	<2000
Q0	0.00913000	0.61122	0.13	712.27	4872	>2000
Q4	-0.00501000	0.56133	0.08	723.56	8062	>2000

Municipal Bond Funds

Regression Results Municipal Funds vs. S&P 500 All Months						
S&P 500	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.01097	0.0165	0.00	116.32	3424	All Months
Q4	-0.00647	0.1793	0.04	277	7153	All Months

Regression Results Municipal Funds vs. S&P 500 Various Months						
S&P 500	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00651	0.1943	0.03	27.32	896	<2000
Q4	-0.00798	0.0347	0.00	4.28	2200	<2000
Q0	0.01176	-0.0068	0.00	0.13	2528	>2000
Q4	-0.00497	0.2206	0.05	271.05	4953	>2000

As indicated by the low beta and R-Squared figures, it can be concluded that based on our evidence there is not a strong relationship between the municipal funds and the S&P 500. This holds true for each time period. As you will see below, this non-existent relationship is broken when the municipal funds are regressed against the bond index. Betas revert back to the higher levels seen previously, indicating there is a stronger relationship. In the case of the pre 2000 period, the Q0 beta is 1.62, alluding to an extremely strong relationship.

Regression Results Municipal Funds vs. Bond Index All Months						
Bond	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00854000	0.95823	0.06	232.11	3424	All Months
Q4	-0.00799000	0.87019	0.04	316.97	7153	All Months

Regression Results Municipal Funds vs. Bond Index Various Months						
Bond	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00749000	1.62789	0.25	303.47	896	<2000
Q4	-0.00883000	0.83916	0.08	189.94	2200	<2000
Q0	0.00950000	0.71400	0.03	82.82	2528	>2000
Q4	-0.00762000	0.87829	0.04	187.09	4953	>2000

Another consistent trend is the consistently higher betas in the pre 2000 time period when compared to the post 2000 period. Again, this indicates that average returns in that time were more levered to the market movements.

Government/Corporate

Regression Results Government/Corporate Funds vs. S&P 500 All Months						
S&P 500	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00422	0.5159	0.25	474.4	1438	All Months
Q4	-0.00656	0.4542	0.09	195.65	1889	All Months

Regression Results Government/Corporate vs. S&P 500 Various Months						
S&P 500	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00573	0.1456	0.03	12.41	410	<2000
Q4	-0.00807	0.3226	0.07	56.22	687	<2000
Q0	0.00537	0.5917	0.30	444.9	1028	>2000
Q4	-0.00468	0.5084	0.10	139.42	1202	>2000

Regression Results Government/Corporate Funds vs. Bond Index All Months						
Bond	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00321000	1.69328	0.15	256.26	1438	All Months
Q4	-0.00616000	0.56258	0.01	16.7	1889	All Months

Regression Results Government/Corporate Funds vs. Bond Index Various Months						
Bond	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.00707000	0.78969	0.08	37.16	410	<2000
Q4	-0.00541000	0.77015	0.04	26.78	687	<2000
Q0	0.00126000	2.03885	0.18	224.06	1028	>2000
Q4	-0.00646000	0.44125	0.00	4.82	1202	>2000

The spreads found in the government/corporate regressions are some of the lowest found in all of our data testing. In addition to low alpha spreads, generally betas were much lower than what were observed in previous regressions. With exception of the regression against the bond index, the results indicate there is no relationship between the government/corporate funds and the equity market.

Commodity Funds

Regression Results Commodity Funds vs. S&P 500 All Months						
S&P 500	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.01418	-0.2538	0.03	0.67	26	All Months
Q4	-0.00051	0.0678	0.00	0.26	123	All Months

Regression Results Commodity Funds vs. S&P 500 Various Months						
S&P 500	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.01434	-0.2597	0.03	0.63	25	<2000
Q4	-0.02623	0.2123	0.01	0.54	40	<2000
Q0	0.01923	-	-	-	1	>2000
Q4	0.01128	0.0853	0.00	0.34	83	>2000

Regression Results Commodity Funds vs. R2000 All Months						
R2000	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.01236	0.0259	0.00	0.01	26	All Months
Q4	-0.00072	0.0877	0.01	0.64	123	All Months

Regression Results Commodity Funds vs. R2000 Various Months						
R2000	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.01196	0.0321	0.00	0.02	25	<2000
Q4	-0.02551	0.1246	0.01	0.25	40	<2000
Q0	0.01923				1	>2000
Q4	0.01104	0.1084	0.01	0.82	83	>2000

Regression Results Commodity Funds vs. Bond All Months						
Bond	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.01676000	-0.78697	0.03	0.85	26	All Months
Q4	-0.00264000	1.55931	0.06	0.37	123	All Months

Regression Results Commodity Funds vs. Bond Various Months						
Bond	**Alpha**	**Beta**	**R-Square**	**F-Value**	**N**	**Time Period**
Q0	0.01657000	-0.78239	0.03	0.81	25	<2000
Q4	-0.02441000	-0.05595	0.00	0	40	<2000
Q0	0.01923000				1	>2000
Q4	0.00543000	1.79850	0.09	7.96	83	>2000

As was the case with the ANOVA testing, many of the results of the commodity funds regressions were statistically insignificant, and thus no meaningful conclusions can be drawn. This may be in part caused by the small sample size.

CONCLUSION

Over the course of the ANOVA testing, several themes emerged. Based on our data, discounts do matter. Funds with the deepest discounts consistently outperform funds with the highest premiums, on average. The spread of average returns between quintile 0 and quintile 4 tends to increase over the investment period. In addition, the spreads between the quintiles tend to be greater in the pre 2000 time period. Lastly, equity funds tend to have the greatest average return spreads.

The regression testing also produced several interesting results. In general, funds in Q0 generate the greatest alpha. More specifically, equity funds generally produce the greatest alpha. In addition to the greatest alpha, Q0 funds tend to have a larger beta. Lastly betas in the pre 2000 time period tended to be larger.

There is no question that the above tests produced some interesting results. While the data set was complete and relatively large, survivorship biases need to be considered.

NEXT STEPS

Due to limitations of both time and available data, several follow up questions and potential additional tests emerge. Further analysis of the composition of the CEFs would allow for further testing. For example, being able to sort the equity funds by market capitalization would allow us to refine our regressions. Additional data that may depict investor sentiment or other economic indicators may also help us refine the regressions. Most importantly, the addition of various leading economic indicators may help build a model that will help predict future movements in closed end fund discounts and premia.