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# SOCIALLY RESPONSIBLE INVESTING AND PORTFOLIO DIVERSIFICATION

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## Abstract

I use a sample of socially responsible stock mutual funds matched to randomly selected conventional funds of similar net assets to investigate differences in characteristics of assets held, portfolio diversification, and variable effects of diversification on investment performance. I find that socially responsible funds do not differ significantly from conventional funds in terms of any of these attributes. Moreover, the effect of diversification on investment performance is not different between the two groups. Both groups underperform the Domini 400 Social Index and S&P 500 during the study period.

*JEL Classifications*: G12, G20, G23

## I. Introduction

Several studies of socially responsible investing assert that ethical and moral screening of companies is likely to affect the characteristics of assets included in the portfolio, portfolio diversification, and portfolio performance because the screening process imposes an additional set of constraints to the wealth-maximizing investor (Rudd 1981; Grossman and Sharpe 1986; Hall 1986; Diltz 1995).[1] Rudd (1981) argues philosophically that each time a portfolio is constrained, its performance suffers. He asserts that socially responsible investing introduces size and other biases into the portfolio, with consequent deterioration in long-run performance.[2] He argues, therefore, that a screened portfolio will have relatively greater extramarket covariation in returns. For example, divesting in companies that do business in South Africa would result in the exclusion of relatively large companies, thus subjecting the portfolio to greater extramarket covariation in returns. According to

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[1]Socially responsible investors generally screen target companies using ethical and moral criteria, as discussed extensively by Kinder, Lyndenberg, and Domini (1993) and Domini (2001).

[2]Several commentators recently make a similar observation, including Clow (1999), who opines that social and environmental filters tend to steer many portfolio managers away from many old-line industrial manufacturers, resulting in growth and high-tech bias in socially screened portfolios.

Rudd, the effect of socially responsible investing is to decrease diversification, and because the decrease in diversification is not likely to be offset by an increase in returns, portfolio performance is impaired.

In support of Rudd (1981), Grossman and Sharpe (1986) argue that any constraint placed on a decision can only lower or leave unchanged the maximum utility that can be obtained. They find that exclusion of South Africa–related stocks hurts portfolio performance, on average. However, the small-stock bias of the South Africa–free strategy greatly increased portfolio returns. The South Africa–free portfolio consists of companies whose market capitalization is smaller on average than that of the rest of the companies listed on the New York Stock Exchange (NYSE). Overall, the South Africa–free portfolio outperformed the rest of the NYSE stocks by 0.187% annually. Diltz (1995), on the other hand, reports that his findings, based on a study of specific moral and ethical criteria applied to 28 hypothetical common stock portfolios, indicate that ethical screening of companies has little effect on portfolio performance.

Empirical studies of the risk-adjusted performance of socially responsible mutual funds are few.[3] The performance of socially responsible mutual funds is well documented by Hamilton, Jo, and Statman (1993) and Statman (2000). For 1981 to 1990, Hamilton, Jo, and Statman find an average excess return of −0.063% per month for 17 socially responsible equity mutual funds, which is not statistically different from zero. The difference in excess returns between the socially responsible and conventional equity funds is statistically insignificant. Therefore, they conclude that the market does not price social responsibility characteristics.[4] The follow-up study by Statman, using the 1990 to 1998 sample period, reveals that the risk-adjusted performance of socially responsible mutual funds is not significantly different from that of conventional funds of approximately equal net assets.

Similar to Hamilton, Jo, and Statman (1993) and Statman (2000), Sauer (1997) and Goldreyer, Ahmed, and Diltz (1999) find that the application of social screens does not have a significant effect on investment performance. Sauer compares the performance of the Domini Social Index (DSI 400) with that of the S&P 500 and the Center for Research in Security Prices (CRSP) value-weighted index, using a 1986 to 1994 study period.[5] He finds that the application of social responsibility screens does not consistently increase or decrease investment

[3] Most of the studies cited here are either qualitative studies of investor behavior or are direct studies of the behavior of stock prices rather than stock mutual fund prices.

[4] Statman (2000) observes that many fund characteristics, such as costs, are related to size. Accordingly, he compares socially responsible mutual funds with conventional funds of similar asset size.

[5] The DSI 400 is maintained by the social research firm of Kinder, Lydenberg, Domini & Company. The index is designed to track the performance of 400 U.S. corporations that pass specific social and environmental screens.

performance relative to either the S&P 500 or the CRSP value-weighted index. He also finds that socially responsible investing does not result in greater risk to the investor when risk is measured as the variability of monthly returns. Furthermore, Goldreyer, Ahmed, and Diltz compare 49 socially responsible mutual funds with a random sample of conventional funds from January 1981 to June 1997. They find that the performance of socially screened portfolios does not differ significantly from that of conventional mutual funds.

The primary purpose of the present study is to investigate empirically the extent to which the ethical and moral screening of companies affects the level of diversification and overall performance of socially responsible stock mutual funds. Although many studies document the investment performance of socially responsible funds, researchers do not investigate the influence of ethical screening on portfolio diversification and the variable effect of diversification on investment performance. I follow Rudd (1981), who predicts that social screening will introduce size bias into a portfolio and consequently impair portfolio diversification and long-run investment performance. Rudd presents a size-bias hypothesis in which constrained portfolios are more likely to contain small companies, resulting in high portfolio betas. Thus, for socially responsible mutual funds, I expect to find a lesser degree of portfolio diversification and a measure of overall portfolio performance that is significantly below that of conventional mutual funds.

My results indicate that socially responsible mutual funds do not differ significantly from conventional funds in the characteristics of assets they hold, the degree of portfolio diversification, or investment performance. Moreover, I find no significant difference in the effect of diversification on investment performance as a function of group. I find that both conventional and socially responsible stock funds underperform the DSI 400 and the S&P 500 from January 1994 to March 2001. My results are in line with previous evidence that indicates no significant difference in long-run investment performance between conventional and ethically screened portfolios.

## II. Testable Hypotheses

Rudd (1981) predicts that ethically screened portfolios have greater extra-market covariation in returns and, as a result, poor investment performance compared with conventional portfolios. To investigate the diversification properties and investment performance of screened portfolios, as well as the effect of diversification on investment performance, I compare a sample of socially responsible mutual funds with randomly selected conventional funds of similar net assets, using both parametric and nonparametric statistical methods. I test the following null hypothesis:

$$H_0: \mu_{SR-RV} - \mu_{CONV-RV} = 0, \tag{1}$$

where *RV* is the portfolio's residual variance, also referred to as idiosyncratic or company-specific variance; *SR* is socially responsible funds; and *CONV* is conventional funds. That is, the degree of diversification of a socially responsible fund portfolio is not different from that of conventional fund portfolio. The null hypothesis is tested against the alternative:

$$H_a: \mu_{SR-RV} - \mu_{CONV-RV} > 0. \tag{2}$$

Following Rudd (1981), I predict that socially responsible fund portfolios will have significantly greater residual variance than will conventional fund portfolios. I also predict a significant correlation between residual variance and measures of investment performance.

$$H_0: \mu_{SR-P} - \mu_{CONV-P} = 0, \tag{3}$$

where *P* is the relevant measure of investment performance. That is, the investment performance of a socially responsible mutual fund is not different from that of a conventional fund. As do Rudd (1981) and Grossman and Sharpe (1986), I expect the investment performance of socially responsible funds to be worse than that of conventional funds. Thus, the alternative hypothesis is

$$H_a: \mu_{SR-P} - \mu_{CONV-P} < 0. \tag{4}$$

I expect residual variance, the measure of portfolio diversification, to be positively correlated with both the median capitalization and the number of companies in which the fund invests. I also expect to find a negative correlation between residual variance and the percentage of portfolio value invested in the fund's top 10 holdings. Morningstar calculates median capitalization, total number of holdings, and percentage of assets in top 10 holdings. Morningstar's clients use these calculations in making their investment decisions. According to Morningstar, number of holdings and the percentage of assets in top 10 holdings can be useful in gaining insight into portfolio diversification because when the number of holdings is lower or the percentage of assets invested in the top 10 holdings is higher, the mutual fund is more concentrated in a few companies or issues and the fund is more susceptible to "market fluctuations in these holdings" (Morningstar Principia, March 2001).

Therefore, I expect the degree of portfolio diversification as measured by the portfolio's residual variance to be positively related to both the capitalization of companies included in the portfolio and the fund's total holdings. I also expect portfolio diversification to be negatively related to the percentage of assets invested in the fund's top 10 holdings. In other words, portfolio diversification should improve as the capitalization and number of holdings rise, and worsen as percentage of assets invested in the top 10 holdings rises.

## III. Data

Morningstar's March 2001 Principia Pro database identifies only 93 mutual funds as socially responsible, domestic stock funds. Because funds that have dropped out for reasons such as liquidation, merger, and such are not included in Morningstar's database, I might expect survivorship bias to be present in the database. However, Statman (2000) confirmed with Morningstar that no socially responsible fund dropped out during his 1990 to September 1998 study period. My own investigation supports this finding. However, I do find that, after Statman's study period and before the end of my 1994 to March 2001 study period, three socially responsible funds dropped out for various reasons. These are Bridgeway Social Awareness, Calvert Strategic Growth A, and Neuberger & Berman NYCDC Social Responsibility. I include these "dead" funds in my sample.

I restrict my sample to domestic equity funds with no more than 30% bonds and with no fewer than 36 rolling monthly returns. If two or more mutual funds listed in the Morningstar database are duplicates (i.e., different classes of the same fund), I include the oldest fund in my sample and ignore the rest. Consequently, my sample consists of 42 socially responsible funds, including the 3 dead funds. I then match each of the 42 funds with two randomly selected conventional funds of approximately equal net assets. Thus, my overall sample comprises 42 socially responsible funds and 84 conventional funds.

I obtain monthly returns on the 126 active mutual funds, corresponding returns on the S&P 500, and three-month Treasury bills from Morningstar's Principia Pro database. Monthly return data on the DSI 400 come from Kinder, Lydenberg, Domini & Company (KLD). Based on my return data, the correlation between the DSI 400, which is designed to serve as a socially screened equity benchmark, and the S&P 500 is 0.98 from January 1994 to March 2001. The DSI 400 includes 250 of the companies in the S&P 500, 100 additional large companies, and 50 companies that are highly rated by KLD in terms of their social responsibility characteristics.

I also obtain from Morningstar's Principia Pro database each fund's net assets and percentage of portfolio funds invested in common stock as of March 2001. For the 3 dead funds, I retrieve monthly returns and other data for January 1994 to June1997 from a previous version of Morningstar's Principia database. I calculate monthly returns after June 1997 by using bid prices and distributions from Standard & Poor's Daily Stock Price Record. These and other portfolio characteristics are shown in Table 1.

Table 2 summarizes the results of a statistical test of the differences between the two groups of funds. Panel A of Table 2 shows that the average monthly return for the socially responsible funds is 1.05%, compared with 1.02% for the conventional funds. A two-sample Wilcoxon rank-sum test with a $Z$-score of 0.8694 indicates that the mean returns for the socially responsible and conventional funds are not statistically different at the 5% level. However, the standard deviations of the

**TABLE 1. Characteristics of Socially Responsible Mutual Funds: March 2001.**

| Name | Net Assets | Stock % | Holdings | Top Ten % | Cap |
|---|---|---|---|---|---|
| Amana Growth | 22.2 | 85.7 | 64 | 36.59 | 12,857 |
| American Trust Allegiance | 31.9 | 82.9 | 60 | 41.68 | 23,696 |
| Aquinas Growth | 64.0 | 89.7 | 115 | 23.31 | 14,658 |
| Aquinas Small-Cap | 5.1 | 88.2 | 77 | 33.58 | 2,388 |
| Aquinas Value | 49.9 | 95.1 | 72 | 33.02 | 28,528 |
| Ariel | 321.9 | 90.2 | 35 | 47.16 | 1,236 |
| Ariel Appreciation | 390.6 | 90.0 | 36 | 42.4 | 3,896 |
| Calvert Capital Accum. A | 124.4 | 93.6 | 45 | 32.72 | 5,452 |
| Calvert Large Cap Grth I | 5.8 | 90.0 | 55 | 36.08 | 8,409 |
| Calvert New Vis. S-Cap A | 86.7 | 88.9 | 34 | 46.23 | 914 |
| Calvert Soc Inv Enh Eq A | 18.8 | 99.6 | 195 | 26.79 | 36,544 |
| Calvert Soc Inv Equity A | 243.0 | 96.3 | 52 | 29.39 | 13,469 |
| Capstone SERV L Cap Eq | 150.9 | 96.6 | 467 | 26.34 | 56,911 |
| Capstone SERV S Cap Eq | 75.3 | 99.3 | 513 | 7.21 | 809 |
| Catholic Values Eq Indiv | 4.1 | 98.0 | 45 | 34.78 | 36,799 |
| Citizens Core Growth I | 159.4 | 100.0 | 301 | 33.83 | 48,201 |
| Citizens Emerg Grth Stnd | 358.5 | 92.3 | 34 | 45.47 | 4,839 |
| Delaware Social Aware. A | 30.4 | 98.1 | 208 | 20.9 | 26,163 |
| DEM Equity Institutional | 26.1 | 100.0 | 42 | 61.23 | 2,499 |
| Devcap Shared Return | 13.7 | 97.9 | 321 | 25.03 | 58,064 |
| Domini Social Equity | 1,193.9 | 100.0 | 400 | 31.26 | 56,215 |
| Dreyfuss Prem. 3rd Cent Z | 957.2 | 93.7 | 63 | 26.06 | 52,178 |
| GMO Tobacco Free Cr III | 250.2 | 91.1 | 245 | 23.1 | 31,551 |
| Green Century Balanced | 84.4 | 61.8 | 62 | 38.51 | 395 |
| IPS Millennium | 425.2 | 99.2 | 94 | 30.75 | 8,952 |
| Meyers Pride Value | 9.8 | 88.9 | 35 | 41.01 | 14,623 |
| MFS Union Std Equity I | 52.7 | 92.8 | 94 | 29.02 | 42,772 |
| MMA Praxis Growth B | 158.9 | 96.1 | 70 | 24.69 | 32,817 |
| Neuberger Berm. Soc R R | 89.6 | 89.9 | 34 | 38.96 | 40,960 |
| New Alternatives | 51.5 | 98.9 | 32 | 59.81 | 1,135 |
| Noah | 15.3 | 99.1 | 173 | 36.97 | 41,455 |
| North Amer. Soc Resp A | 1.6 | 89.4 | 322 | 31.14 | 57,127 |
| Parmassus Income Equity | 54.3 | 88.0 | 155 | 35.56 | 29,669 |
| Pax world balanced | 1,178.9 | 51.0 | 117 | 30.04 | 18,742 |
| Rightime OTC | 3.6 | 97.3 | 42 | 32.43 | 6,595 |
| Security Soc Awaren A | 15.7 | 100.0 | 85 | 34.35 | 60,350 |
| Smith Barn. Soc Aware B | 324.8 | 66.4 | 132 | 20.03 | 40,637 |
| Timothy Plan S. Value A | 13.9 | 100.0 | 37 | 56.19 | 1,149 |
| Women's Equity | 10.6 | 95.4 | 61 | 30.8 | 30,577 |
| Bridgeway Soc Respons. | 0.6 | 74.2 | 25 | 56.62 | 10,449 |
| Calvert Strategic Grth A | 95.0 | 49.5 | 49 | 61.43 | 1,249 |
| Newberger Berman NYCDC | 153.3 | 93.7 | 56 | 27.42 | 4,516 |

Note: Stock % is common stock investments as percentage of the fund's assets, holdings is the total number of companies held by the fund, top ten % is the percentage of net assets invested in the fund's top ten holdings, and cap is the median market capitalization of the companies held by the fund. Net assets and market capitalization are in millions of dollars.

**TABLE 2. A Profile of Socially Responsible Mutual Funds: January 1994 to March 2001.**

| | Sample Mean | | |
|---|---|---|---|
| | SR | CONV | *Z*-score |
| Panel A. Monthly Return | | | |
| Mean return % | 1.05 | 1.02 | 0.8694 |
| Avg. standard deviation | 5.54 | 4.96 | 2.1736** |
| Avg. coefficient of variation[a] | 7.04 | 5.07 | 1.3455** |
| Panel B. Portfolio Characteristics | | | |
| Net assets ($millions) | 174.37 | 174.06 | 0.1346 |
| Common stock % | 90.21 | 90.71 | 0.9317 |
| Bonds %[b] | 2.61 | 1.17 | −0.0595 |
| Capitalization ($millions) | 23,105.36 | 22,423.88 | 0.6377 |
| Holdings | 122.79 | 104.85 | 0.9109 |
| Top ten % | 35.24 | 35.73 | 0.0155 |

Note: Common stock % and bonds % are common stock and bond investments, respectively, as percentage of the fund's assets; capitalization is the median market capitalization of the companies held by the fund; holdings is the total number of companies held by the fund; and top ten % is the percentage of net assets invested in the fund's top ten holdings. Net assets and market capitalization are in millions of dollars. The *Z-s*cores are from a Wilcoxon two-sample rank-sum test. Results are for 42 socially responsible funds (SR) and 84 conventional funds (CONV).

[a]This is the average of the coefficients of variation of the funds in that group.
[b]Other investments, including non-U.S. stocks, are not shown in this table.

**Significant at the 5% level (one-sided $pr > z$).

monthly returns are significantly different, as indicated by a 2.1736 *Z*-score from the Wilcoxon test. The average coefficients of variation for the two groups are also significantly different, indicating that in terms of total variability of monthly returns, rather than market-related volatility, socially responsible mutual funds are more volatile than conventional mutual funds.

## IV. Research Methods

I use three alternative measures of investment performance to compare the two groups of mutual funds. These are Jensen's alpha, $\alpha_p$; Sharpe information ratio, $S_p$; and excess standard deviation adjusted return, *eSDAR*. Jensen's alpha relies on beta as a measure of the risk of a portfolio whereas the two other performance measures rely on total variability of returns. I estimate Jensen's alpha as:

$$r_{pt} = \alpha_p + \beta_p r_{mt} + \varepsilon_{pt}, \tag{5}$$

where $r_{pt}$ is the excess return (i.e., the observed return minus the risk-free rate) on portfolio $p$ in month $t$, $r_{mt}$ is the excess return on the benchmark portfolio in month

*t*, $\beta_p$ is portfolio *p*'s beta, and $\varepsilon_{pt}$ is the residual term during period *t*. I use the S&P 500 as the relevant benchmark for both the socially responsible and conventional equity funds, and the DSI 400 as an alternative benchmark for comparison. The risk-free rate is represented by the monthly return on three-month Treasury bills.

From equation (5), the total variance of portfolio *p*, $\sigma_p^2$, is:

$$\sigma_p^2 = \beta_p^2 \sigma_m^2 + \frac{1}{n}\sigma_{\varepsilon p}^2, \tag{6}$$

where $\sigma_m^2$ is the variance of returns on the benchmark portfolio, *n* is the number of nonmissing monthly returns on portfolio *p*, and $\sigma_{\varepsilon p}^2$ is the variance of portfolio *p*'s residual returns. In other words, the total volatility of portfolio returns consists of two components: a market-related component, $\beta_p^2\sigma_m^2$, and a company-specific component, $\frac{1}{n}\sigma_{\varepsilon p}^2$. Company-specific variance tends to decrease as the number of stocks held by the mutual fund increases. Therefore, the higher the residual variance, the less diversified the mutual fund is.

I estimate portfolio *p*'s residual variance, normalized by the total variance of the portfolio (or *RV*), as:

$$RV = 1 - \frac{\beta_p^2 \sigma_m^2}{\sigma_p^2}. \tag{7}$$

I use the estimated residual variance to compare the levels of unsystematic risk in portfolios of socially responsible and conventional mutual funds. If, as hypothesized by Rudd (1981), an ethically screened portfolio has greater extramarket covariation in returns, the standardized unsystematic risk, *RV*, for the socially responsible funds should be significantly greater than that of conventional funds. If so, perhaps risk-adjusted performance can best be measured using a measure of performance that adjusts for total risk rather than just systematic risk. Therefore, Jensen's alpha, which is a frequently used measure of portfolio performance, may not be appropriate for evaluating socially responsible funds.

Furthermore, Reilly and Norton (2003) introduce a measure of investment performance recently suggested by Sharpe (1994). Reilly and Norton observe that the new Sharpe performance measure, $S_p$, is a more general measure of portfolio performance than the traditional Sharpe measure. If $D_t$ is the difference in return between the portfolio and the benchmark ($R_{pt} - R_{mt}$) in period *t*, then:

$$S_p = \frac{\bar{D}}{\sigma_D} \tag{8}$$

where $\bar{D}$ is the average value of the monthly differences in return between the portfolio and the benchmark, $\frac{1}{n}\sum_{t=1}^{n} D_t$, and $\sigma_D$ is the standard deviation of the differential return. As with Jensen's alpha, this new measure indicates portfolio

performance relative to the benchmark portfolio and lends itself to statistical tests of significance. However, unlike the Jensen's alpha, the Sharpe performance measure adjusts for total risk rather than just systematic risk.

The third measure of investment performance is *eSDAR* (Statman 2000), measured as follows:

$$eSDAR = r_f + \left(\frac{r_p - r_f}{S_p}\right) S_m - r_m, \tag{9}$$

where

$r_f =$ monthly return on three-month Treasury bills,
$r_p =$ monthly on portfolio *p,*
$r_m =$ monthly return on the benchmark portfolio,
$S_p =$ standard deviation of portfolio *p*'s return, and
$S_m =$ standard deviation of return on the benchmark portfolio.

As indicated by Statman (2000), the *eSDAR* of a portfolio is the excess return of the portfolio over the return of the benchmark portfolio, where the portfolio is leveraged to have the benchmark's standard deviation.

I compare the investment performance of the two groups of mutual funds using two alternative statistical methods. First, I compare the two samples using the Wilcoxon two-sample rank-sum test. I compare the samples again by using an analysis of covariance to investigate the differential impact of residual variance on investment performance between the two groups of mutual funds. Analysis of covariance combines the characteristics of both analysis of variance (a nested design in our case) and regression. This statistical method allows me to test whether the means of portfolio performance measures are significantly different between socially responsible and conventional funds and, simultaneously, to test whether differences in investment performance are attributable to the difference in residual variance. The model that links investment performance to the two independent variables is:

$$y = \omega_0 + \omega_1 x_1 + \omega_2 x_2 + \omega_3 x_1 x_2 + \varepsilon, \tag{10}$$

where

$y =$ investment performance of the portfolio;
$x_1 =$ residual variance (the covariate); and
$x_2 =$ group (A = socially responsible mutual funds, and B = conventional funds), where $x_2 = 0$ if group B, and 1 if group A.

Because $x_2$ is equal to 1 if the mutual fund is socially responsible, and 0 if the fund is conventional, the expected values of investment performance are

$$E(y) = (\omega_0 + \omega_2) + (\omega_1 + \omega_3)x_1 \tag{11}$$

for the socially responsible funds, and

$$E(y) = \omega_0 + \omega_1 x_1 \tag{12}$$

for the conventional funds. Therefore, $\omega_2$ is the difference in intercepts and $\omega_3$ is the difference between the slopes of the two analysis of covariance models.

I can test whether there is a difference in the effect of residual variance on investment performance as a function of group by testing the hypothesis: $H_0: \omega_3 = 0$ (Kleinbaum, Kupper, and Muller 1988). Rudd (1981) predicts that there is a residual variance effect that is a function of group. I can also test the difference in investment performance between groups, after adjusting for the effects of residual variance, by testing the hypothesis: $H_0: \omega_2 = 0$. Finally, $\omega_0$ is the intercept and $\omega_1$ is the slope on $x_1$ for the conventional mutual funds, as equation (12) indicates. Therefore, for conventional funds, I can test for a linear relation between residual variance and investment performance by testing the null hypothesis: $H_0: \omega_1 = 0$.

## V. Results

*Characteristics of Socially Responsible Funds*

I compare the characteristics of socially responsible mutual funds shown in Table 1 with those of conventional funds, using a Wilcoxon two-sample rank-sum test. Following Statman (2000), I compare socially responsible funds with a matching sample of conventional funds based on size of net assets. The resulting *Z*-scores, shown in Table 2, indicate that not a single characteristic of socially responsible mutual funds is significantly different from that of conventional funds. When I repeat the analyses using Kruskal-Wallis test and two-sample *t*-test, the results are consistent with the Wilcoxon test results for all fund characteristics.

The two groups of funds are not statistically different in the percentage of bonds and stocks in their portfolios, nor are the two groups significantly different in the market capitalization of the companies in which they invest, total portfolio holdings, or the percentage of total assets invested in the top 10 holdings. For example, the mean capitalization of the socially responsible funds is $23,105 million, compared with $22,424 million for the conventional funds. The 0.6377 *Z*-score from the Wilcoxon test indicates that the two groups are not significantly different at the 5% level.

Based on my results, I conclude that the investment practices of socially responsible mutual funds are not different from those of conventional funds that have approximately equal net assets. Portfolio constraints do not appear to force socially responsible funds to target smaller companies than do conventional funds of similar asset size, nor are socially responsible fund portfolios more concentrated in fewer companies and issues.

*Portfolio Performance*

Table 3 shows the estimated measures of investment performance of the 42 socially responsible mutual funds. I estimate Jensen's alpha, portfolio beta, and residual variance using the two alternative benchmarks, the DSI 400 and S&P 500. Using either index as benchmark, only one fund has a positive and significant alpha, and three funds have negative and significant alphas. All other alphas are not significant.

I compare the performance measures of the two groups of funds using the Wilcoxon two-sample test. Table 4 presents the results. Regardless of the benchmark used to measure investment performance, socially responsible funds are not significantly different from conventional funds for either alpha or *eSDAR,* as indicated by the relevant *Z*-scores. However, conventional funds significantly underperform their socially responsible peers when I measure the Sharpe information ratio using the S&P 500 as the performance benchmark, as indicated by the *Z*-score of 1.4025. The results are not consistent with Rudd (1981), who predicts that constrained portfolios will underperform conventional portfolios. Thus, overall, I am unable to reject hypothesis 3.

I find that for portfolio diversification represented by residual variance, the two groups of funds are not significantly different. This result is indicated by a *Z*-score of 0.6521 when the S&P 500 is the benchmark and $-0.7421$ when the DSI 400 is the benchmark. Thus, my results are not consistent with Rudd (1981), who predicts a higher level of extramarket covariation for screened portfolios. Therefore, I do not have sufficient evidence to reject hypothesis 1. I conclude that during my 1994 to March 2001 study period, neither the investment performance nor the level of portfolio diversification of socially responsible funds differs from those of conventional funds of similar net assets.

Table 5 presents my analysis of the correlation between investment performance and measures of portfolio diversification. The results indicate that there is no significant correlation between alpha and residual variance for each of the two groups of funds or for the combined sample. Because I compute the Sharpe ratio and *eSDAR* using total variance as the relevant measure of portfolio variance, I expect to find a significant correlation between these measures of investment performance and residual variance. I find this to be true only for the conventional funds and for the combined sample.

*Results of Covariance Analysis*

In Table 6 I test the effect of diversification on investment performance as a function of group using $H_0: \omega_3 = 0$. When I use Jensen's alpha as a measure of investment performance, the $RV * Group$ interaction term ($F = 0.54$, $p = .4618$) shown in Panel A of Table 6 indicates that there is no significant difference in the effect of diversification on investment performance as a function of group. When

**TABLE 3. Performance of Socially Responsible Mutual Funds: January 1994 to March 2001.**

| | DSI 400 as Benchmark | | | S&P 500 as Benchmark | | |
|---|---|---|---|---|---|---|
| Name | $\alpha_p$ | $\beta_p$ | $RV$ | $\alpha_p$ | $\beta_p$ | $RV$ |
| Amana Growth | −0.06 | 0.95 | 0.54 | −0.02 | 0.98 | 0.56 |
| American Trust Allegiance | 0.08 | 1.14 | 0.51 | 0.14 | 1.23 | 0.50 |
| Aquinas Growth | −0.12 | 0.90 | 0.28 | −0.12 | 0.98 | 0.25 |
| Aquinas Small-Cap | −0.31 | 0.49 | 0.41 | −0.34* | 0.57 | 0.31 |
| Aquinas Value | −0.16 | 0.65 | 0.45 | −0.21 | 0.76 | 0.34 |
| Ariel | 0.29 | 0.50 | 0.70 | 0.26 | 0.58 | 0.65 |
| Ariel Appreciation | 0.27 | 0.57 | 0.58 | 0.24 | 0.64 | 0.53 |
| Calvert Capital Accum. A | −0.12 | 0.94 | 0.49 | −0.13 | 1.04 | 0.46 |
| Calvert Large Cap Grth I | −0.11 | 0.94 | 0.39 | −0.10 | 1.01 | 0.38 |
| Calvert New Vis. S-Cap A | −0.40 | 0.70 | 0.76 | −0.38 | 0.79 | 0.74 |
| Calvert Soc Inv Enh Eq A | −0.02 | 0.90 | 0.43 | 0.04 | 1.00 | 0.38 |
| Calvert Soc Inv Equity A | −0.26 | 0.88 | 0.24 | −0.26 | 0.95 | 0.22 |
| Capstone SERV L Cap Eq | 0.01 | 0.88 | 0.34 | 0.01 | 1.00 | 0.25 |
| Capstone SERV S Cap Eq | 0.66 | 0.54 | 0.81 | 0.65 | 0.63 | 0.77 |
| Catholic Values Eq Indiv | −0.71* | 0.83 | 0.51 | −0.68* | 0.93 | 0.45 |
| Citizens Core Growth I | −0.13 | 1.15 | 0.27 | −0.06 | 1.23 | 0.27 |
| Citizens Emerg Grth Stnd | 0.29 | 1.09 | 0.50 | 0.30 | 1.16 | 0.50 |
| Delaware Social Aware. A | −0.34 | 0.93 | 0.39 | −0.30 | 1.03 | 0.36 |
| DEM Equity Institutional | 0.99 | 1.45 | 0.74 | 1.08 | 1.55 | 0.74 |
| Devcap Shared Return | −0.05 | 0.95 | 0.21 | −0.03 | 1.02 | 0.19 |
| Domini Social Equity | −0.11** | 0.99 | 0.00 | −0.08 | 1.04 | 0.03 |
| Dreyfuss Prem. 3rd Cent Z | −0.24 | 1.04 | 0.11 | −0.23 | 1.11 | 0.10 |
| GMO Tobacco Free Cr III | 0.20 | 0.86 | 0.10 | 0.19* | 0.95 | 0.05 |
| Green Century Balanced | 0.07 | 0.85 | 0.74 | 0.06 | 0.93 | 0.73 |
| IPS Millenium | 0.15 | 1.21 | 0.60 | 0.15 | 1.31 | 0.59 |
| Meyers Pride Value | 0.29 | 0.81 | 0.59 | 0.30 | 0.92 | 0.54 |
| MFS Union Std Equity I | −0.34 | 0.73 | 0.25 | −0.36** | 0.81 | 0.18 |
| MMA Praxis Growth B | −0.16 | 0.73 | 0.26 | −0.17 | 0.82 | 0.19 |
| Neuberger Berm. Soc R R | −0.12 | 0.80 | 0.28 | −0.16 | 0.90 | 0.19 |
| New Alternatives | 0.07 | 0.50 | 0.83 | 0.01 | 0.61 | 0.78 |
| Noah | −0.38 | 1.19 | 0.48 | −0.31 | 1.27 | 0.48 |
| North Amer. Soc Resp A | −0.24 | 0.83 | 0.32 | −0.24** | 0.95 | 0.22 |
| Parmassus Income Equity | 0.00 | 0.60 | 0.34 | −0.01 | 0.65 | 0.31 |
| Pax World Balanced | 0.33** | 0.43 | 0.34 | 0.32** | 0.47 | 0.32 |
| Rightime OTC | −0.86** | 0.62 | 0.63 | −0.87** | 0.66 | 0.62 |
| Security Soc Aware A | −0.39** | 0.93 | 0.34 | −0.33* | 1.00 | 0.33 |
| Smith Barn. Soc Aware B | −0.04 | 0.63 | 0.13 | −0.04 | 0.68 | 0.09 |
| Timothy Plan S. Value A | −0.46 | 0.62 | 0.59 | −0.48 | 0.68 | 0.57 |
| Women's equity | −0.23 | 0.86 | 0.20 | −0.23 | 0.92 | 0.19 |
| Bridgeway Soc Respons. | 0.02 | 0.85 | 0.45 | 0.04 | 0.92 | 0.44 |
| Calvert Strategic Grth A | −0.87 | 0.61 | 0.69 | −0.91 | 0.68 | 0.67 |
| Newberger Berman NYCDC | −0.59 | 0.88 | 0.90 | −0.64 | 1.06 | 0.87 |

Note: Jensen's alpha, $\alpha_p$, is the measure of portfolio $p$'s investment performance, using the Domini Social Index (DSI 400) and S&P 500 as alternative benchmarks. $RV$ and $\beta_p$ are portfolio $p$'s residual variance and beta, respectively. Statistical significance relative to $\beta_p$ and $RV$ is not indicated in this table.

**Jensen's alpha is significant at the 5% level.
*Jensen's alpha is significant at the 10% level.

**TABLE 4. Performance of Socially Responsible Funds: January 1994 to March 2001.**

| | Sample Mean | | |
|---|---|---|---|
| | SR | CONV | *Z*-score |
| Panel A. Performance Relative to S&P 500 | | | |
| $\alpha_p$ | −0.0920 | −0.1697 | 1.0557 |
| $S_p$ | −0.0825 | −0.1058 | 1.4025** |
| *eSDAR* | −0.3704 | −0.3241 | −0.4399 |
| $\beta_p$ | 0.9144 | 0.8694 | 1.1799 |
| *RV* | 0.4134 | 0.3834 | 0.6521 |
| Panel B. Performance Relative to DSI 400 | | | |
| $\alpha_p$ | −0.0969 | −0.1622 | −1.0019 |
| $S_p$ | −0.1228 | −0.1152 | −0.3432 |
| *eSDAR* | −0.4050 | −0.3556 | −0.4399 |
| $\beta_p$ | 0.8317 | 0.7750 | −0.1299** |
| *RV* | 0.4455 | 0.4318 | −0.7421 |

Note: This table shows the means of the measures of investment performance of socially responsible (SR) funds and conventional (CONV) funds, represented by Jensen's alpha, $\alpha_p$; Sharpe performance measure, $S_p$; and excess standard deviation adjusted return, *eSDAR*. *RV* and $\beta_p$ are the residual variance and beta, respectively, of the mutual fund's portfolio. DSI 400 = Domini Social Index.

**Significant at the 5% level.

I use Sharpe information ratio and *eSDAR* as measures of investment performance, the $RV * Group$ interaction terms also do not indicate any significant effect of diversification as a function of group. I can also test for the difference in investment performance between socially responsible funds and conventional funds using $H_0$: $\omega_2 = 0$. The results in Panel B of Table 6 ($F = 1.76$, $p = .1872$) indicate that after adjusting for the variable effects of diversification, there is no difference in investment performance between socially responsible funds and their conventional peers.

Finally, to determine the relation between residual variance and investment performance for conventional funds, I test the hypothesis $H_0$: $\omega_1 = 0$. The results shown in Table 6 indicate that when I measure investment performance using Jensen's alpha, residual variance is unrelated to investment performance (Panel A: $F = 0.07$, $p = .7872$; Panel B: $F = 0.03$, $p = .8582$). However, when I measure performance using either the Sharpe performance measure or *eSDAR,* the results in Panels C and D indicate that residual variance is significantly related to investment performance. The difference in these results could be because Jensen's alpha uses systematic risk as the measure of portfolio risk, but both the Sharpe performance measure and *eSDAR* use total variability of returns. Systematic risk, or beta, is the correct measure of risk if the portfolio is fully diversified; thus, portfolio returns are perfectly correlated with returns on the benchmark. This is not typical of the mutual funds in my sample, as revealed by the substantial undiversified residual variance

**TABLE 5. Pearson Correlations of Investment Performance with Diversification.**

| Measure of Diversification | $\alpha_p$ | $S_p$ | *eSDAR* |
|---|---|---|---|
| Panel A. Socially Responsible Funds | | | |
| *RV*[a] | 0.0908 | 0.2124 | −0.2577 |
| | (.5674) | (.1768) | (.0994) |
| Capitalization | −0.1407 | −0.2021 | −0.0543 |
| | (.3742) | (.1993) | (.7326) |
| Holdings | 0.2097 | 0.1858 | −0.0060 |
| | (.1826) | (.2389) | (.9700) |
| Top Ten % | 0.0192 | −0.0149 | −0.0846 |
| | (.9041) | (.9256) | (.5945) |
| Panel B. Conventional Funds | | | |
| *RV*[b] | −0.0390 | 0.2362 | −0.4048 |
| | (.7248) | (.0305)** | (.0001)** |
| Capitalization | −0.0504 | −0.4007 | 0.1412 |
| | (.6505) | (.0002)** | (.2028) |
| Holdings | 0.0604 | −0.0760 | 0.0581 |
| | (.5606) | (.4920) | (.5995) |
| Top Ten % | −0.0838 | −0.1056 | −0.0936 |
| | (.4485) | (.3391) | (.3972) |
| Panel C. Combined Sample | | | |
| *RV*[c] | 0.0243 | 0.2291 | −0.3428 |
| | (.7874) | (.0099)** | (.0001)** |
| Capitalization | −0.0788 | −0.3118 | 0.0648 |
| | (.3823) | (.0004)** | (.4725) |
| Holdings | 0.1172 | 0.0236 | 0.0296 |
| | (.1914) | (.7928) | (.7423) |
| Top Ten % | −0.0482 | −0.0712 | −0.0857 |
| | (.5920) | (.4285) | (.3398) |

Note: In this table, the degree of portfolio diversification is measured by residual variance (*RV*). Investment performance is measured by Jensen's alpha, $\alpha_p$; Sharpe performance measure, $S_p$; or excess standard deviation adjusted return, *eSDAR*. The S&P 500 is used as the benchmark portfolio. Capitalization is the median market capitalization, holdings is the total number of companies held by the fund, and top ten % is the percentage of net assets invested in the fund's top ten holdings. Numbers in parentheses are probabilities > $|r|$ under $H_0$: $\rho = 0$.

[a] *RV* is correlated with capitalization, holdings, and top ten % at the 5% level (−0.7522, $p = .0001$; −0.3062, $p = .0486$; 0.4789, $p = .0013$, respectively).
[b] *RV* is significantly correlated only with capitalization (−0.6804, $p = .0001$).
[c] *RV* is significantly correlated only with capitalization (−0.6941, $p = .0001$).

**Significant at the 5% level.

in Table 4 (socially responsible funds, 0.4134; conventional funds, 0.3834). My results suggest that the Sharpe performance measure and *eSDAR* are the appropriate measures of investment performance for mutual funds with net assets similar to those in my sample. I conclude that residual variance is related to investment

**TABLE 6. Covariance Analysis.**

| Source | *df* | SS[a] | *F*-value | Prob > *F* |
|---|---|---|---|---|
| Panel A. Dependent Variable: $\alpha_p$ | | | | |
| *RV* | 1 | 0.0069 | 0.07 | .7872 |
| *Group* | 1 | 0.1652 | 1.75 | .1881 |
| *RV* ∗ *Group* | 1 | 0.0514 | 0.54 | .4618 |
| Panel B. Dependent Variable: $\alpha_p$ | | | | |
| *RV* | 1 | 0.0030 | 0.03 | .8582 |
| *Group* | 1 | 0.1652 | 1.76 | .1872 |
| Panel C. Dependent Variable: $S_p$ | | | | |
| *RV* | 1 | 0.0783 | 6.81 | .0102** |
| *Group* | 1 | 0.0109 | 0.95 | .3328 |
| *RV* ∗ *Group* | 1 | 0.0004 | 0.04 | .8457 |
| Panel D. Dependent Variable: *eSDAR* | | | | |
| *RV* | 1 | 1.1462 | 16.33 | .0001** |
| *Group* | 1 | 0.0295 | 0.42 | .5174 |
| *RV* ∗ *Group* | 1 | 0.0129 | 0.18 | .6682 |

Note: This table shows the results of covariance analysis using a general linear model. The response variable is investment performance measured by Jensen's alpha, $\alpha_p$; Sharpe performance measure, $S_p$; or excess standard deviation adjusted return, *eSDAR,* all calculated using S&P 500 as the benchmark portfolio. Residual variance, *RV,* is the covariate. *Group* is equal to 1 if socially responsible fund, and 0 if conventional fund. The *RV* ∗ *Group* interaction term indicates difference in the relation between residual variance and performance as a function of group.

[a]Type III sum of squares (SS) for Panel B, and Type I SS for Panels A, C, and D.

**Significant at the 5% level.

performance only for conventional funds. For socially responsible mutual funds, residual variance is not linearly related to investment performance.

For investment performance, my findings are consistent with prior studies by Hamilton, Jo, and Statman (1993), Sauer (1997), Goldreyer, Ahmed, and Diltz (1999), and Statman (2000). These studies find no significant difference in investment performance between socially screened portfolios and conventional investments. And, consistent with Statman (2000), when I use either the Sharpe information ratio or *eSDAR* as the measure of performance, my results indicate that both socially responsible and conventional mutual funds underperform the DSI 400 and the S&P 500. Jensen's alpha, however, is negative and significant for conventional funds and not significantly different from zero for socially responsible funds, regardless of the benchmark.

My findings support those of Grossman and Sharpe (1986), who argue that any constraint placed on a decision would only lower or leave unchanged the maximum utility that can be obtained by investors. Moreover, my findings differ

from those of Rudd (1981) and Clow (1999), who assert that socially responsible investing introduces size and other biases into a portfolio, resulting in greater extramarket covariation in returns and consequently poor long-run investment performance. Overall, my results indicate that socially responsible mutual funds are not statistically different from conventional funds in terms of portfolio beta, the degree of portfolio diversification, and risk-adjusted investment performance.

## VI. Summary and Conclusions

The primary objective of my study is to investigate the extent to which socially responsible investing affects the characteristics of assets included in a portfolio, the degree of portfolio diversification, and the effects of diversification on investment performance. My sample includes 42 socially responsible mutual funds, each of which is matched to two randomly selected conventional funds of approximately equal net assets. The sample includes only domestic stock funds.

My findings are that socially responsible funds do not differ from conventional funds in asset characteristics, degree of portfolio diversification, or long-run investment performance. After adjusting for the degree of portfolio diversification, I find that the investment performance of socially responsible mutual funds is indistinguishable from that of conventional funds. Characteristics such as portfolio concentration, total portfolio holdings, and the size of companies in the portfolio are also not significantly different between the two groups. Both groups of funds underperform the DSI 400 and the S&P 500 from January 1994 to March 2001.

Moreover, both groups of funds have significant extramarket covariation in returns, indicating that they are substantially undiversified. When I use beta as the relevant measure of portfolio risk, my results indicate no significant correlation between the degree of portfolio diversification and investment performance.

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