The Eco-Efficiency Anomaly

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By
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The study submitted last year has now been updated to show the results for the five years ending December 2001. Each of the three tests were run using the Eco-Efficiency ratings produced by Innovest Strategic Value Advisors, Inc. (Innovest), as published at year-end 2000. In each case, a buy and hold strategy frozen throughout calendar year 2001was emulated.

2001 appears to have been a relatively consistent year for Innovest's Eco-Efficiency ranks. The more Eco-Efficient portfolios out-performed their respective benchmarks in all three tests, and in each case was measured with slightly less overall volatility.

The first test compared the equal weighted total returns of a portfolio composed of all top stocks (those rated 5 or 6) with the equally weighted returns if the Innovest Universe. Table 1A shows the year-by-year returns of the top rated stocks and the Innovest Universe. Table 1B shows the compound annual returns for the last one to five years.

Table 1A

A comparison of the Characteristics and Performance of the Innovest Universe and the Top Rated Stocks

Characteristics	1997	1998	1999	2000	2001
Rating Date	12/1996	12/1997	12/1998	12/1999	12/2000
# Stocks in Top-Rated Portfolio	49	61	89	130	221
# Stocks in Innovest Universe	184	190	342	490	926
Total Volatility of Top Rated %	9.51%	10.59%	12.59%	13.82%	15.53%
Total Volatility of Universe %	10.00%	10.89%	14.02%	15.11%	15.56%
Average Rating of Top-Rated Stocks	5.33	5.38	5.48	5.55	5.53
Average Rating of Universe	3.11	3.25	2.89	2.94	2.70
Equal-weighted Return Innovest Univ. %	13.97%	4.93%	14.74%	2.31%	2.22%
Equal-weighted Return of Top-Rated %	14.45%	6.91%	19.00%	9.52%	3.86%
Difference in Basis Points	48	198	426	721	164

Table 1B shows the compound annual total returns for the last one to the last five years.

Table 1B		
Compound		
Annualized	**Entire**	**Innovest**
# of Yrs.	**Universe**	**Top-Rated**
5	7.49%	10.62%
4	5.93%	9.68%
3	6.26%	10.62%
2	2.26%	6.65%
1	2.22%	3.86%
(Period ended 31 Dec, 2001)		

Table 2A shows the results of buying and holding a portfolio designed to be factor-neutral to the S&P 500 Index while simultaneously tilting towards stocks rated most highly in Eco-Efficiency by Innovest. The factor-neutral portfolios were projected to produce 50 basis or less annual tracking error, and created using the APT® optimizer and risk factor analytic system. Stocks not rated by Innovest were frozen at their beginning-of-year S&P weightings.

Table 2A					
A comparison of the Characteristics and Performance of the Innovest Universe and the Top Rated S&P 500 Stocks					
Characteristics	1997	1998	1999	2000	2001
# of S&P 500 Stocks in Innovest Universe	128	153	248	363	368
Total Volatility of Enhanced Portfolio %	13.50%	12.53%	10.34%	13.67%	18.84%
Total Volatility of S&P 500 %	13.54%	12.53%	10.48%	15.11%	18.88%
Correlation - Enhanced Portfolio & S&P 500	0.995	0.990	0.994	0.752	0.997
Total Return of Innovest Enhanced Portfolio %	32.41%	30.04%	23.47%	3.40%	-11.92%
Total Return of S&P 500 %	33.36%	28.58%	21.04%	-9.10%	-12.59%
Difference between returns in basis points	-95	146	243	1250	67
Sharpe Ratio of Enhanced Portfolio	1.99	1.96	1.83	-0.19	-0.79
Sharpe Ratio of S&P 500	2.05	1.84	1.57	-1.00	-0.83
Difference between Sharpe ratios in BP	-6	12	26	81	4

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Table 2B shows the compound annual total returns for the last one to the last five years.

Table 2B			
Compound			
Annualized	**Innovest**	**S & P**	
# of Yrs.	**Enhanced**	**500**	**Difference**
5	14.13%	10.52%	3.61%
4	9.97%	5.45%	4.52%
3	3.99%	-1.29%	5.28%
2	-4.57%	-10.86%	6.29%
1	-11.92%	-12.59%	0.67%

(Period ended Dec 31, 2001)

Table 3A shows the year by year returns and other data for the highest (rated 5 or 6) and the lowest (rated 0 or 1) rated stocks in the most environmentally sensitive industries (those rated 4 or 5). During 2001, an equally weighted portfolio of the top rated companies out-performed the portfolio of bottom rated companies by 97 basis points.

Table 3A

A Comparison Between Top and Bottom Rated Stocks in Environmentally Intensive Industries

Characteristics	1997	1998	1999	2000	2001
Rating Date	12/1996	12/1997	12/1998	12/1999	12/2000
Number Stocks Rated 0 or 1	19	14	14	39	89
Number of Stocks rated 5 or 6	28	24	24	32	54
Total Volatility of Bottom Rated Stocks %	15.91%	20.90%	25.38%	17.46%	16.00%
Total Volatility of Top Rated Stocks %	14.67%	18.49%	26.14%	17.05%	14.35%
Average Rating of Bottom Rated Stocks	0.42	0.43	0.43	0.56	0.47
Average Rating of Top Rated Stocks	5.36	5.38	5.38	5.47	5.52
Annual Return of Bottom Rated Stocks %	11.52%	-6.65%	9.69%	22.98%	2.06%
Annual Return of Top Rated Stocks %	22.50%	4.80%	22.31%	13.63%	3.03%
Difference in basis points	1099	1145	1262	-935	97

Table 3B shows the compound annual total returns for the last one to the last five years.

Table 3B			
Compound			
Annualized	**Top**	**Bottom**	
# of Yrs.	**Rated**	**Rated**	**Diff.**
5	12.95%	7.46%	5.49%
4	10.68%	6.47%	4.21%
3	12.71%	11.25%	1.46%
2	8.20%	12.03%	3.83%
1	3.03%	2.06%	0.97%

All multiple period compound annualized returns data were computed for dates ending December 31, 2001

Respectfully submitted,

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The Eco-Efficiency Anomaly

By Herbert D. Blank and C. Michael Carty

Introduction

For many years, the prevailing tenet in the institutional investment industry held that investors could not invest in a socially responsible manner without giving up the opportunity to achieve higher rates of return. Social screens generally eliminated companies that participated in businesses deemed undesirable (e. g., tobacco, alcohol, etc.) by some groups. According to the Capital Asset Pricing Model, such screening significantly narrows the selection set. Thus, it follows that portfolios randomly selected from a restricted opportunity set have lower expected returns. Accordingly, many investment professionals adopted the position that imposing such social criteria may be considered irresponsible from a fiduciary's perspective.

From 1995-1999, some thoughts on this matter began to change as social screens resulted in such funds eliminating many value stocks (e.g., Philip Morris, Seagram's) from the selection set. This resulted in portfolios that overweighted growth stocks (e. g., Cisco Systems, Intel) relative to the popular indexes. As long as growth drastically outperformed value, such screens weren't so bad after all. But since style cycles can be expected to change over time, this does not solve the essential problems caused by the narrowing of the opportunity set. Indeed in 12-month-period ending March 31, 2001, as growth stocks fell out of favor with investors resulting in a 24.1% decline in the S&P 500 Index. In contrast to even that precipitous drop, the Domini Social Equity Index Fund plummeted 30.3%, ranking it in the bottom quintile of the Morningstar Large Cap Blend Universe of funds with more than $500 million in assets.

Historically, environmental concerns were generally treated the same as other social concerns. Energy companies and some others would simply be removed from the selection set. This helped portfolio performance when these companies tended to underperform, and vice versa. The concept of Eco-efficiency adds a new dimension that challenges this paradigm.

Eco-efficiency is the theorized tendency of companies that meet environmental challenges perspicaciously to deliver superior profitability. The test of superior eco-efficiency is not only to manage downside risk, but also of having the managerial ability, at both the strategic and operational levels, to identify and capture upside opportunities for additional profit and competitive advantage. According to the theory, eco-efficiency is a good proxy of management quality because it is an indicator of the likelihood that a firm will rise above unknown challenges, particularly those that are complex and of an interdisciplinary and multidimensional nature.

In a recent study, Waddock and Graves [1] found that socially responsible companies perform about the same financially and investment-wise. Other attempts have been made to determine whether the investment returns of socially and environmentally responsible portfolios fair better or worse than the average of all funds with similar investment objectives. For example, Gottsman and Kessler [2] analyzed the returns of environmentally screened S&P 500 stocks, compared them to the S&P 500, and found that there was "no significant effect, positive or negative, on returns or risk-adjusted returns."

The absence of a relationship implies that portfolios, actively or passively managed, that exclude poor environmental companies will perform no better or no worse than portfolios containing less responsible companies. In other words, investors who care about environmental goals, but are unwilling to sacrifice returns for them, are not required to do so.

There is, however, a growing opinion that suggests socially responsible investing may produce higher risk-adjusted portfolio returns than using all eligible stocks drawn from a large universe. Guerard [3] used analysts' forecasts and forecast distribution information in socially screened and unscreened portfolios and found they added value to the returns of both. Moreover, he found environmental; alcohol, tobacco and gaming; military, and nuclear screens produced portfolios "with higher excess returns than those from unscreened and tobacco-free portfolios." Also that, "the only social screen that consistently costs the investor returns is the military screen."

Eco-Efficiency as a Test of Management's Skill

As the social costs associated with ecological and environmental problems become more tangible, the key to both financial and investment success increasingly depends upon the efficiency with which companies solve them. Stephen Schmidheiny, the famed Swiss industrialist, observed, "The capital markets will soon come to reward eco-efficiency much more systematically; far-sighted investors and company leaders will position themselves accordingly." [4]

Corporate managers' awareness of the problems, and the vigor with which they seek and implement solutions, determines the quality of their leadership. Among their operating problems may be toxic emissions, product risk liabilities, hazardous waste disposal, waste discharges, etc. In such cases, liability and risk management requires strategic corporate governance, environmental management systems, and accounting capacity. Corporate management teams that are eco-efficient, therefore, should profit directly from environmentally driven industry and market trends. It follows that investors should be rewarded with higher returns for identifying the stocks of such companies.

At year-end 1996, Innovest Strategic Value Advisors ("Innovest"), a Toronto-based research firm, began providing ratings on companies based on eco-efficiency. The ranking system is called EcoValue 21. Since midyear 1998, the list of companies followed has expanded from 200 companies in environmental-intensive industries to more than 1000 companies with many lower impact industries now included. Their ratings are industry relative ratings. Within each industry, companies are rated from best to worst using a list of 62 variables; e.g., tons of CO_2 gas released per dollar of profit. The best companies get a rating equal to 6, or AAA, the worst companies get a rating of 0, or CCC.

Assertion of Superior Investment Returns Through Eco-efficiency

Innovest claims that its eco-efficiency ranks provide not only environmental differentiation but return differentiation as well. On a relative basis, the stocks of higher ranked companies purportedly will deliver higher investment returns than lower ranked counterparts within industry groups. This claim seemed intriguingly reminiscent of the Value Line Ranking System's claim of relative differentiation. Fischer Black[5] and others wrote a series of articles illustrating that the rankings explained performance differences in ways that could not be explained by the Capital Asset Pricing Model. In short, not all the information that Value Line used to compute its ranks, despite public availability, was adequately factored into stock market prices.

Innovest's argument is similar. By carefully analyzing and quantifying factors relating to the manner in which companies handle the challenge of environmental change, the ranks capture significant information not utilized by most investors in determining the price at which stocks should trade. The central purpose of this study is to substantiate the extent to which results support Innovest's hypothesis.

Methodology and Results of a Simple Test

Innovest's ratings were analyzed to determine whether they add value by identifying companies the market will reward for their superior management of environmental issues. All companies rated by Innovest were compared over the almost four years since inception.

The analysis was performed in three stages. The first stage computed the returns of equally weighted portfolios composed of the highest rated companies (ratings equal to 5 or 6) and compared them to the returns of the equally weighted total universe of all rated companies. The portfolios were rebalanced at each year-end, over the period from December 31, 1996 through yearend 2000.

Table 1. A Comparison of the Characteristics and Performance of the Innovest Universe and the Top Rated Stocks

Characteristics	1997	1998	1999	2000
Rating Date	Dec-96	Dec-97	Dec-98	Dec-99
No. of Stocks in Top-Ranked Portfolio	49	61	89	130
No. of Stocks in Innovest Universe	184	190	342	490
Ann. Weekly Std. Dev. Of Top-Ranked (%)	9.51	10.59	12.59	13.82
Ann. Weekly Std. Dev. Of Universe (%)	10.00	10.89	14.02	15.11
Average Rating of Top Rated Stocks (%)	5.33	5.38	5.48	5.55
Average Rating of the Universe (%)	3.11	3.25	2.89	2.94
Return of Innovest Universe (%)	13.97	4.93	14.74	2.31
Return of Top Rated Stocks (%)	14.45	6.91	19.00	9.52
Difference in Basis Points	**48**	**198**	**426**	**721**

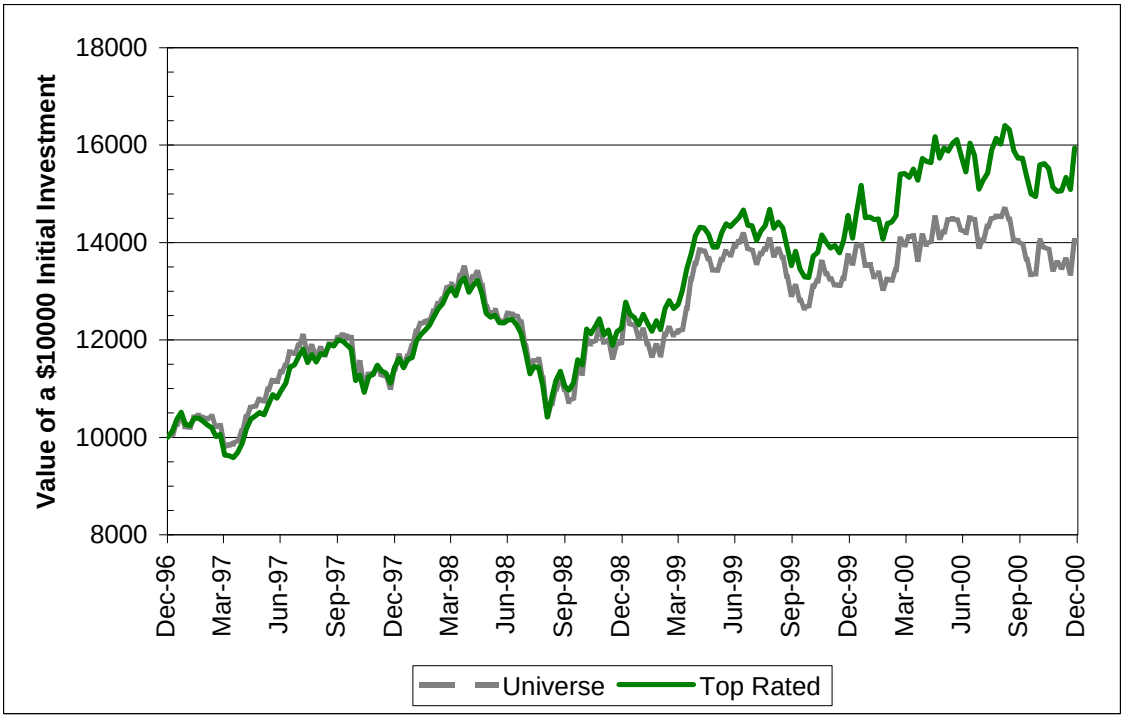
Source: Innovest and QED International Associates, Inc.

The results are summarized in Table 1. The two portfolios are compared as to size, volatility, average ratings, and returns. The top rated portfolio, as one would expect, has a higher quality rating.

The other comparisons certainly pique interest. The first fact that stands out is that the top rated stocks outperform the ranked universe in each of the four years. Moreover, the magnitude of outperformance has increased each year. Equally impressive is the observation that the total volatility of the top portfolio is lower than that of the total universe. The implication of this observation is that the stocks ranked highest by Innovest do not derive above-average returns from assuming above-average risks.

The value of a $10,000 initial investment in these portfolios over the four-year span is illustrated in Chart 1. $10,000 invested in the average stock in the Innovest-ranked universe would have grown to $14,037 as compared to $15,946 for the average top-ranked stock. Over the entire period the top rated companies returned 12.37% annually versus 8.85% for the universe, a difference of 353 basis points per year.

Chart 1. The Growth of a $10,000 Investment of
Top-Rated Stocks Versus the Total Universe



Source: Innovest and QED International Associates, Inc.

These returns demonstrate that the top-ranked performers in Innovest's rating system outperformed the universe as a whole by a substantial amount during the time period measured. Yet, beyond a short time frame, there are other factors to be researched before the assertion of an anomaly can be made with any validity.

Judging from the number of stocks in the top rated portfolios, one might be tempted to conclude that the portfolios are sufficiently diversified. However, equal weighting may sometimes result in unintended concentrations in certain industries, sectors, or other security characteristics. This occurrence is frequently described as taking "factor bets." Furthermore, the universe of stocks ranked by Innovest is not randomly selected. By Innovest's own admission, company coverage is initiated according to the perceived importance of the environment to a company's business. In 1997 and 1998, the companies ranked by Innovest

were primarily high-environmental-impact companies. As interest has grown, Innovest has gradually expanded its coverage to include most major US companies. However, companies with almost no interaction with the environment, such as software developers, still tend not to be ranked.

Methodology and Results of a More Stringent Test

The second stage of the analysis attempts to determine whether the Innovest ratings add value after neutralizing any factor bets. Before factor-neutral portfolios can be created, the factors that drive systematic risk must be defined and quantified. For this purpose, the authors employed a risk management system provided by APT[5], Inc. based upon the Arbitrage Pricing Theory. This particular model utilizes factor analysis to empirically define more than 20 systematic sensitivities of the US market. Every US stock is assigned a co-efficient of risk on each factor relative to the market. For example, Merrill Lynch might be twice as sensitive to unexpected spikes in inflation than the market, and in a negative direction while Rubbermaid may be relatively insensitive and Barrick Corp. may have above-average sensitivity to the same factor but in a positive direction.

The object of this stage, then, was to construct portfolios with the same aggregate risk profile as the S&P 500 Index that favor stocks ranked highly by Innovest. APT provides an optimizer for the express purpose of constructing such portfolios that give maximum exposure to favored ranks for given risk constraints. Since the only portfolio that has the exact risk profile on every factor as the S&P 500 index with zero tracking error is the Index itself, the authors allowed for a 50-basis-point tracking error to the Index for the Innovest-tilted portfolios. Stocks in the S&P 500 that had no Innovest ranking were automatically placed in the Innovest-tilted portfolios at their identical weights in the Index. The Innovest rating for each industry was normalized, a process that reduces significant rating disparities between industries. These normalized ratings were then used to create portfolios “tilted” towards Innovest-favored stocks, but constrained to a 50-basis-point-predicted tracking error versus the S&P 500.

Table 2. A Comparison of the Characteristics and Performance of the Innovest Universe and the Top Rated Stocks

Characteristics	1997	1998	1999	2000	Ann. 4-yr-pd.
No. of S&P 500 Stocks in Innovest Universe	128	153	248	363	--
Annualized Weekly Std. Dev. Of Enhanced Portfolio (%)	13.50	12.53	10.34	13.67	12.42
Annualized Weekly Std. Dev. Of S & P 500 Index (%)	13.54	12.53	10.48	15.11	12.95
Correlation Coefficient between the portfolios (Pearson's "r ")	0.995	0.990	0.994	0.752	0.910
Total Return of Innovest-Enhanced Portfolio (%)	32.41	30.04	23.47	3.40	21.76
Total Return of S&P 500 (%)	33.36	28.58	21.04	-9.10	17.07
Difference between returns in basis points	**- 95**	**146**	**243**	**1250**	**469**
Sharpe Ratio of Enhanced Portfolio	1.99	1.96	1.83	-0.19	1.32
Sharpe Ratio of S&P 500	2.05	1.84	1.57	-1.00	091
Difference between Sharpe Ratios (in b. p.)[9]	**- 6**	**12**	**26**	**81**	**41**

Source: Innovest and QED International Associates, Inc.

These results are summarized in Table 2. There are many interesting observations that can be made. Innovest increased its coverage of S & P 500 companies each year. In 1997, only 128 stocks in the index were covered. Therefore, 372 positions and their weights in the Innovest portfolio matched the S&P 500 identically. This did not allow many degrees of freedom for potential outperformance, and indeed the fit is very tight. With such restricted space in a high-return year for the S&P 500, the Innovest-enhanced portfolio slightly underperformed in 1997. In 1998 and 1999, however, portfolios with more Innovest-ranked stocks from which to choose outperformed the index substantially with very tight tracking statistics indicating portfolios that were a mirror image from a risk perspective, but superior from a return perspective.

The Innovest-enhanced results in 2000 were outstanding, and merit further explanation. With fewer positions constrained and many more rated stocks from which to select, it would not have been surprising to see a slightly lower correlation between the two portfolios and some disparity between the standard deviations; given the results in Table 1, an increase in the relative outperformance by the Innovest-enhanced portfolio also could be expected. However, all of these differences are remarkably huge. The starkest contrast is the fact that a portfolio constructed to track the S&P 500 within 50 basis points had a correlation of just .75 instead of the minimum correlation of .99 recorded in the prior three years.

The implication of actual tracking being this far removed from expected tracking is that the APT factor model at the beginning of 2000 turned out to be misspecified as the year proceeded. Anecdotally, this would seem to indicate the pronounced "dump-anything related-to the-Internet" phenomenon that occurred during the last nine months of the year became a new and significant systematic risk factor to explain market behavior. This factor, obviously, was not accounted for at the beginning of the year, so the Innovest-enhanced portfolio did not mirror it. Furthermore, since the most Internet-sensitive stocks do not tend to have significant environmental impact, these stocks would not tend to garner the higher rankings toward which the Innovest-enhanced portfolio would tend to tilt. Consequently, the authors suggest that the magnitude of outperformance exhibited in 2000 was probably aided by a unique market phenomenon. Without the anti-Internet phenomenon, an outperformance of between 300 and 600 basis points in a portfolio that tracked within 200 basis points would have been more consistent with prior experiences. Indeed, the annualized outperformance for the period is 469 basis points.

Finally, the Sharpe Ratios for the two portfolios also demonstrate continued improvement in the Innovest-enhanced portfolio. The statistical data reveal continuously increasing differentials. The ratio quantifies risk-return tradeoffs in terms of the historical average differential return per unit of historical variability of the differential return. The higher the ratio, the more advantageous the trade-off has been for the investor on an ex-post basis.[7]

These findings bolster the initial findings that, as coverage has increased with time, the eco-efficiency anomaly claimed by Innovest appears more likely to be true and, potentially, statistically significant. If true, it well could be the case that eco-efficiency will prove to be a proxy for managing the challenge of change in many industries, not just environmental-intensive ones. As the incidence of environmental challenges continue to grow in the new century, eco-efficiency may become an even stronger differentiator of the potential for superior investment performance.

Table 2A. The Innovest-Enhanced S&P-Targeted Portfolio vs. the S & P 500 Index: Comparison of Quarterly rates of Return

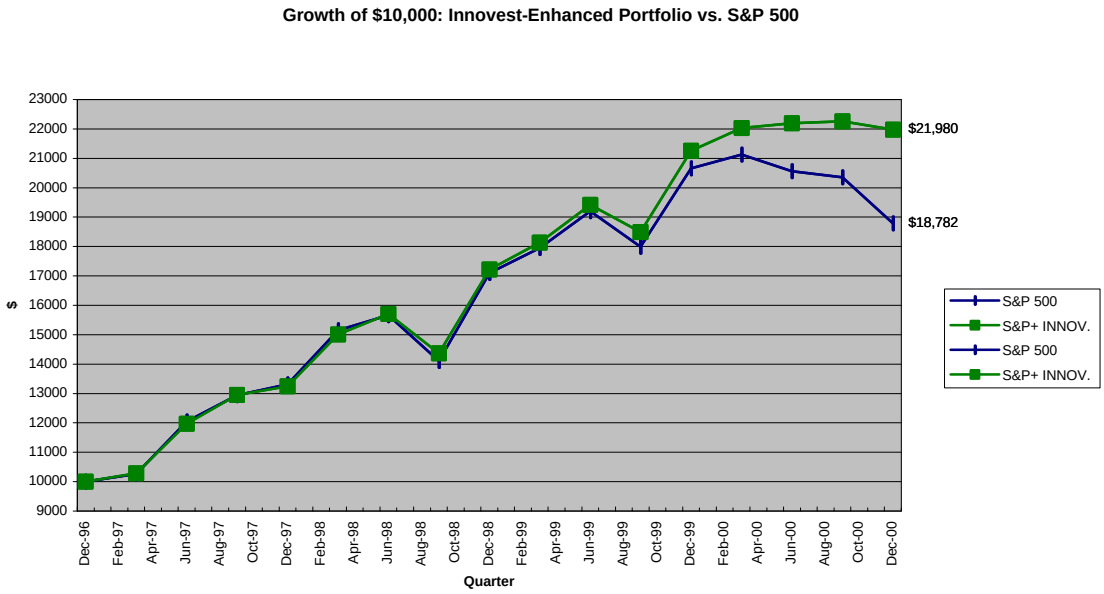
	INNOVEST ENHANCED S&P 500	***S&P 500***	***DIFFERENCE***
1997, Q1	**2.82%**	2.62%	0.20%
1997, Q2	16.45%	***17.37%***	*-0.92%*
1997, Q3	**8.13%**	7.44%	0.69%
1997, Q4	2.27%	***2.84%***	*-0.57%*
1998, Q1	13.39%	***13.86%***	*-0.47%*
1998, Q2	**4.63%**	3.37%	1.26%
1998, Q3	**-8.55%**	-9.95%	1.40%
1998, Q4	19.85%	***21.22%***	*-1.37%*
1999, Q1	**5.33%**	4.96%	0.37%
1999, Q2	**7.10%**	6.98%	0.12%
1999, Q3	**-4.76%**	-6.28%	1.52%
1999, Q4	**14.92%**	14.84%	0.08%
2000, Q1	**3.66%**	2.24%	1.42%
2000, Q2	**0.72%**	-2.67%	3.39%
2000, Q3	**0.28%**	-0.99%	1.27%
2000, Q4	**-1.24%**	-7.74%	6.50%

Source: Innovest and QED International Associates, Inc.

Table 2A compares the Innovest-enhanced portfolio's quarterly rates of return with those of the Index during the four years measured. The Innovest-enhanced portfolio outperforms its benchmark Index in 12 of the 16 quarters.

Interestingly, three of the four quarters where the Innovest-enhanced portfolio underperforms are the three highest performing quarters for the S&P. In the fourth highest performing quarter for the S&P 500, the Innovest-enhanced portfolio experiences its smallest magnitude of outperformance. Conversely, in all five negative-return quarters suffered by the S&P 500 Index, the Innovest portfolio outperformed it by at least 120 basis points. These results tend to bolster the Innovest's argument that its eco-efficiency ranks define and quantify factors relating to risk not captured in the stock price. Coupled with the fact that the Innovest-enhanced portfolio exhibited a standard deviation no higher than the S&P 500 Index in all four years, the Innovest-enhanced portfolio appears to be consistently more defensive than its benchmark.

Chart 2B. Growth of $10,000 in the Value of Portfolios
Tilted to Top Rated Stocks Versus the S&P 500



Source: Innovest and QED International Associates, Inc.

Chart 2B demonstrates how the Innovest-enhanced portfolios grew from $10,000 to $21,980 as compared to $18,782 for the index during the time period. It also illustrates visually how the Innovest-enhanced portfolios mirrored the movements of the S&P 500 very reliably until the second quarter of 2000 at which point the benchmark curve slopes much more steeply downward.

Comparing the Performance of Top Rated and Bottom Rated Companies

The third stage of the analysis attempts to determine the degree to which Innovest ratings distinguishes between the returns of their most favorably rated companies, 5 and 6, and their least favored, 0 and 1, in the most environmentally sensitive industries; e.g., chemicals, electric utilities, forest products, mining, petroleum, and steel. In the first stage of analysis, an equal-weighted top rated portfolio was found to outperform one containing Innovest's entire universe of stocks. If a portfolio of bottom rated stocks underperforms, by a significant degree, one of top rated stocks, then a number of investment strategies might be developed containing both. Such a combination of strategies, if successful, may be appropriate for a market-neutral strategy and/or a hedge fund manager.

Table 3. A Comparison Between Top and Bottom Rated Stocks in Environmentally Intense Industries

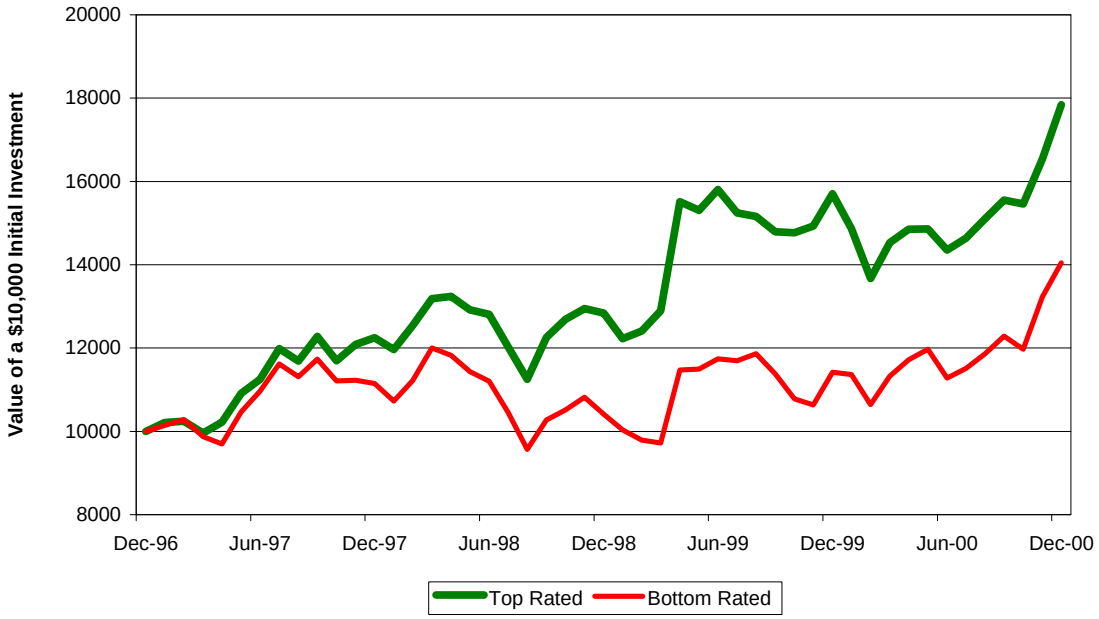
Characteristics	1997	1998	1999	2000	Annualized
Rating Date	Dec-96	Dec-97	Dec-98	Dec-99	4-yr.-pd.
No. of Stocks Rated 0 or 1	19	14	14	39	---
No. of Stocks Rated 5 or 6	28	24	24	32	---
Total Volatility of Bottom Rated Stocks (%)	15.91	20.90	25.38	17.46	20.40
Total Volatility of Top Rated Stocks (%)	14.67	18.49	26.14	17.05	19.65
Average Rating of Bottom Rated Stocks (%)	0.42	0.43	0.43	0.56	0.49
Average Rating of Top Rated Stocks (%)	5.36	5.38	5.38	5.47	5.40
Annual Return of Bottom Rated Stocks (%)	11.51	-6.65	9.69	22.98	8.86
Annual Return of Top Rated Stocks (%)	22.50	4.80	22.31	13.63	15.58
Difference in Annual Returns (basis points)	**1099**	**1145**	**1262**	**- 935**	**772**

Source: Innosvest and QED International Associates, Inc.

The results are summarized in Table 3. The two portfolios are compared as to size, volatility, average ratings, and annual returns. The top rated portfolio, as one would expect, has a higher quality rating. More importantly it has significantly higher returns and slightly lower volatility than the bottom rated portfolio.

A comparison of the growth in value of these environmentally sensitive portfolios is illustrated in Chart 3. The portfolio of top-ranked stocks grew to $17,844 in four years versus $14,043 for the bottom-ranked stocks. Over the entire period the top rated companies returned 15.58% annually versus 8.86% for the bottom rated companies, or 772 basis points per annum.

Chart 3. A Comparison of the Growth $10,000 Investment in
Top and Bottom Rated Stocks in Environmentally Intense Industry Groups



Source: Innovest and QED International Associates, Inc.

Interestingly, the stocks disliked by Innovest, suppressed by considerably below average returns in the 1997-1999 period, bounced back more strongly in 2000 than the top-ranked group as investors shifted funds intensely from tech to value stocks. This flood of funds into environmentally sensitive industries was a tide that raised all ships in this pool of stocks, regardless of merit. Following the Persian Gulf War, Eisenstadt[8] observed a similar disregard for the individual stock fundamentals measured by the Value Line Ranking System in the face of an extreme event. So, the eco-efficiency anomaly, even if proven, may endure periods where its differentiator of superior future performance is overwhelmed by other short-term market factors.

These results indicate that Innovest's rating system distinguishes strongly between the socially responsible companies rated 5 and 6 likely to be favored by investors and the bottom rated, less responsible companies that they are likely to avoid. Given the wide disparity between the performances of the top and bottom rated stocks, one may conclude that the rating system is sufficiently robust to differentiate between eco-efficient companies that will be rewarded in the market and those that will not.

Such results also suggest that if these equal weighted portfolios are, indeed, taking “factor bets”, then these bets may be on their eco-efficiency, and not as earlier reasoned, on having a high concentration of large cap stocks whose style may have been in favor over the period tested.

Equally weighted portfolios containing Innovest’s 0 and 1 rated stocks, or 5 and 6 rated stocks appear to be adequately diversified, in part because of the number of stocks in those groups, but mainly because the rating system appears sufficiently robust to differentiate between eco-efficient companies and those that are not, particularly in the most environmentally sensitive industries.

Limits of the Current Study and Suggestions for Further Research

The results of the foregoing analysis find that Innovest’s rating system distinguishes companies that are eco-efficient from those that are not. Further, it seems to do so increasingly with time. Thus, further efforts should be made to monitor its performance, and develop new portfolio strategies to enhance its prospective profitability.

Many of the companies initially rated by Innovest were in environmentally sensitive industries. Stocks in these industries, often referred to as “smokestacks” or “old economy”, accounted for a decreasing percentage of S &P 500 market capitalization as “new economy” stocks outgrew their more mature brethren at an astonishing pace. Therefore in 1997 and 1998, with limited universe coverage, a ranking system not especially relevant to computer software and other “virtual” companies was limited severely in the scope of its potential impact. In 1999 and 2000, Innovest greatly increased its coverage to target all large US companies to which the environment has any relevance. It would be interesting to see the results of recreated Innovest ranks back 10 years or more for a full coverage universe. However, the labor-intensive research process does not easily lend itself to processing such a test with simulated Innovest ranks. Yet, now that the dot-com bubble has burst, such tests would be even more relevant. Indeed, if social, political, and demographic trends continue to increase the competitive benefits of superior eco-efficiency, the documented significance of Innovest’s rating system may reasonably be expected to increase. Therefore, eco-efficiency performance data should be carefully gathered and monitored to document the direction of these trends.

Summary and Conclusions

It was once believed that investors could not invest in a socially responsible manner without giving up the opportunity to achieve higher rates of return. In the past five years, thoughts on this matter have changed. The concept of eco-efficiency, however, adds a new dimension that challenges these views. Eco-efficiency is based on the idea that companies that meet environmental challenges well tend to outperform their peers in other areas.

All investors, social and traditional, are rightly concerned about the financial and investment performance of companies in their portfolios. There is growing evidence that socially responsible investing may produce higher risk-adjusted portfolio returns than using all eligible stocks drawn from a large universe.

As the social, ecological and environmental problems become more tangible, financial and investment success increasingly depends upon the efficiency with which companies solve them. Managements that are eco-efficient should be able to profit directly from environmentally driven industry and market trends. It therefore follows that investors should be rewarded with higher returns if they can identify such managers.

Innovest's ratings were analyzed to determine whether they add value by identifying companies the market will reward for their superior management of environmental issues. In one test, a portfolio of Innovest's highest rated companies was compared to its entire universe of companies. Since inception the top rated companies returned 12.37% annually versus 8.85% for the universe for a 353 basis point advantage.

Next, an arbitrage-pricing-theory analytic framework was employed in order to determine what value the rankings added, if any, after neutralizing "factor bets" that may have been implicit in the initial test. This analysis yielded very impressive results despite data limitations. The factor-neutral portfolios "tilted" toward the Innovest ranks returned an average of 465 basis points per year more than the S&P 500 Index. The first two years' analyses allowed the APT optimizer few degrees of freedom. Although the tilt toward superior eco-efficiency produced slightly positive results, the significance of this test was limited by the paucity of relevant data. As coverage expanded,, the outperformance of Innovest-enhanced portfolios increased dramatically relative to the S&P 500. Even accounting for increased tracking error in the year 2000, the portfolios' Sharpe ratios clearly show a steady increase in the magnitude of the enhanced portfolios' differentials.

A third test sought to determine the degree to which Innovest ratings distinguish between the returns of their most favorably rated companies and their least favored in the most environmentally sensitive industries. This "long-short" comparison proved the most spectacular of all, yielding an annualized advantage of 780 basis points, despite a minor setback in the year 2000.

All three tests indicate significant outperformance using Innovest eco-efficiency ranks during the four-year period measured. Except for the third test measured against a small group of previously depressed stocks, the portfolios favored by Innovest increased magnitude of outperformance substantially with the passage of time. Although Innovest's initial focus on "old economy"

companies with high environmental impact, enough data exists to give a strong indication that Innovest may have identified and quantified a true anomaly. The authors conclude that asset management firms seeking to enhance future performance should take a long look at eco-efficiency.

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[1] Waddock, Sandra, and Samuel B. Graves Journal of Investing, Summer 2000, pp.27-38.

[2] Gottsman, Laura and Jon Kessler, "Smart Screened Investments: Environmentally Screened Equity Funds the Perform Like Conventional Funds," Journal of Investing, Fall 1998, pp.15-24.

[3] Guerard, John B. Jr., "Additional Evidence on the Cost of Being Socially Responsible in Investing," Journal of Investing, Winter 1997, pp.31-35.

[4] Schmidheiny, Stephan,

[5] Black, Fischer, "Yes Virginia, There is Hope: Tests of the Value Line Ranking System," Center for Research in Security Prices, University of Chicago, May, 1971

[6] Blin, John, "Arbitrage and the Structure of Risk", Working Paper, Apt., Inc., June 1995.

[7] Sharpe, William, "The Sharpe Ratio", Journal of Portfolio Management, Fall 1994, pp. 31-46.

[8] Eisenstadt, Samuel, "The Ranking System at Mid-Year", *Value Line Investment Survey, Selection & Opinion Section,* July 12, 1991, p. 1.

[9] Risk-free rates used in Sharpe ratio calculations are one-year T-Bill rate at beginning of year: 1997 = 5.55%; 1998 = 5.54%; 1999 = 4.59%; 2000 = 6.00%.