# Does 'Going Green' Make Economic Sense?

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## I. INTRODUCTION

The emission of greenhouse gases from large corporations has contributed to a number of environmental problems, most notably climate change. As the problems associated with environmentally irresponsible actions become more severe (the eight warmest years on record since 1850 have all occurred since 1998), stakeholders are increasingly pressuring companies to 'go green.'[1]

Companies have responded to this growing concern by dedicating a portion of their corporate budgets to environmentally friendly initiatives. Many U.S. companies now track their environmental progress in annual sustainability reports, hire senior executives to fill sustainability posts, and construct new buildings according to environmental specifications. In addition, companies have spent increased attention on developing new products tailored to eco-minded customers and implementing new, environmentally friendly processes. Despite the significant outflow of capital required to institute these environmental initiatives, it is unclear whether or not these investments have generated financial returns.

## II. PREVIOUS WORK

There are a number of theories surrounding the relationship between corporate social performance, of which environmental performance is a large part, and firm performance. Previous research on this topic has elicited inconclusive results, indicating that this relationship may be positive, neutral, or negative (Sánchez and Sotorrío, 2007).

Researchers in favor of a positive correlation stress that strong environmental performance can enhance a firm's reputation, improving its competitive advantage

[1] "Climate Change: Basic Information." Environmental Protection Agency. 20 July 2011. <http://www.epa.gov/climatechange/basicinfo.html>.

(Covin and Miles, 2000). In addition, firms that invest in environmental initiatives may avoid future fines, crises, and liabilities (Klassen and McLaughlin, 1996). The reduction of waste associated with green activity can reduce costs and increase profitability (Schmidheiny, 1992). A positive correlation could also imply that only profitable firms have the cash flow required for green investment (Ullman, 1985).

Proponents of a neutral relationship between environmental and firm performance claim that too many factors impact social and firm performance to elicit any strong relationship (Sánchez and Sotorrío, 2007). Researchers in favor of this theory attribute the existence of positive or negative relationships in previous studies to problems associated with testing this hypothesis. Specifically, researchers have used different models and defined social and firm performance differently. To complicate matters further, they have also analyzed different firms across different time periods (Ullman, 1985).

Environmental performance may be negatively correlated with firm performance because of the higher costs associated with investing in and maintaining environmental programs (Sánchez and Sotorrío, 2007; Friedman, 1970). Furthermore, investments in environmental initiatives could prevent companies from undertaking more profitable investments (Palmer, Oates, & Portney, 1995).

## III. THE TRADE OFF ON GOING GREEN: WEIGHING THE PLUSES AND MINUSES

Although previous research has produced discordant results regarding the relationship between environmental and firm performance, this paper will argue that these two factors are negatively correlated, both due to greening's high price tag and due

to the pattern of its financial returns. Going green forces companies to make a crucial trade off. Corporate greening can produce economic benefits in the form of waste reduction, crisis prevention, and reputation enhancement, but these advantages are offset by the higher cost of undertaking and maintaining environmental initiatives. It can be difficult to determine if the economic benefits of corporate greening outweigh its high cost because green investments are typically accompanied by large initial outflows of capital and less quantifiable returns in the future. This paper will argue that the market will not reward companies making large investments now in the hopes of enjoying unquantifiable payoffs in the future. On average, firms investing in environmental activities will experience negative returns.

The relationship between environmental and firm performance is not stable across time. Rather, it is likely to vary based on the amount of pressure a firm faces to go green and the quality of the firm's environmental investment options. Increased public pressure could lead firms to overestimate the benefits and underestimate the costs of greening in order to justify their investments. Additionally, companies that have dedicated a large portion of their budgets to greening may be required to invest in environmental projects, regardless of their quality. As time goes on and the best green projects are undertaken, companies may begin investing in second-tier projects with less attractive returns. Increased public pressure, coupled with a lack of attractive investment opportunities, could make the costs of greening outweigh the benefits.

The relationship between environmental and firm performance is likely to vary based on the type of company engaging in green activity, as well, since differences in firms alter the trade off inherent in green investment. Specifically, firms in customer

facing industries are likely to experience larger benefits from reputation enhancement while firms in manufacturing industries are likely to experience larger benefits from waste reduction and crisis prevention. This paper will attempt to identify which type of benefit is more likely to outweigh the high costs of greening. Firms facing different tax rates are also likely to experience differing degrees of green benefits. Environmental tax credits are much more enticing for firms facing higher tax rates than lower tax rates, a fact that could induce high tax rate firms to invest in poorer environmental projects. However, environmental tax subsidies for companies that operate in high tax rate industries are more likely to generate significant financial benefits. On a more granular level, the relationship between environmental and firm performance could vary by a number of firm-specific factors, such as firm size, shareholder power, and profitability. These factors are all likely to influence the trade off associated with greening.

The relationship between environmental and firm performance is also likely to vary based on the type of environmental investment being made. Announcements of active green investment, such as the launch of a new environmentally friendly product or process, are typically accompanied by large initial outflows of capital. As discussed earlier, it is difficult to conduct a detailed cost benefit analysis on these investments, since future payoffs are less concrete. On the other hand, announcements of passive green activity, such as the receipt of an environmental award or the launch of an environmental strategy, are even more ambiguous. Although this type of green activity does not typically require an immediate outflow of capital, it indicates the presence of both past and future environmental commitments. However, it is likely that active green activity will lead to larger negative returns, on average, than passive green activity

because more concrete capital outflows represent stronger commitments to the environment.

## IV. HYPOTHESES

This paper will attempt to prove that there is a negative correlation between environmental performance and firm performance, as measured by abnormal stock returns. The advantages of an enhanced reputation, liability avoidance, and waste minimization, are outweighed by the disadvantages of increased operational costs and limited investment opportunities that result from environmental investment.

***H1: Corporate environmental investment, determined by the announcement of a new, green initiative, affects firm performance. In particular, the announcement of a green initiative will result in negative abnormal stock returns.***

This basic hypothesis can be extended to determine if the market's attitude towards environmental investment has changed over time. Green activity is much more commonplace now than it has been in the past. As companies feel pressure to increase their green budgets, they may begin to invest in less desirable environmental projects. Cumulative stock returns may also be influenced by the proliferation of environmental news in the press. Historic Google trend data for the terms "global warming" and "carbon emissions" will be factored into this study to account for variation in the amount of environmental news in the popular press.

***H2: The relationship between environmental and firm performance has changed over time. Specifically, more recent announcements of environmental activity will be accompanied by larger negative abnormal stock returns than older announcements.***

***Cumulative stock returns will also be correlated to the amount of environmental news in the press.***

This paper will attempt to prove that the strength of the relationship between environmental and firm performance varies across industries, as well. Environmental investment in historically 'dirty' industries, such as petroleum, may be treated with skepticism; however, firms in these industries are more likely to benefit from "resource conservation, crisis prevention, and the establishment of new competitive barriers" (Klassen and McLaughlin, 1996). Firms operating in 'dirty industries,' generally referred to as non-customer facing industries in this paper, are more likely to benefit from green investment because their operations tend to have a larger impact on the environment. On the other hand, firms operating in customer-facing industries are more likely to enjoy the reputation benefits associated with increased environmental performance.

Cumulative stock returns may also vary by industry due to differing tax rates across industries. Firms that operate in industries with higher average tax rates will benefit more from government subsidies for environmental investment. The desire to gain tax subsidies may induce firms with high effective tax rates to invest in unprofitable environmental projects.

***H3: The effect of corporate environmental investment on firm performance varies by industry. The degree of abnormal stock returns will differ between companies that operate in non-customer facing industries and those that operate in customer-facing industries. Cumulative stock returns will also be correlated to firms' effective tax rates.***

This paper will also attempt to prove that the strength of the relationship between environmental and firm performance will vary based on the type of green activity a firm

engages in. Environmental investments that require an outflow of capital, such as the launch of a new product of the implementation of a new process, will generate larger negative abnormal returns than announcements that are not accompanied by outflows of capital. The market will penalize active press releases, those accompanied by capital outflows, more aggressively than passive releases because they display a stronger, more tangible commitment to the environment.

***H4: Announcements of active green investment, such as the development of a new product or process, will generate larger negative abnormal returns than announcements of passive green investment, such as the receipt of a green award or the disclosure of a new, environmental strategy.***

Lastly, this paper will attempt to demonstrate that cumulative stock returns are correlated to firm-specific factors, namely size, shareholder power, profitability, and effective tax rate.

Larger firms are more likely to invest in environmental initiatives because they are under more public scrutiny (Stanwick and Stanwick, 1998). In fact, larger firms have historically scored higher on *Fortune's* Corporate Reputation Index (Fombrun and Shanley, 1990). Larger firms, under pressure to maintain their strong environmental reputation, may be more likely to invest in unprofitable green initiatives. Trailing 12-month revenues, as of the most recent fiscal year end, will be as a proxy for firm size while trading volume, as of the most recent fiscal year end, will be used as a proxy for public interest.

Large degrees of stakeholder power will increase environmental investment because companies are more likely to respond to the desires of stakeholders when power

is consolidated. For this reason, as stakeholder power increases, environmental investment will also increase (Ullman, 1985). Conversely, when shareholder power is consolidated amongst insiders, companies are less likely to invest in unprofitable environmental projects solely to appease their shareholders. Percentages of insider holdings, as of the most recent fiscal year end, will be used to measure the relative power of insiders.

More profitable firms are able to devote more attention to environmental initiatives. In addition, they are able to spend the money required to institute and maintain costly environmental programs (Ullman, 1985). More profitable firms also have a history of choosing profitable projects. They are less likely to undertake an unprofitable environmental investment due to public or shareholder pressures. For the purpose of this paper, return on capital, as of the most recent fiscal year end, will be used as a measure of firm profitability.

Tax subsidies are an important factor in corporate environmental investment decisions. Federal, state, and local tax credits are available to firms that invest in green initiatives. Companies with high tax rates may be more willing to institute unprofitable environmental initiatives in order to receive tax subsidies than companies with lower tax rates. Effective tax rates, as of the most recent fiscal year end, will be used to measure firm-specific tax levels.

***H5: Cumulative stock returns will be correlated to firm size, shareholder power, profitability, and the effective tax rate. As firm size and the effective tax rate increase, cumulative stock returns will also increase. As firm profitability and insider holdings increase, cumulative stock returns will decrease.***

## V. RESEARCH METHODOLOGY

This paper relies on event study methodology to determine the relationship between environmental and firm performance. Event study methodology was used to extract the portion of stock returns that could be attributed to firm-specific events, namely the release of an announcement detailing environmental activity, rather than to changes in the market as a whole.

Press releases outlining green activity were used to measure environmental performance. These press releases could be broadly categorized as announcing 1) the launch of a new eco-friendly product, 2) the introduction of a new eco-friendly process, 3) the receipt of an environmental award, and 4) the communication of eco-friendly goals and strategies. Cumulative stock returns served as a measure of firm performance.

The release date of the announcement was treated as the event date. Cumulative stock returns, cumulative market returns, and cumulative risk free rates were calculated for the period beginning 2 days before the event date and ending 3 days after the event date. Bloomberg equity pricing data was used to calculate cumulative stock returns, S&P returns were used to calculate cumulative market returns, and Ken French's database, which amasses data from Ibbotson and Associates, Inc., was used to calculate cumulative risk-free rates.[2] The cumulative stock return, net of the cumulative risk free rate, was regressed against the cumulative market return, net of the risk free rate, in order to determine an alpha, or the amount of excess return that cannot be attributed to the market. This data was then segmented by year, industry, and type of press release for hypotheses 2 – 4.

[2] Kenneth French. "Fama/French Factors." 12 Dec 2011. <http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Research>.

A multivariate regression was used to analyze the relationship between cumulative stock returns and independent, firm-specific variables, such as trailing 12-month revenue, trading volume, percentage of insider holdings, return on capital, and effective tax rate. These independent variables were obtained from Value Line. The effective tax rate and percent changes in weekly Google trend data for the terms "global warming" and "carbon emissions" were used as independent variables in additional regressions.

## VI. DATA SELECTION

The data set consisted of 619 environmental press releases. It was comprised of 155 unique US-based publicly traded companies across 10 industries from 2006 to 2011. The data set is summarized below.

**Figure 1: Data Segmentation by Industry and Year**

| Industry | Count |
|---|---|
| Consumer Discretionary | 154 |
| Consumer Staples | 107 |
| Industrials | 103 |
| Information Technology | 99 |
| Materials | 61 |
| Utilities | 31 |
| Health Care | 27 |
| Financials | 15 |
| Telecommunication Services | 14 |
| Energy | 8 |
| **Total** | **619** |

| Year | Count |
|---|---|
| 2006 | 61 |
| 2007 | 73 |
| 2008 | 77 |
| 2009 | 132 |
| 2010 | 126 |
| 2011 | 150 |
| **Total** | **619** |

A subset of the original data set was used to analyze the relationship between cumulative stock returns and independent, firm-specific variables. This data set consisted of 346 environmental press releases. It was comprised of 111 unique US-based publicly traded companies across 10 industries from 2006 to 2010. The data set is summarized below.

**Figure 2: Data Segmentation by Industry and Year, Subset**

| Industry | Count |
|---|---|
| Information Technology | 78 |
| Consumer Discretionary | 69 |
| Consumer Staples | 56 |
| Industrials | 51 |
| Materials | 34 |
| Utilities | 21 |
| Health Care | 12 |
| Telecommunication Services | 10 |
| Financials | 9 |
| Energy | 6 |
| **Total** | **346** |

| Year | Count |
|---|---|
| 2006 | 61 |
| 2007 | 68 |
| 2008 | 77 |
| 2009 | 127 |
| 2010 | 13 |
| 2011 | 0 |
| **Total** | **346** |

## VII. RESULTS

***H1:*** The regression indicated a negative, albeit statistically weak, relationship between environmental performance and firm performance. The regression yielded an alpha, or excess return not attributable to the market, equal to -0.003 with a p-value of 0.151 (see Exhibit 1).

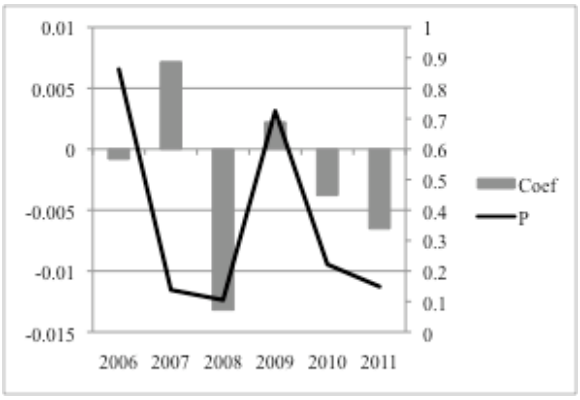
***H2:*** Abnormal returns declined from 0.007 in 2007 to -0.013 in 2008 and from -0.004 in 2010 to -0.007 in 2011. The regression did not yield a significant alpha for 2006 or 2009. Subsequent regressions did not yield significant alphas for the periods 2006 – 2008 or 2009 – 2011 (see Exhibit 2).

**Figure 3: Regression Results: Segmentation by Year**

| Year | Coef | P |
|---|---|---|
| 2006 | -0.000818 | 0.862 |
| 2007 | 0.007163 | 0.138 |
| 2008 | -0.013185 | 0.105 |
| 2009 | 0.00222 | 0.725 |
| 2010 | -0.003783 | 0.222 |
| 2011 | -0.006524 | 0.149 |
| | | |
| 2006 - 2008 | -0.002404 | 0.499 |
| 2009 - 2011 | -0.003226 | 0.239 |

As the graph below shows, there is no relationship between the year in which an environmental initiative is announced and the degree of abnormal returns.

**Figure 4: Regression Coefficients and P-Values by Year**




There also appears to be no relationship between the level of public concern for the environment, as measured by changes in weekly Google trend data for the terms "global warming" and "carbon emissions," and abnormal returns (see Exhibit 3). Both independent variables were not statistically significant.

**Figure 5: Regression Results: "Global Warming" and "Carbon Emissions"**

| Predictor | Coef | P |
|---|---|---|
| "Carbon Emissions" | 0.003898 | 0.604 |
| "Global Warming" | -0.01031 | 0.426 |

***H3:*** On the other hand, there does appear to be a strong relationship between the type of environmental announcement and the presence of abnormal returns. While active press releases, those announcing a new environmental product or process, did not exhibit a significant abnormal return, passive press releases, those announcing a new environmental goal or award, did exhibit a significant abnormal return. In fact, the passive regression yiedled an alpha of -0.008 with a p-value of 0.015 (see Exhibit 4).

**Figure 6: Regression Results: Active and Passive**

| Type of Release | Count | Coef | P |
|---|---|---|---|
| Active | 306 | 0.001894 | 0.491 |
| Passive | 313 | -0.008111 | 0.015 |

***H4:*** The type of industry a firm operates in is also related to the presence of abnormal stock returns. Customer facing industries, defined in this paper as consumer discretionary, consumer staples, information technology, health care, financials, and telecommunication services, did not exhibit abnormal returns. However, environmental press releases of non-customer facing industries, defined in this paper as industrials, materials, utilities, and energy, were met with significant abnormal returns (see Exhibit 5). The non-customer facing regression yielded an alpha of -0.009 with a p-value of 0.043 (see Exhibit 6).

**Figure 7: Regression Results: "Customer-Facing" and "Non-Customer Facing"**

| Industry Category | Coef | P |
|---|---|---|
| Customer Facing | 0.000057 | 0.980 |
| Non-Customer Facing | -0.009296 | 0.043 |

There is also a strong statistical relationship between the effective tax rate of a firm and cumulative stock returns. Effective tax rate was a significant independent variable with a coefficient of 0.061 and a p-value of 0.028 (see Exhibit 7).

***H5:*** A multivariate regression with the independent variables trading volume, trailing 12-month revenues, return on capital, effective tax rate, and insider holdings did not yield any strong statistical relationships. However, return on capital is a weakly significant variable with a coefficient of 0.032 and a p-value of 0.112. This variable is positively correlated with cumulative stock returns (see Exhibits 8 and 9).

**Figure 8: Multivariate Regression Results**

| Predictor | Coef | P |
|---|---|---|
| Trading Volume | 0.00000000 | 0.170 |
| Trailing 12-mth Revenues | 0.00000005 | 0.207 |
| ROC | 0.03163 | 0.112 |
| Eff Tax Rate | 0.0201 | 0.536 |
| Insider Holdings | -0.00317 | 0.841 |

## VIII. ANALYSIS

Why do firms continue to invest in green initiatives if the market does not decidedly value these activities? It is unlikely that companies pursue environmental investment for purely altruistic reasons. Rather, firms may be overestimating the advantages of greening, such as waste reduction and reputation enhancement. Companies may also be investing in green activities to avoid the financial fall out that could occur from environmental liabilities or crises. The cost associated with maintaining environmental infrastructure may be less than the costs associated with responding to an environmental crisis. In fact, previous research has indicated that environmental crises decrease firm valuation by an average $390 million, or $0.70 per share (Klassen and McLaughlin, 1996). Subsequent studies can test this hypothesis by evaluating the degree of cumulative abnormal returns associated with announcements of green investment in addition to those associated with incidents of environmental crises.

The relationship between environmental and firm performance may appear weak because the market is judging press releases on an individual basis. Put simply, the market may respond to a press release positively or negatively, based on the financial implications of each announcement. This hypothesis is corroborated by the fact that abnormal returns vary according to the type of announcement made. Active

announcements do not exhibit a significant cumulative abnormal return, while passive investments do. This could indicate that the market evaluates active press releases based on the NPV of the particular project being announced. Since passive releases tend to announce general green behavior rather than specific green projects, the market is unable to evaluate the financial implications of these activities. It views nonspecific environmental investment in a negative light. Additionally, the insignificance of firm-specific factors in the relationship between environmental and firm performance, indicates that the market is more concerned with the content of the actual announcement than firm-level attributes. This analysis suggests that companies should dedicate their environmental budget to concrete, NPV positive projects rather than broad, overarching environmental behavior.

Differing market perceptions regarding environmental investment across industries farther complicate the relationship between environmental and firm performance. Investments in environmental initiatives by firms operating in non-customer facing industries exhibit negative cumulative abnormal returns, while investments by firms operating in customer facing industries do not. These results confirm that environmental investment can enhance a firm's reputation in the eyes of its customers, a factor that is especially meaningful in customer-facing industries. Consumers in business-to-customer relationships are more likely to be altruistically motivated to reduce their carbon footprint than consumers in business-to-business relationships. Reputation benefits can lead to a competitive advantage and, ultimately, improved financial performance (Covin and Miles, 2000). Going forward, it would be interesting to research a potential relationship between the income level of end-consumers and cumulative abnormal returns. Firms that

cater to affluent customers may be able to easily pass on the higher costs associated with green activity in the form of higher prices. If this is true, these companies are less likely to experience negative abnormal returns.

There is a significant positive relationship between a firm's effective tax rate and its cumulative stock return. This signals that higher tax rates are associated with higher cumulative returns. The average effective tax rate of non-customer facing firms is 29.0%, compared with 26.9% for customer-facing firms. These differing tax rates could also help explain variation in cumulative abnormal return across industries. A higher tax rate could induce non-customer facing firms to invest in poor environmental projects, purely for tax subsidization. Since tax credits are an important consideration in environmental investing, subsequent research could investigate whether market attitudes towards environmental investment have changed along with changes in the tax code. As we stand today, environmental tax credits are not large enough to make the majority of green investment economically attractive. However, it may be possible to adjust the tax code to encourage more environmental spend, while simultaneously producing more NPV positive investments.

Additionally, there was no discernible pattern to the degree of abnormal returns over time, a fact that indicates market perceptions towards environmental investment have not changed significantly from 2006 – 2011. Furthermore, the level of environmental coverage in the press has not played a large role in how the market judges environmental activity. Subsequent research could evaluate press releases over a broader time period to determine if changes in market perceptions occur more slowly. A broader time period may also convey a more meaningful relationship between changes in environmental press

coverage and environmental spend. It would be interesting to segment this broader data set by type of press release, by industry, and by year to determine if market perceptions have changed on a more granular level.

## IX. SUMMARY

This paper focuses on the relationship between corporate environmental performance, as measured by press releases announcing environmental activity, and firm performance, as measured by abnormal stock returns. This paper concludes that there is not a strong statistical relationship between environmental and firm performance. Furthermore, it does not appear that market attitudes towards green investment have changed over time or that firm-specific variables influence abnormal returns. Although there is not a strong statistical relationship between all of the press releases studied and abnormal stock returns, there are statistically significant relationships in subsets of the data. In particular, passive press releases and releases for firms in non-customer facing industries exhibit negative cumulative abnormal returns. Additionally, effective tax rate is a statistically significant independent variable positively correlated with cumulative stock returns.

This paper suggests that the weak relationship between firm and environmental performance is partially due to variance in market reactions across press releases and industries. It appears that the market reacts to active press releases, those announcing identifiable investments, based on the financial merit of those individual projects. However, passive press releases, which cannot be judged according to this same metric, are viewed in a negative light. The market also judges press releases differently based on the type of industry a firm operates in. Firms in customer facing industries are less likely to experience negative abnormal returns because their reputation is enhanced by

investments in environmental initiatives. Non-customer facing industries do not reap this same benefit. Their announcements are accompanied by negative cumulative abnormal returns.

This paper also suggests areas for further research. Subsequent studies could utilize a larger data set that includes both environmentally positive and negative announcements. A broader data set could also be used to evaluate press releases over a longer time period. Lastly, future research could attempt to identify relationships between cumulative abnormal returns and consumer income levels or tax code changes.

## APPENDIX

### Exhibit 1: Regression of All Press Releases

The regression equation is:
Cumulative Net Stock Return = -.00310 + 1.06 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.003103 | 0.002156 | -1.44 | 0.151 |
| Cum. Mrkt. Rtn. | 1.06244 | 0.06295 | 16.88 | 0.000 |

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.82030 | 0.82030 | 284.83 | 0.000 |
| Residual Error | 618 | 1.77980 | 0.00288 | | |
| Total | 619 | 2.60010 | | | |

### Exhibit 2: Regressions of Press Releases Segmented by Year

| Year | Coef | P |
|---|---|---|
| 2006 | -0.000818 | 0.862 |
| 2007 | 0.007163 | 0.138 |
| 2008 | -0.013185 | 0.105 |
| 2009 | 0.00222 | 0.725 |
| 2010 | -0.003783 | 0.222 |
| 2011 | -0.006524 | 0.149 |
| | | |
| 2006 - 2008 | -0.002404 | 0.499 |
| 2009 - 2011 | -0.003226 | 0.239 |

2006 Data

The regression equation is:
Cumulative Net Stock Return = -0.00082 + 0.811 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.000818 | 0.004682 | -0.17 | 0.862 |
| Cum. Mrkt. Rtn. | 0.8112 | 0.3777 | 2.15 | 0.036 |

S = 0.0339270 R-Sq = 7.3% R-Sq (adj) = 5.7%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.005310 | 0.005310 | 4.61 | 0.036 |
| Residual Error | 59 | 0.067911 | 0.001151 | | |
| Total | 60 | 0.073222 | | | |

2007 Data

The regression equation is:
Cumulative Net Stock Return = 0.00716 + 1.60 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.007163 | 0.004771 | 1.50 | 0.138 |
| Cum. Mrkt. Rtn. | 1.6047 | 0.2378 | 6.75 | 0.000 |

S = 0.0407402 R-Sq = 39.1% R-Sq (adj) = 38.2%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.075602 | 0.075602 | 45.55 | 0.000 |
| Residual Error | 71 | 0.117843 | 0.001660 | | |
| Total | 72 | 0.193445 | | | |

2008 Data

The regression equation is:
Cumulative Net Stock Return = -0.0132 + 1.02 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.013185 | 0.008032 | -1.64 | 0.105 |
| Cum. Mrkt. Rtn. | 1.0228 | 0.1330 | 7.69 | 0.000 |

S = 0.0666879 R-Sq = 44.1% R-Sq (adj) = 43.4%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.26310 | 0.26310 | 59.16 | 0.000 |
| Residual Error | 75 | 0.33355 | 0.00445 | | |
| Total | 76 | 0.59664 | | | |

2009 Data

The regression equation is:
Cumulative Net Stock Return = 0.00222 + 0.844 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.002220 | 0.006289 | 0.35 | 0.725 |
| Cum. Mrkt. Rtn. | 0.8445 | 0.1791 | 4.71 | 0.000 |

S = 0.0697822 R-Sq = 14.6% R-Sq (adj) = 13.9%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.10821 | 0.10821 | 22.22 | 0.000 |
| Residual Error | 130 | 0.63304 | 0.00487 | | |
| Total | 131 | 0.74126 | | | |

2010 Data

The regression equation is:
Cumulative Net Stock Return = -0.00378 + 1.28 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.003783 | 0.003082 | -1.23 | 0.222 |
| Cum. Mrkt. Rtn. | 1.2837 | 0.1247 | 10.29 | 0.000 |

S = 0.0345179 R-Sq = 46.1% R-Sq (adj) = 45.6%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.12623 | 0.12623 | 105.95 | 0.000 |
| Residual Error | 124 | 0.14774 | 0.00119 | | |
| Total | 125 | 0.27398 | | | |

2011 Data

The regression equation is:
Cumulative Net Stock Return = -0.00652 + 1.02 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.006524 | 0.004500 | -1.45 | 0.149 |
| Cum. Mrkt. Rtn. | 1.0187 | 0.1365 | 7.46 | 0.000 |

S = 0.0546429 R-Sq = 27.4% R-Sq (adj) = 26.9%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.16636 | 0.16636 | 55.72 | 0.000 |
| Residual Error | 148 | 0.44191 | 0.00299 | | |
| Total | 149 | 0.60827 | | | |

2006 - 2008 Data

The regression equation is:
Cumulative Net Stock Return = -0.00240 + 1.12 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.002404 | 0.003548 | -0.68 | 0.499 |
| Cum. Mrkt. Rtn. | 1.12067 | 0.09114 | 12.30 | 0.000 |

S = 0.0509068 R-Sq = 42.0% R-Sq (adj) = 41.7%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.39184 | 0.39184 | 151.2 | 0.000 |
| Residual Error | 209 | 0.54162 | 0.00259 | | |
| Total | 210 | 0.93347 | | | |

2009 - 2011 Data

The regression equation is:
Cumulative Net Stock Return = -0.00323 + 1.02 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.003226 | 0.002737 | -1.18 | 0.239 |
| Cum. Mrkt. Rtn. | 1.02024 | 0.08711 | 11.71 | 0.000 |

S = 0.0551817 R-Sq = 25.3% R-Sq (adj) = 25.1%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.4177 | 0.4177 | 137.18 | 0.000 |
| Residual Error | 406 | 1.23628 | 0.00305 | | |
| Total | 407 | 1.65398 | | | |

**Exhibit 3: Regressions of Press Releases with the Independent Variables "Carbon Emissions" and "Global Warming"**

The regression equation is:
Cumulative Net Stock Return = - 0.00364 + 1.06 Cumulative Net Market Return
+ 0.00390 Google Trend "Carbon Emissions"

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.003642 | 0.002334 | -1.56 | 0.119 |
| Cum. Mrkt. Rtn. | 1.06202 | 0.06504 | 16.33 | 0.000 |
| "Carbon Emissions" | 0.003898 | 0.007505 | 0.52 | 0.604 |

S = 0.0548832 R-Sq = 31.8% R-Sq(adj) = 31.6%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 2 | 0.80759 | 0.40379 | 134.05 | 0.000 |
| Residual Error | 574 | 1.72898 | 0.00301 | | |
| Total | 576 | 2.53657 | | | |

| Source | DF | Seq SS |
|---|---|---|
| Cum. Mrkt. Rtn. | 1 | 0.80677 |
| "Carbon Emissions" | 1 | 0.00081 |

The regression equation is:
Cumulative Net Stock Return = - 0.00283 + 1.06 Cumulative Net Market Return
- 0.0103 Google Trend "Global Warming"

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.002825 | 0.002191 | -1.29 | 0.198 |
| Cum. Mrkt. Rtn. | 1.06477 | 0.06325 | 16.83 | 0.000 |
| "Global Warming" | -0.01031 | 0.01293 | -0.8 | 0.426 |

S = 0.0537231 R-Sq = 31.5% R-Sq(adj) = 31.3%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 2 | 0.81818 | 0.40909 | 141.74 | 0.000 |
| Residual Error | 616 | 1.77788 | 0.00289 | | |
| Total | 618 | 2.59606 | | | |

| Source | DF | Seq SS |
|---|---|---|
| Cum. Mrkt. Rtn. | 1 | 0.81635 |
| "Global Warming" | 1 | 0.00183 |

**Exhibit 4: Regressions of Press Releases Segmented by Type of Press Release**

Active

The regression equation is
Cumulative Net Stock Return = 0.00189 + 1.07 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.001894 | 0.002748 | 0.69 | 0.491 |
| Cum. Mrkt. Rtn. | 1.07479 | 0.08589 | 12.51 | 0.000 |

S = 0.0480272 R-Sq = 34.0% R-Sq(adj) = 33.8%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.3612 | 0.3612 | 156.59 | 0.000 |
| Residual Error | 304 | 0.70121 | 0.00231 | | |
| Total | 305 | 1.06241 | | | |

Passive

The regression equation is
Cumulative Net Stock Return = - 0.00811 + 1.04 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.008111 | 0.003316 | -2.45 | 0.015 |
| Mrkt | 1.03757 | 0.09172 | 11.31 | 0.000 |

S = 0.0584609  R-Sq = 29.2%  R-Sq(adj) = 28.9%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.43735 | 0.43735 | 127.97 | 0.000 |
| Residual Error | 311 | 1.0629 | 0.00342 | | |
| Total | 312 | 1.50025 | | | |

**Exhibit 5: Industry Segmentation**

| Customer Facing | Count |
|---|---|
| Consumer Discretionary | 154 |
| Consumer Staples | 107 |
| Information Technology | 99 |
| Health Care | 27 |
| Financials | 15 |
| Telecommunication Services | 14 |
| **Total** | **416** |
| Non-Customer Facing | Count |
| Industrials | 103 |
| Materials | 61 |
| Utilities | 31 |
| Energy | 8 |
| **Total** | **203** |

## Exhibit 6: Regressions of Press Releases Segmented by Type of Industry

Non-Customer Facing

The regression equation is
Cumulative Net Stock Return = - 0.00930 + 1.15 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.009296 | 0.00456 | -2.04 | 0.043 |
| Cum. Mrkt. Rtn. | 1.1542 | 0.1278 | 9.03 | 0.000 |

S = 0.0647175  R-Sq = 28.9%  R-Sq(adj) = 28.5%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.3418 | 0.3418 | 81.61 | 0.000 |
| Residual Error | 201 | 0.84186 | 0.00419 | | |
| Total | 202 | 1.18366 | | | |

Customer Facing

The regression equation is:
Cumulative Net Stock Return = 0.00006 + 1.00 Cumulative Net Market Return

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | 0.000057 | 0.002313 | 0.02 | 0.980 |
| Cum. Mrkt. Rtn. | 1.00319 | 0.06927 | 14.48 | 0.000 |

S = 0.0471772  R-Sq = 33.6%  R-Sq(adj) = 33.5%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 1 | 0.46678 | 0.46678 | 209.72 | 0.000 |
| Residual Error | 414 | 0.92143 | 0.00223 | | |
| Total | 415 | 1.38821 | | | |

## Exhibit 7: Regressions of Press Releases with the Independent Variable Effective Tax Rate

The regression equation is
Cumulative Net Stock Return = - 0.0186 + 1.03 Cumulative Net Market Return + 0.0608 Eff. Tax Rate

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.018577 | 0.008228 | -2.26 | 0.025 |
| Cum. Mrkt. Rtn. | 1.02918 | 0.08364 | 12.3 | 0.000 |
| Eff Tax Rate | 0.0608 | 0.02761 | 2.2 | 0.028 |

S = 0.0582676  R-Sq = 30.9%  R-Sq(adj) = 30.5%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 2 | 0.52212 | 0.26106 | 76.89 | 0.000 |
| Residual Error | 344 | 1.16792 | 0.0034 | | |
| Total | 346 | 1.69004 | | | |

| Source | DF | Seq SS |
|---|---|---|
| Cum. Mrkt. Rtn. | 1 | 0.50566 |
| Eff Tax Rate | 1 | 0.01646 |

## Exhibit 8: Multivariate Correlation Matrix

| Pearson Correlation<br>*P-Value* | Trading Volume | Trailing 12-mth Revenues | ROC | Eff Tax Rate |
|---|---|---|---|---|
| Trailing 12-mth Revenues | 0.287<br>*0.000* | | | |
| ROC | 0.090<br>*0.104* | 0.018<br>*0.747* | | |
| Eff Tax Rate | -0.098<br>*0.067* | 0.171<br>*0.002* | 0.071<br>*0.202* | |
| Insider Holdings | -0.096<br>*0.106* | 0.228<br>*0.000* | 0.007<br>*0.908* | 0.131<br>*0.026* |

**Exhibit 9: Regression of Press Releases with the Independent Variables Trading Volume, Trailing 12-month Revenues, Return on Capital, Effective Tax Rate, and Insider Holdings**

The regression equation is

Cumulative Net Stock Return = - 0.0109 + 1.12 Cumulative Net Market Return - 0.000000 Trading Volume
+ 0.000000 Trailing 12-mth Revenues + 0.0317 ROC + 0.0202 Eff Tax Rate - 0.0033 Insider Holdings

| Predictor | Coef | SE Coef | T | P |
|---|---|---|---|---|
| Constant | -0.01088 | 0.01083 | -1.00 | 0.316 |
| Cum. Mrkt. Rtn. | 1.12022 | 0.09565 | 11.71 | 0.000 |
| Trading Volume | -0.00000000 | 0.00000000 | -1.39 | 0.166 |
| Trailing 12-mth Revenues | 0.00000005 | 0.00000004 | 1.27 | 0.206 |
| ROC | 0.03168 | 0.01979 | 1.60 | 0.111 |
| Eff Tax Rate | 0.02021 | 0.03238 | 0.62 | 0.533 |
| Insider Holdings | -0.00333 | 0.01578 | -0.21 | 0.833 |

S = 0.0600517 R-Sq = 36.5% R-Sq(adj) = 35.0%

Analysis of Variance

| Source | DF | SS | MS | F | P |
|---|---|---|---|---|---|
| Regression | 6 | 0.527497 | 0.087916 | 24.38 | 0.000 |
| Residual Error | 255 | 0.919584 | 0.003606 | | |
| Total | 261 | 1.447081 | | | |

| Source | DF | Seq SS |
|---|---|---|
| Cum. Mrkt. Rtn. | 1 | 0.509625 |
| Trading Volume | 1 | 0.001586 |
| Trailing 12-mth Revenues | 1 | 0.005244 |
| ROC | 1 | 0.009558 |
| Eff Tax Rate | 1 | 0.001324 |
| Insider Holdings | 1 | 0.00016 |

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