Are Renewable Energy (Green) Companies Outperforming Non-Green Companies?

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ABSTRACT

Beyond the popular notion that companies are going ‘green’ due largely to pressures from environmental groups and in order to meet regulatory requirements, this research project examines ‘what is in it’ for the green companies. Are green companies actually worse off than their non-green peers considering the traditional or conventional belief that the ‘additional’ costs involved with being environmentally-compliant, negatively impacts the bottom line? Our research’s focus is on whether or not renewable energy companies have been out-performing non-green companies. Thus far, published works, have shown conflicting results on the financial performance of investments that have set environmental compliance as their major criteria. While some have been able to prove that it pays to be green, others have reported that green investors are worse off. Unlike previous studies that examined green performance at the portfolio or aggregate level with mutual funds, our study examines performance at the firm level.

We examined companies in the alternative energy sector and created a match for them with non-green companies and found that their operational and stock performance, were not any worse off, but they also outperformed their traditional energy peers. In terms of raising finance, our findings further revealed that the green companies were better able to raise capital via equity.

Thus we are of the opinion that investment in the renewable energy sector is a worthwhile venture.
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Without doubt, this accomplishment would have been truncated but for GOD ALMIGHTY! Daddy, I give you glory for making this a r-e-a-l-i-t-y, despite all odds!

This project is dedicated to the memory of my late wife, Mrs. Olamidé Olajumoke Olowojulu (August 30, 1980 – April 24, 2007) and my darling adorable daughter, Emmanuella Aduragbemi Olowojulu.

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1.0 INTRODUCTION

The green energy (also generally referred to as clean energy or renewable energy, can be defined as energy sources that are less harmful to the environment) industry is one of the most exciting emerging industries of the 21st century. Corporate bodies have been revising their strategy to pursue business opportunities that the sector provides in the foreseeable future.

Given the new energy frontier this industry represents, there is considerable interest in their business performance. Their business performance is very important for the development and sustainability of this industry. Ron Pernick, Co-founder and Principal of Clean Edge is quoted as saying that:

"Global revenues for the solar, wind, bio-fuels and fuel cells industries totalled $77 billion in 2007 and by 2017, it is projected that revenues from these sectors may grow to $257 billion, offering growth rates more akin to the technology and computer revolutions of the 80's and 90's."

Similarly, the World Economic Forum reported that:

"Brazilian sugar cane-based ethanol is competitive with oil at US$ 40 per barrel"

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Based on the World Economic Forum report and projected revenues from the sector, it would seem that if the current energy industry does not adopt green energy production, it can be very costly in terms of lost opportunities, higher costs from environmental regulation, namely carbon taxes, carbon permits and carbon regulations, increasing exploration risk and costs, and that in the long run traditional non-renewable sources of energy will run out. Indeed, in recognition of this outlook, General Electric, one of America’s most respected companies, has made “Ecomagnination”, i.e. developing a green energy business, a key strategic driver for future growth.

The purpose of this study is to examine the relative performance of green energy companies which to date, has no comparable studies in terms of methodology and implications.

Studying the value of “green” is the purpose of this study; hence, by examining performance we can deduce the benefit of sustainability over and above firms which are not operationally defined to be sustainable. The sustainability report defines sustainability as “...living and working in ways that meet and integrate existing environmental, economic and social needs without compromising the well-being of future generations”³. We argue that green means sustainability as the focus of green energy is on reducing the amount of harmful substances emitted into the atmosphere. To the best of our knowledge, this is the first time that a portfolio of ‘green’ companies is matched with non-green companies to determine which group outperforms the other. We propose and formally hypothesize that companies producing green energy, have attractive performance compared to their non-green peers. We examined performance in terms of operational performance, stock performance and raising of capital. Thus the study

³ http://www.sustreport.org/
measured the performance of quoted renewable energy companies (also known as ‘green’ companies) against their matched non-green peers on the basis of operational performance (Gross Margin, Return on Asset, Return on Equity); stock performance (average 5-year stock return, standard deviation of average 5-year stock return and average 5-year stock return versus the average 5-year NASDAQ composite index return); and ability to raise finance (5-year growth in equity, 5-year growth in cash flow from financing activities and 5-year growth in total liabilities). This research is considered important and timely as it literally compares ‘apples against apples’ by matching green and non-green companies with comparable sales volume (+/- 30 percent), having the same global industry classification (GIC) code and operating within the same country. It is important as there is a great deal of interest and investment in green renewables as part of recent reform of national energy policies of the United States, United Kingdom, Europe, Japan and other major developed countries.

We offer a unique approach from this literature; we offer a pure play approach in examining the relationship between environment and performance. We focus namely on those firms with environmental solutions in alternative and renewable energy, and compare their performance with their best non-green match. In this way, we have more definitive answer to the environmental performance and corporate financial performance link. Indeed, our approach in selecting green firms is thus uncomplicated by other CSR concerns such as social responsibility and business ethics as found in this literature, particularly Brammer et al. (2006) and Lee and Faff (2009). Our pure play approach isolates firms by virtue of environmental or green solutions; hence, we do not suffer from endogeneity issues in explaining financial performance for reasons of environmental,
social and ethical performance as measured by CSR measures in previous studies. Moreover, we found that the studies focused exclusively on stock performance of the mutual funds or firms examined. We enhance the literature by considering firm level financial performance with regards to raising funds and operating performance that yields new insights. Because we study firms on a firm level, we are able to examine various aspects of performance not possible with studying at the fund level, such as operating performance and capital growth.

Compared to existing studies that examine the benefit of sustainability or social responsibility at the portfolio level, our study examines sustainability at the firm level and allows investors to understand new implications. Even though some research examining this issue at the firm level has found a link between social responsibility, namely ethical practice, and financial performance, our study stands out in examining environmental performance as captured by the emerging renewable energy sector. We avoid ambiguity in defining what a green company is – such as the difficulty in evaluating a firm that incrementally adopts green practice or products or even “green washing”. Because we choose to examine renewable energy firms, we clearly define green firms as those whose core operations or purpose is in renewable energy versus non-renewable and fossil fuel producing firms. Hence, it is timely for the portfolio manager interested in green stocks, to know which green industry outperforms. This study suggests that the green energy sector is an attractive sector. Their financial performance may be due to the ability to attract capital.

The remainder of the paper is organized as follows: Chapter One continues with background information tracing the origin of Socially Responsible Investing (SRI),
closely followed by definitions of what green investing is. Chapter Two reviews current literature on environmentally friendly companies including their financial performance and our hypotheses. Chapter Three discusses the research methodology while Chapter Four provides an analysis of the empirical results. Chapter Five concludes.

1.1 BACKGROUND

The notion of investing in green companies has its roots in socially responsible investing. SRI, is widely believed to date back to the 1758 yearly meeting of the Quakers (Religious Society of Friends), which placed restrictions on members’ involvement in slave trade. Since the early 1920’s, religious bodies in the United States have vigorously campaigned for investors’ boycott of what they considered ‘sinful’ products such as guns, liquor, gambling and tobacco.4

Historically, the first known fund is Pax World Fund (now known as the Pax World Balanced Fund), promoted by Luther Tyson and Jack Corbett (both workers for the United Methodist Church) and launched on August 10, 1971 with an asset base of $101,000. The Fund claims credit for being the “first broadly-diversified, publicly-available mutual fund to use social as well as financial criteria in the investment decision-making process”5

Socially Responsible Investing has grown and become respected, relevant and important today. Boulatoff and Boyer (2009) noted that “Social Responsible Investing, SRI, has been gaining popularity among investors since the early 1990s. In the United

4 http://en.wikipedia.org/wiki/Socially-responsible_investing
5 http://www.paxworld.com/about/welcome-from-the-president/pax-history/
States alone, it now encompasses an estimated $2.71 trillion out of the overall $25.1 trillion investment marketplace”. The huge interest generated by SRI has brought about innovations and led to the development of indexes such as KLD 400 social index, FTSE4 Good index series and Kehati-SRI index (Indonesia).

There are some impressive stories highlighting the successes of SRI's. For instance, NASDAQ traded Domino social equity fund recently reported that it outperformed the S&P 500 by 9.1% in 2009. In a similar vein, Jeffrey R. Immelt, Chairman of the Board and CEO of General Electric attributed $17 billion of the company's sale to “Ecomagination” products and reiterated their commitment to sustain the growth in their “Ecomagination” initiative. As a matter of fact, the company says it is well positioned to leverage part of the more than $70 billion meant for renewable energy in the U.S. stimulus package, to profit its $7 billion renewable energy business (Wind and Solar energy).

Indeed, there is far greater potential for the role of SRI in the foreseeable future. A report by Deutsche Asset Management (2007) estimates that:

“the value of low-carbon energy markets by 2050 will be $500 billion, the worldwide investment in clean energy by 2009 will be valued at $100 billion, estimated solar industry revenues by 2010 will be $18.6 billion, the global fuel cell market will be $15 billion by 2015, and the cumulative net savings from energy efficient products in the United States will be $84 billion by 2012”.

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7 General Electric 2008 Annual Report: Management Discussion and Analysis. Page 1 - 8
The potential size of the market for SRI and race by corporate bodies across the globe to leverage alternative energy sources, make it impossible to ignore. SRI may be the next big thing for investors since the dot.com era of the 1980’s and will generate academic interest for the next couple of years.

1.2 WHAT IS GREEN INVESTING?

Green investing has a number of definitions by which we needed to explore to select a working definition for this study. *Investopedia* defines green investing as “Investment activities that focus on companies or projects that are committed to the conservation of natural resources, the production and discovery of alternative energy sources, the implementation of clean air and water projects, and/or other environmentally conscious business practices”.\(^8\) Similarly, Boulatoff and Boyer (2009) defined “green investing as the act of investing in companies that have a positive environmental impact”. Similar to the above definitions, the notion of green investing excludes investments in other areas such as alcohol, tobacco, arms etc considered undesirable.

In practice, socially responsible investing aims to invest by principles focused on a positive or better environmental impact and exclusion of firms deemed to be involved in undesirable products. Leahy (2008) noted that socially responsible investors and funds are those that generally avoid companies engaged in 'undesirable' businesses such as arms, alcohol, tobacco, gambling, animal testing and nuclear power. They invest in companies that are engaged in desirable activities such as environmental management, alternative

\(^8\) http://investopedia.com/ask/answers/07/green-investments.asp
energy, green technology, green construction, sustainable living, equal treatment of minorities and fair trade; or a combination of the above (i.e. avoiding the undesirable plus engaging in the desirable).

Defining green investment is not a black and white issue; there is a spectrum or degrees of “greenness” about any investment with some more green than others. Whilst some may regard an oil producing company as a non-green investment due to the enormous amount of carbon dioxide emission, others might justify the inclusion of the company’s stock in their portfolio as a result of the perceived environmental best practices in terms of preventing oil spillages etc.

In order to avoid any form of controversy as to the basis for the definition of the sample used in this study, we have narrowly and precisely defined green investment to be an investment in quoted companies in the renewable energy industry which includes wind, solar, electric grid, electricity storage, environmental market, hydrogen, ocean power, smart grid, biodiesel, clean transportation, micro-turbine, energy efficiency, flywheel, battery, geothermal, ethanol, fuel cell, waste-to-energy, hydroelectric, biofuel and pollution control.

Two major reasons account for our decision to limit our focus on the renewable energy industry. Firstly, it readily allows us to do a comparative study of the green companies versus the non-green companies with energy being the common denominator, and secondly due to the fundamental importance of the sector to economies. Readers may recall that the price of a barrel of oil rose to an all-time high of U.S. $147.29 in July 2008\(^9\) and it did hurt the fortunes of a lot of organizations. We are of the opinion that a majority of corporate bodies, whose daily operations rely on the use of oil would be

unable to sustain this huge cost over the long term, hence the urgent need for developing an alternative source of energy that could possibly come at a much cheaper price levels.

We present below definition of the green energy firms we are looking at for a better understanding of the activities of firms in the renewable energy industry.

**Battery Stocks** are publicly traded companies whose business involves batteries, devices for chemically storing electricity.

**Biodiesel Stocks** are publicly traded companies whose business involves biodiesel which is a biofuel made from oil with lowered viscosity for use in diesel engines. Common feedstocks for biodiesel production include rapeseed, palm oil and algae.

**Biofuel Stocks** are publicly traded companies whose business involves transportation fuels or any other form of liquid fuel made from plant or animal feedstocks (also called biomass).

**Biomass Stocks** are publicly traded companies whose business involves using biological matter to make some other form of energy. Includes human waste, municipal solid waste, sewage sludge, as well as industrial wastes such leftover wood from logging operations.

**Clean Transportation Stocks** are publicly traded companies whose business involves methods of lowering the environmental impact of transportation. Includes efficient vehicles such as hybrids and electric vehicles, as well more efficient modes of transit, such as rail or bus.

**Coal-To-Liquids Stocks** are publicly traded companies which focus on converting coal into a liquid transportation fuel.
Energy Efficiency Stocks are publicly traded companies whose business involves ways of accomplishing the same activity with less energy and lower environmental impact. Includes demand-response, improved lighting and climate control systems.

Electric Grid Stocks are publicly traded companies whose business involves electric infrastructure, including transmission, distribution, pricing, and regulation.

Electricity Storage Stocks are publicly traded companies whose business involves the mechanical, physical, or chemical storage of electricity.

Environmental Market Stocks are publicly traded companies whose business involves the trading of commodities designed to represent an environmental attribute, such as the environmental benefits of renewable energy (Renewable Energy Credits, or RECs) or Carbon Offsets.

Ethanol Stocks are publicly traded companies whose business involves ethanol alcohol \( \text{(C}_2\text{H}_5\text{OH)} \) made from biomass for use in transportation. Common feedstock include corn and sugar cane.

Flywheel Stocks are publicly traded companies whose business involves the storage of electricity as kinetic energy (the energy of motion).

Fuel Cell Stocks are publicly traded companies whose business involves fuel cells, devices for efficiently converting the energy in fuel directly into electricity by chemical means, without combustion. Applications include road transport, large-scale energy storage and short-haul transport such as forklifts.

Geothermal Stocks are publicly traded companies whose business involves using the earth’s heat energy for productive use.
Hydroelectric Stocks are publicly traded companies whose business involves converting the energy of falling water into electricity.

Hydrogen Stocks are publicly traded companies whose business involves the use of hydrogen as energy storage or a transportation medium.

Microturbine Stocks are publicly traded companies whose business involves small combustion turbines suitable for use in distributed electricity generation and combined heat and power projects.

Ocean Power Stocks are publicly traded companies whose business involves using the ocean's energy to create electricity or other forms of useful energy. Includes technologies to take advantage of both the motion of waves or tides, as well as Ocean Thermal Electric Conversion (OTEC)

Pollution Control Stocks are publicly traded companies whose business involves technologies for removing or reducing the emissions of harmful pollutants from industrial processes such as power generation, or removing these pollutants from the atmosphere.

Power Production Stocks are publicly traded companies whose business involves the generation of electric power. Includes integrated utilities, independent power producers and financial investors owning power generation assets.

Smart Grid Stocks are publicly traded companies working to enhance the effectiveness of the electric grid through the more effective use of information and communication technology.

Solar Stocks are publicly traded companies whose business involves conversion of sunlight into energy.
**Waste-to-Energy Stocks** are publicly traded companies whose business involves the collection and use of the methane gas present in decomposing garbage or sewage sludge to produce energy, or energy produced from the incineration of this waste.

**Wind Stocks** are publicly traded companies whose business involves the conversion of the wind's energy into electricity or another form of energy or work.\(^{10}\)

\(^{10}\) [http://www.altenergystocks.com](http://www.altenergystocks.com)
2.0 LITERATURE REVIEW

There are theoretical developments in debating our understanding of the benefit of environmentalism or green practice towards business performance. Firstly, Darnall (2009) presents views on a traditional school of thought opposed to those in the ‘revisionists’ school, in justifying their positions on the link between being environmentally-friendly and financial performance. For scholars like Christiansen and Haveman, 1981; Conrad and Morrison, 1989; Lave 1973 in the traditional school of thought, the notion is that, organizations that meet regulatory requirements on the environment, which comes at additional cost of doing business, tend to lose some of their competitiveness in the market place. Thus such firms are believed to be better off in terms of financial performance, if they do not incur environmentally-related costs. This has clear face validity but it is rather simplistic in its approach and narrow in view because it isolates the firm relative to the world. It does not take cognizance of the larger environment in which businesses operate, as it ignores obligations that firms normally have beyond firm boundaries such as a wider value chain with customers, suppliers, local society and government. Since an organization cannot do business in isolation, its success depends, to a large extent, on the interests of other stakeholders including the Government and consumers.

In contrast to the neo-classical views, more recent “revisionist” views argue for an environmental role for business because of growing innovation and social environmental expectations and regulations. Scholars like Hoffman (1997) seem to consider other stakeholders’ interest and are of the opinion that organizations’ chances of playing the
turf over a longer period of time, would be enhanced due to their acceptance by the
society.

Porter and Van de Linde (1995) see a silver lining in the horizon and are of the
view that being environmentally-conscious presents organizations with opportunities to
be more innovative and thus leverage on its increased efficiencies (in terms of reduced
material purchases and waste in the production cycle), to cut down on its cost of
production. This is in addition to the new products and technology that is expected to be
the end result of the innovation process. Indeed, the Internet giant, Google seem to
provide evidence to back up this assertion. In the summer of 2007, the company
announced its plans to use 9,212 solar panels at its Mountain View headquarters, to
produce 1.6MW of electricity, enough to power approximately 1,000 California homes.
According to the company, this initiative reduces carbon emissions and will repay itself
within 7.5 years, thus making it a good business decision. \(^\text{11}\)

Scholars supporting a revisionist view further challenge the basic assumption of
the neo-classical model that environmentally-conscious firms, do not maximize
efficiency and profits. Indeed, it is not possible to maximize profits unless firms can
definitively know the costs and benefits of environmental practice (Scott, 2001). Ashford
(1993) argues that environmental costs may be improperly classified as overheads. Thus
for organizations, one step forward towards determining the true cost of environmental
initiatives, would be to isolate these from overheads. Thus, until the cost and benefits of
being green can be reasonably measured, firms holding a traditional view may be denying
themselves of the possibility of maximizing profits and firm value derivable from
pursuing sustainability in business practice. Dieleman and De Hoo (1993) assert that

\(^{11}\) http://www.google.com/corporate/green/clean-energy.html
when managers fail to adopt innovative environmental practice, they forego opportunities to the benefit of their firms.

Table 1 below summarizes the arguments of the neo-classical and the “revisionists” schools of thought as adapted from Darnall (2009).

<table>
<thead>
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<th>Neo-classical</th>
<th>Revisionist</th>
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<tr>
<td>a) Being environmentally-conscious comes at an ‘additional’ cost of doing business</td>
<td>a) They argue that being environmentally-conscious would lead to innovation</td>
</tr>
<tr>
<td>b) They argue that this additional cost negatively affects firms from being competitive</td>
<td>b) The acceptance by the society of firms engaged in environmental best practices, would enhance their chance of playing the turf over a longer period of time</td>
</tr>
<tr>
<td>c) They seem to ignore the interest of other stakeholders such as consumers and the regulatory authorities</td>
<td>c) The innovation would lead to increased efficiency, new products and technology</td>
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Ambec and Lanoie (2007) present different scenarios to show how some of the costs associated with being environmentally-friendly could be mitigated by other benefits of being at the forefront of keeping a safe environment. Specifically, their research examined ways in which being green could increase revenues through access to new markets, product differentiation and sale of pollution-control technology. This would seem feasible considering economic realities of today, premised on state incentives to develop green energy and rising cost of traditional sources of energy and emerging regulation costs such as compliance, carbon taxes and carbon permits. In addition, they considered the possibility of cost reduction measures arising from lower regulatory costs, labour and cost of capital. Ultimately, their research successfully highlighted circumstances that would help an organization to be more environmentally-friendly without hurting the bottom-line.

Given these revisionists points about the benefits of practicing environmental sustainability to firms - does it pay to be green? A study by Winslow Management Co., a Boston-based money manager, covering the period August 1999 through December 2003, concluded that 'it pays to be green' as the Winslow Green Index (WGI), an equally weighted index of 100 'green screened' companies, had a cumulative increase in value of +98.5 percent in comparison with the S & P 500 with a cumulative decrease in value of -10.69 percent while the Russell 2000 had a cumulative return of +32.77 percent. Despite the bear market of 2000 through 2002, the annualized return for the period was +16.78 percent for the Winslow Green Index. Onwallstreet also reported that the Domino social 400 index (now run by KLD indexes, which tracks top-ranked companies using environmental, social and governance selection criteria across North America, Europe

12 Survey builds case for ‘Green’ stocks, Financial Executive, June 2004
and Asia-Pacific) returned 8.5% from inception in May 1990 until May 2009 compared with the S&P 500 which trailed behind at 7.7%. The Dow Jones Sustainability World index which has dropped 29.51% since inception in August 1999 through May 2009 compares favorable to a 30.74% loss in value by the MSCI World index.\(^{13}\)

Intriguingly, can we reconcile opposing views about the benefit and cost views of environmentally sustainable practice in business? In a recent joint study, researchers found that this may be a false dichotomy: their research strongly suggest that companies who are proactive about the environmental impact of their activities, have been financially rewarded. This is based on their ability to avoid the cost of litigations for environmental degradation thus they may be less risky deserving a lower cost of capital. Generally, a significant reduction in an organization’s cost of capital is expected to give rise to increased profitability.\(^{14}\) Based on an extensive review of literature, Ambec and Lanoie (2007) also found strong evidence supporting the notion that a better environmental performance does not lead to an increase in cost of capital. This notion finds a basis due to their ability to borrow more easily from banks. In finance, it is generally believed that cost of capital is lower for companies that are able to use leverage, i.e. borrowing, in their capital structure due to the fact that interest cost (on borrowed funds) is tax deductible.

The evidence on whether it pays to be green is mixed. Scholarly works investigating the financial performance of ‘ethical funds’ by Kreander et al. (2002) have found out that very few ethical funds in Europe, have managed to significantly out-

\(^{13}\) Socially Responsible Investing Plows Path to Profitability by Elizabeth Wine, *Onwallstreet*, August 2009, Pages 26 – 32
\(^{14}\) The value of Going Green, Harvard Business Review, September – October 1997, Page 11
perform a global benchmark, on a risk-adjusted basis using Jensen (evaluates the return earned by a fund relative to the risk of the fund and the return achieved on a benchmark portfolio); Sharpe (reward to total risk ratio); and Treynor (reward to market risk ratio) measures. Hamilton and Statman (1993) used the Jensen Alpha measure (abnormal return of the portfolio over the theoretical expected return) to compare the performance of 32 American ethical funds with 170 other funds for the period 1981 and 1990. They found that the average 10-year return of the ethical funds was better than those of other funds. One shortcoming of this stream of literature is that, whether it pays to be green, to be ethical or to have social responsibility, is not industry specific and thus comparative conclusions are at the fund level and not at the firm-industry level. Furthermore, Derwall et al. (2005) also find value creation in green funds. They built their equity portfolio on Innovest Strategic Value Advisors’ corporate eco-efficiency scores. They defined eco-efficiency as the “ratio of the value a company adds (e.g. by producing products) to the waste the company generates by creating that value”. In simple terms, a chemical producing company, generally considered as environmentally non-friendly/compliant, could be considered “eco-efficient” in relation to their competitors, provided the value created by the company, outweighs the value destroyed. This study, which examined data over the 8-year period between 1995 and 2003, found evidence that the more “eco-efficient” portfolios, i.e. the higher ranked portfolios, substantially outperformed its less “eco-efficient”, i.e. lower-ranked counterparts. Kreander et al. (2002) investigated the financial performance of 40 ethical funds from 7 European countries using Jensen, Sharpe and Treynor measures. The study found that very few ethical funds managed to significantly outperform a global benchmark on a risk-adjusted basis. However, neither
did the funds significantly under-perform the global benchmark portfolio. Therefore, from this study, ethical funds are clearly as desirable as any mainstream fund.

Another approach in studying the performance-CSR in the literature are studies examining firm level data. Lee and Faff (2009) found evidence supporting the notion that leading sustainability firms are not worse off relative to the market portfolio (Dow Jones Sustainability Index). However, their lagging counterparts outperform the market portfolio and the leading portfolio. They defined leading (lagging) corporate social performance (CSP) portfolio to contain firms with superior (inferior) CSP profiles. Lee and Faff (2009) noted the research contributions of Griffin and Mahon, 1997; Orlitzky, Schmidt and Ryes, 2003; Filbeck, Gorman and Zhao, 2009 appear to find a positive link between corporate social performance (CSP) and corporate financial performance (CFP). This contrasts with the findings of Brammer, Brooks and Pavelin (2006) which show a negative link between CSP and CFP in a sample of U.K. firms.

Our study is different from the relevant literature for these key reasons. Although the literature has studied performance and socially responsible investing at the fund and the firm level, none have examined this topic on a ‘match by match’ basis on green and non-greens, in the renewable energy sector. Moreover, previous studies are more interested in the broader concerns of social responsibility as opposed to our focus on environmental solution focused firms. That is, Kreander et al. (2002); Hamilton and Statman (1993) and Brammer et al., (2006) have based their definition of socially responsible investing on ethics and social contribution and not really on the environmentally-friendly firms like we have done. Kreander et al. (2002) examined 40 ‘ethical’ funds. Indeed, Brammer et al. (2006) focused on social performance indicators
such as the environment, employment and community activities using the Ethical Investment Research Service (EIRiS) database. They compared the returns from portfolios with different levels of CSR scores against the FTSE All-Share index and concluded that “firms scoring highly on ethical criteria appear on the surface to represent poor investments”. Lastly, Lee and Faff (2009) studies leading and lagging firms based on their ranks on the Dow Jones Sustainability Index which measures five areas of sustainability: strategy, financial ability, ability to foster loyalty, corporate governance, and human resources ability.

### 2.1 HYPOTHESIS DEVELOPMENT

Given the theorized benefits and studied performance of green companies, we develop our first hypothesis. To recall, the revisionists’ view of the benefits of sustainable business, include better alignment of the firm with society expectations and regulations, realizing additional revenue from innovative products and new markets. Next, empirical studies of Derwall et al. (2005) and Kreander et al. (2002) have shown that green companies perform at least as well, if not better, than non-green firms. Based on the above research, we propose this hypothesis that implies that green companies are not disadvantaged by being green:

H1: Green energy companies perform no differently from non-green companies.
Second, in addition to financial performance, we wish to examine whether green companies can raise capital equally as well as non-green companies — again, suggesting that green companies are not hampered in this issue. As Ambec and Lanoie (2007) conclude that firms with better environmental performance do not have higher cost of capital, and in fact, can more easily borrow from banks, we also intend to examine this issue. However, we examine overall capital growth from not only liability sources, but also from equity sources. Based on the above research, we propose this hypothesis:

H1: Green energy companies can raise capital equally as well as non-green companies.
3.0 METHODOLOGY AND DATA

In order to evaluate our hypotheses on whether green companies' financial performance and ability to raise finance is no different from their non-green peers; we collected data from publicly available sources such as Thomson ONE banker, published by Thomson Reuters. The financial information used, were obtained from the Thomson financial sub-section of the Financials in company analysis main heading.

We describe our method of data collection, our sources and our final sample. The original data set consisted of three hundred and thirty six (336) renewable energy companies (some of which were duplicated) obtained from the clean energy website, AltEnergyStocks.com.

AltEnergyStocks.com provides high-quality, original research into alternative energy, renewable energy, and clean technology companies. The website describes the criteria for inclusion of companies as alternative energy companies as follows: alternative and renewable energy companies either directly produce energy from renewable or environmentally-benign sources, or develop and commercialize technologies and applications for the production of clean energy. Clean technologies (cleantech) are technologies that allow the economy to maintain and grow its output while neutralizing or minimizing adverse impacts on the environment. Cleantech includes innovations in a number of areas such as pollution control, water management, materials science and nanotechnology. The goal of the website is to be the premier resource for investors who are looking to invest in alternative energy and clean tech stocks.15

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15 http://www.altenergystocks.com
We subsequently reduced the renewable energy companies in the data set to ninety nine (99) after eliminating the stocks duplicated, the ethical funds and those with neither five-year share price data nor five-year financial statements. Our five-year period is defined as the period between 2004 and 2008 for the financial performance while the five-year period for the stock market is the period between October 2004 and September 2009. This timing difference is as a result of the period required to finalize and publish financial statements, as opposed to stock market data that is publicly available on a daily basis.

Thereafter, the forty nine (49) stocks that made the final list were the ones for which matches of non-green companies, based on the criteria of +/- 30% of Sales for the current financial year, GIC code and operating within the same country, were found. Our ability to match the samples by GIC code was made possible using Thomson ONE Banker’s website. The Global Industry Classification Standard (GICS) was developed by MSCI Barra and Standard & Poor’s in 1999 to provide an efficient, detailed and flexible investment tool. The GICS classification system consists of: 10 sectors, 24 industry groups, 68 industries and 154 sub-industries. The GICS sectors are: Energy, Materials, Industrials, Consumer Discretionary, Consumer Staples, Health Care, Financials, Information Technology, Telecommunication Services and Utilities.¹⁶ We created our match of the green energy firms versus their non-green peers at the sub-industry level as this is the most specific and relevant level of match available using the GICS. The sub-industries include environmental and facilities services; industrial machinery; electrical components and equipment; heavy electrical equipment; biotechnology; household products; semiconductor equipment; independent power producers; electronic

manufacturing services; pharmaceuticals; and life sciences tools and services. At this detailed level of matching, we were able to obtain the best possible comparison of the green energy firms versus the non-greens to provide meaningful results.

The comparatives sub-section under the company analysis header on Thomson ONE Banker’s website, allowed us to create matches of the renewable energy with the non-green using the GIC code and other criteria described above. For simplicity, we describe an example of a matched renewable energy company versus a non-green company. First, having narrowed down “Acorn Energy Inc” as one of our green companies, we found a match of non-green “Helios & Matheson North America Inc” using peer set by custom search on Thomson ONE banker. The industry box allows matching by GIC code; while the location box allows the company matched by GIC code to be further compared within the same country and lastly the financial comparison box allowed us to include comparison based on current sales value. Another example of a match created between a green company and a non-green company is “Evergreen Solar Inc.” (Green) versus “Nortech Systems Inc.” (Non-green).

We obtained the historical stock market price data for the sample including the NASDAQ composite index, used for this research from Yahoo finance\(^\text{17}\) while the historical financial statements namely the income statement, balance sheet and cash flow statements were obtained from Thomson ONE Banker’s website\(^\text{18}\).

We used the share price data and financial data collected to calculate the average five year performance of the sample size. Due to the criteria used in matching, most of

\(^{17}\) http://ca.finance.yahoo.com/investing

\(^{18}\) http://banker.thomsonib.com/ta/
the companies that made the sample size of the matched data set are headquartered in the United States of America.

Thereafter, we examined the operational performance, stock performance and growth from financing sources. The use of Statistical Packages for Social Sciences (SSPS) version 17 assisted in identifying case sets in the sample size that were considered extreme and affected the results. The extremes or outliers which were at least three standard deviations from the mean, were identified and eliminated, to give a more normalized result. To test our hypotheses, we performed a paired sample T-test, a non-parametric test and Wilcoxon signed rank test.

In order to add more robustness to the research, a comparative analyses of the original ninety-nine (99) renewable energy companies with the necessary data such as five-year stock market and financial information, was done against another ninety-nine (99) non-green Fortune 500 companies. The list of the non-green energy Fortune 500 companies were obtained from the money page of cable news network (CNN)'s website.\(^{19}\) We define the unmatched sample as the companies for which we could not find exact matches based on the criteria set above.

Our consideration of operational performance will be based on metrics such as Gross margin, Return on Assets and Return on Equity. We defined Gross margin as gross profit divided by sales while we defined Return on asset as net income divided by total assets and we defined Return on Equity as net income divided by shareholders’ equity. In order to answer our question on stock performance, our approach will be to evaluate the average return over a five-year period, the standard deviation and a comparison of the stock return with the NASDAQ composite index. We included standard deviation to

examine and compare the riskiness of investing in green versus non-green companies. Lastly, we base our hypothesis on raising capital on five-year growth in equity, cash flow from financing and total liabilities.

There are two other major methods of examining the subject matter in the literature, i.e. examining fund performance and examining firm performance as in this paper. We have decided on this methodology due to our belief that finding answers to the various performance indicators would give a more comprehensive understanding of the financial performance of the green energy firms. Table 2 below provides a summary of the original sample size of 336 renewable energy firms and reasons for eliminating some of them to arrive at the final sample size of 49 firms used for the research.

**Table 2 – Original sample size composition**

<table>
<thead>
<tr>
<th>Original sample size</th>
<th>Eliminated</th>
<th>Reasons for elimination</th>
<th>Sample size remaining</th>
</tr>
</thead>
<tbody>
<tr>
<td>336</td>
<td>175</td>
<td>Duplication, mutual funds</td>
<td>161</td>
</tr>
<tr>
<td>161</td>
<td>62</td>
<td>Lack of 5-year financial performance and stock performance data</td>
<td>99</td>
</tr>
<tr>
<td>99</td>
<td>50</td>
<td>Matched portfolio with Non-green companies could not be created on the basis of +/-30% of current sales volume, GIC code and operating within the same country</td>
<td>49 (Final sample size of matched green firms)</td>
</tr>
</tbody>
</table>

26
4.0 EMPIRICAL RESULTS

We shall be presenting our findings on the performance of green companies matched with their non-green counterparts using tables and graphs. For further robustness, we also examine unmatched samples of green companies with non-green companies. We begin with presenting stock return performance, followed by financial operating performance and then raising capital performance.

In the Appendix section, we use Tables 5 - 10 to present the paired t-test and the wilcoxon signed rank test results. The panel named ‘paired difference’ under mean show a comparison of the mean values for the non-green companies versus the green energy companies. A negative value signifies that the green energy companies outperformed the non-green companies in absolute percentage terms while a positive value shows that the non-green performed better. The panel (last column) named ‘Asymp. Sig. (2-tailed)’ explains the significance of the statistical tests. Where the result show values less than 10%, it is considered significant while values higher than 10% are considered not significant.

4.1 DESCRIPTIVE STATISTICS

Table 3 in the Appendix provides summary of descriptive statistics for matched sample while Table 4 in the Appendix show the summary of descriptive statistics for the unmatched sample. These tables show the mean, median, and standard deviation.

The differences in the mean and median for the matched sample are generally less than 5% except for the 5-year growth in equity for which the non-green companies
differed by approximately 11% while the green companies differed by approximately 17.72%.

4.2 STOCK PERFORMANCE

We first report empirical results with respect to our first hypothesis; that is:

\[ H1: \text{Green energy companies perform no differently versus non-green companies.} \]

a) 5-YEAR STOCK MARKET RETURN

![Graph showing average 5-year stock return](image)

*Figure 1: Average 5-year stock return (Matched sample)*

We first consider the average 5-year stock return. Figure 1 and Table 5 in the Appendix shows that the green energy companies clearly out-performed their non-green peers by 0.88%. This means that the shareholders of the green energy companies were better rewarded for their investments in the stock market relative to their colleagues who
held shares in non-green companies over the 5-year period under consideration. This result is significant at less than one percent level of significance as shown on Table 5 in the Appendix. This result seems to support Frank Dixon’s statement that “investments in environmentally-friendly companies will bring greater returns than those in their less green competitors”\textsuperscript{20}

Based on the results obtained in Table 6 in the Appendix and Figure 2, the unmatched non-green companies barely managed to outperform the green companies by an almost negligible 0.4% and not surprisingly, this result is not significant with the significance levels being 0.808 as shown on Table 6 in the Appendix. Thus, we conclude that the unmatched non-green companies perform no differently than the green energy companies. This further confirms our hypothesis that the green energy companies perform no worse than the non-greens.

\textsuperscript{20} 'Green' investments bring greater returns, Accountancy International, January 2000, Page 7
b) STANDARD DEVIATION OF 5-YEAR STOCK MARKET RETURN

![Matched: Standard deviation of 5-year stock return](chart)

**Figure 3: Standard deviation of 5-year stock return (Matched sample)**

We are also interested in comparing the riskiness of investing in green energy companies compared to traditional companies. Given that the green energy companies' stock return was better than that of the non-green companies, it is expected that the green investments will be riskier. Investors should be compensated with a “risk premium” for the extra risk that they take on in their investment decisions. Thus, the green energy companies differed by about 1.98% as shown on Table 5 in the Appendix and Figure 3. This is a significant difference at less than 5 percent level (0.032) as shown in Table 5 in the Appendix. The result here rejects our null hypothesis that investments in green energy companies are no less risky than non-green companies; there is a risk premium commensurate with additional risk in green companies.
c) 5-YEAR STOCK MARKET RETURN VERSUS THE 5-YEAR NASDAQ COMPOSITE INDEX RETURN

Does investing in green or non-green energy companies' pay? To answer this more objectively from an investor's point of view, we report five-year equity returns relative to the five-year NASDAQ composite index return. This will tell us excess returns from investing in these defined companies.

![Matched: Stock return Vs NASDAQ index](image)

*Figure 4: Stock return vs. NASDAQ index (Matched sample)*

Though both the non-green companies and the green energy companies outperformed the NASDAQ composite index by 0.5% and 1.12% respectively (Table 5 in the Appendix and Figure 4), the green energy companies did much better than the non-green by 0.62%. This result is significant at less than 5% level, see Table 5 in the Appendix. This also means that investment in the green energy companies in the review period, gave a better return than the market as measured by the NASDAQ index. As a result our null hypothesis that green firms perform no differently from non-green firms is
rejected. Evidently, green firms outperform their non-green energy peers. Thus, we conclude that green energy companies earn normal returns as predicted by theory.

![Unmatched: 5-year stock return vs. NASDAQ index](image)

**Figure 5: Stock return vs. NASDAQ index (Unmatched sample)**

With the unmatched sample as illustrated in Figure 5, there appears to be no difference in market performance between the unmatched green energy companies and non-green companies. This is because the results on difference from zero return, are not significant. Thus, we fail to reject our null hypothesis that green energy firms perform no differently than non-green firms. Therefore, we conclude that green energy companies, at the very least, again do not perform worse than the non-greens.
After comparing stock return performance, we now compare financial operating performance. As shown in Table 7 in the Appendix and in the Figure 6 above, the matched non-green companies outperformed their green energy peers in absolute terms, at approximately 32% compared with 30% for green energy companies, over the five year review period. However, the test statistic value of 0.553 on Table 7 in the Appendix shows the result is not significant. Thus, we fail to reject our null hypothesis that green energy companies perform no better than non-green firms. Because gross margins are an indicator of operational cost efficiency, this finding that non-green firms have no statistical difference in cost efficiency, suggests support for the literature’s reasoning that traditional non-green companies could face higher costs for non-environmental compliance. After all, if there is a cost advantage to non-green companies for not
expending for environmental benefits, then their gross margins should be higher than green energy companies. This is not found to be the case.

Our findings here, as it relates to the unmatched sample show the same non-significant difference in gross margins between green and non-green companies. In other words, non-green companies outperformed their green energy peers by a non-significant 1.85% (Table 8 in the Appendix and Figure 7) in terms of gross margin. It appears then that contrary to the traditionalist view of the firm on the issue of the benefit of sustainability in business, green energy firms suffer no cost disadvantage compared to traditional energy firms as evidenced by similar gross margin returns.
b) RETURN ON ASSET (ROA)

![Matched: Return on Asset (ROA)](image)

*Figure 8: Return on Assets (Matched sample)*

In terms of returns on assets (ROA), the matched green energy companies showed a higher ROA than the non-green by about 0.14%, see Table 7 in the Appendix and Figure 8; however, it is not significant since the test statistic value is 0.926. Again, we fail to reject our null of no performance difference between green energy and non-green firms. Thus, green energy firms perform no differently than non-green firms on operating performance.
c) RETURN ON EQUITY (ROE)

Figure 9: Return on Equity (Matched sample)

This performance metric reveals that the green energy companies perform no better than the non-greens as this result is not significant, see Table 7 in the Appendix. Thus we fail to reject our null hypothesis, and we find support for our notion that green firms perform no better.

In conclusion, we summarize that consistent with our conjectures, green energy firms perform comparably with non-green firms in terms of financial operating performance.
4.4 RAISING CAPITAL PERFORMANCE

Third, we report empirical results with respect to our second hypothesis; that is:

\[ H2: \text{Green energy companies raise capital no differently versus non-green companies.} \]

\textbf{a) 5-YEAR GROWTH IN EQUITY}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{fig10.png}
\caption{5-year Growth in Equity (Matched sample)}
\end{figure}

First, we examine capital growth from equity sources. Our findings reveal that green energy companies are able to raise capital from their shareholders for expansion and other purposes, better than their non-green peers by a whopping 42.47\%, see Table 9 in the Appendix and Figure 10. This result is significant at less than 10 percent level (0.081), see Table 9 in the Appendix. This result rejects our second null hypothesis; that is, green energy firms raise capital no differently compared with non-green firms. However, it clearly shows that sustainability benefits firms in their ability to raise capital.
Figure 1: 5-year Growth in Equity (Unmatched sample)

This result here with respect to the unmatched sample, differs from our earlier findings on the matched samples. Though the result revealed that green energy companies, are better able to raise additional funds via equity for expansion and other purposes, in absolute terms by approximately 1.27% (Table 10 in the Appendix), the result is not significant as the test statistics is 0.688, see Table 10 in the Appendix.
Cash flow from financing activities relates to the net funds realised by firms from the issue of long term debt instruments, repayments of long term debt instruments, interest and dividends paid and increase/decrease in short-term borrowings. A positive result or an increase in cash flow from financing activities over the 5-year period indicate that the firms were able to grow their financing from these sources while a negative result means that the firms were not able to grow their financing from these sources.

In continuance of its winning streak, the matched green energy companies were also, better able to generate cash flow from financing activities at 65.86%, see Table 9 in the Appendix and Figure 12, than the non-green companies which were actually in negative territory of -82.15%. The result is significant at less than 5 percent level, see Table 9 in the Appendix. This result rejects our null hypothesis that green and non-green firms are no different in cash flow fund raising.
On the basis of 5-year growth in cash flow from financing activities, both the unmatched green companies and the unmatched non-green reported negative values of -6.59% and -12.20% respectively. However, we note that green energy companies’ inability to grow its cash flow from financing activities was at a lower rate compared to the non-green companies. With test statistics value of 0.920 as shown on Table 10 in the Appendix, this result is not significant. This result is at variance with what was obtainable with the matched data set.
c) 5-YEAR GROWTH IN LIABILITIES

Perhaps, green energy companies’ source of capital growth came from increased borrowing. On the basis of the last metric considered, i.e. the green energy companies grew their total liabilities by 33.85% (Table 9 in the Appendix and Figure 14) compared with the non-green at 19.78%. As the result is not significant, we conclude that they can borrow no differently than the non-greens. Thus, it would appear that most of green energy companies’ capital growth is from equity financing rather than liability financing.
We again confirm the result presented above with the case of unmatched samples. Though the green energy companies were able to raise liabilities much easier at 84.58% than the non-greens at 74.37%, the result is not significant. We thus conclude that the growth in capital for green companies is attributable to equity sources rather than liabilities sources.
5.0 DISCUSSION

Our research set out to understand if sustainability (i.e. pursuing business practices favourable to the environment) is beneficial to business by examining whether or not green energy companies perform any better than their non-green counterparts.

Our methodology differs from other scholars who have investigated the financial performance of investments with an environmental consciousness. A majority of the earlier studies were focused on ethical investments funds and the financial performance examined was based on stock returns. In so far as SRI’s isn’t just about ethical funds or investments, we decided to investigate an emerging sector within the SRI namely renewable energy companies. Beyond just collecting a sample of green energy companies, we created a match of non-green companies with comparable sales volume, within the same global industrial and sub-sector classification code and operating within the same country. We have also taken the debate on performance higher by investigating operating financial performance measures. In addition to these measures, we examined how differently green energy companies were able to raise finance than the non-green companies.

In terms of stock performance, our firm level study reveal that the green energy companies outperformed their non-green peers. Also, when compared with returns by the market as represented by the NASDAQ composite index, both the green energy firms and the non-green outperformed the NASDAQ. However, we note that the stock over and above NASDAQ was higher by the green energy firms. While green energy companies have higher returns, they also have higher risk. Hence, returns and risk are normal and consistent with asset pricing expectations. Thus our study supports the findings of
Hamilton and Statman (1993), which concluded that the average 10-year return of ethical funds was better than those of other funds.

We found support for our proposition that green energy companies perform no differently than their non-green peers based on operating performance metrics. Relatedly, the matched non-green companies, only managed to outperform the green energy companies on gross margin basis, with the result not being significant and leading to our conclusion that the green energy firms perform no worse than their non-green peers.

In the area of raising capital, we were able to establish that the green energy companies substantially out-performed the non-greens in growing their equity capital and cash flows from financing activities.

5.1 CONCLUSION

The green energy sector is an important and exciting new and innovative sector with a great deal of promise to be a catalyst for environmental sustainability change in the vast energy industry of the world. We are motivated to examine the benefits of sustainable practice in businesses in order to further knowledge that could support the revisionists’ theoretical view for sustainability. Rather than address the benefits of a broad based concept of socially responsible investing (SRI) or sustainability as previously done in the literature, we chose to isolate for the benefits of environmental solution or green companies through our pure play approach. That is, we created a matched sample of renewable energy companies versus non-green companies with comparative sales volume, GIC code and operating within the same country. Our study largely supports the
revisionist’s view of being green, i.e. green energy firms are not disadvantaged in terms of financial performance as a result pursuing strategies aimed at being environmentally-friendly. This result supports the studies of Griffin and Mahon, 1997; Orlitzky, Schmidt and Ryes, 2003; Filbeck, Gorman and Zhao, 2009; Lee and Faff, 2009 which finds a positive link between corporate social performance (CSP) and corporate financial performance (CFP). While Faff and Lee (2009) constructed two mutually exclusive portfolios with differing CSP profile, we created our matched portfolios of green energy firms versus non-green with a focus on the renewable energy sector using sales volume, GIC code and operating within the same country as criteria. Additionally, we further find that sustainability is beneficial to firms in terms of raising finance for their operations as green energy companies are better able to raise capital vs. non-green. This new finding supports Ambec and Lanoie (2007) conclusion that being environmentally friendly lowers cost of capital.

We found that alternative energy firms deriving renewable energy sources such as solar, ethanol and wind could well replace the conventional source of energy as we know it today. For managers who are highly dependent on oil in their production process, this should be cheering news considering that a barrel of oil rose to an all-time high price of $147.29 in July 2008. Secondly, growth in world population comes with higher demand for energy which presents great opportunities for proactive corporate bodies to go back to the drawing board, to develop strategies that would allow them tap into these emerging technologies, to develop a better return to their shareholders, whilst still being applauded by the society for its effort in combating global warming.

Thirdly, managers could consider the possibility of reducing costs of doing business by leveraging on the ‘greenness’ of their organizations. By this we mean, they could take advantage of the sentiment favoring environmentally-conscious firms by raising funds through borrowing which has the effect of lowering their cost of capital.

Fourthly, we believe the outcome of this research work would help investment managers in developing the appropriate portfolios that would help them deliver superior results to investors. Rather than just generalizing on green companies to include in their portfolios, this research helps them to identify the renewable energy sector that has the potential for a better value creation.

Despite a number of limitations such as sample size (resulting from inability to obtain relevant data on financial and stock market performance, concentration on the U.S. market etc), this research work has been able to contribute to existing literature on environmentally friendly companies, in reaching its conclusion that green companies have actually performed no worse than non-green companies based on operational performance, stock market returns and ability to raise equity and debt financing. Indeed, in some respects, green energy companies outperformed and are desirable investments. Our conclusion seems more supportive of revisionist views towards the benefit of sustainability as we find no cost and performance disadvantage faced by green firms as opposed to traditional views of increased costs for green business operations.
APPENDICES

Table 3: Descriptive Statistics for Matched Samples

The forty nine (49) stocks that made the final list were the ones for which matches of non-green companies, based on the criteria of +/- 30% of Sales for the current financial year, GIC code and operating within the same country, were found. Our ability to match the samples by GIC code was made possible using Thomson ONE Banker's website.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Non Green</th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Margin</td>
<td></td>
<td>31.99%</td>
<td>29.06%</td>
<td>14.40%</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>30.35%</td>
<td>28.83%</td>
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<td>Return on Assets</td>
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<td>5.05%</td>
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<td>Return on Equity</td>
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</tr>
<tr>
<td>5-year Stock Return</td>
<td></td>
<td>0.90%</td>
<td>0.83%</td>
<td>1.29%</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>1.78%</td>
<td>1.40%</td>
<td>1.67%</td>
</tr>
<tr>
<td>Standard Deviation of Stock Return</td>
<td></td>
<td>14.10%</td>
<td>13.13%</td>
<td>6.17%</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>16.09%</td>
<td>15.74%</td>
<td>6.86%</td>
</tr>
<tr>
<td>Stock Return vs. NASDAQ Index</td>
<td></td>
<td>0.50%</td>
<td>0.49%</td>
<td>1.19%</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>1.11%</td>
<td>0.96%</td>
<td>1.27%</td>
</tr>
<tr>
<td>5-year Growth in Equity</td>
<td></td>
<td>30.02%</td>
<td>19.02%</td>
<td>62.50%</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>72.50%</td>
<td>54.78%</td>
<td>105.70%</td>
</tr>
<tr>
<td>Cash flow from financing activities</td>
<td></td>
<td>-82.14%</td>
<td>-77.48%</td>
<td>298.17%</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>65.85%</td>
<td>-40.70%</td>
<td>442.29%</td>
</tr>
<tr>
<td>5-year Growth in Total Liabilities</td>
<td></td>
<td>19.77%</td>
<td>19.83%</td>
<td>54.03%</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>33.84%</td>
<td>19.31%</td>
<td>75.86%</td>
</tr>
</tbody>
</table>
Table 4: Descriptive Statistics for Unmatched Samples

The ninety nine (99) stocks that made the list could not be matched based on our criteria of +/- 30% of Sales for the current financial year, GIC code and operating within the same country.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Median</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross Margin</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Green</td>
<td>33.71%</td>
<td>28.74%</td>
<td>20.36%</td>
</tr>
<tr>
<td>Green</td>
<td>31.86%</td>
<td>28.86%</td>
<td>18.81%</td>
</tr>
<tr>
<td><strong>Return on Assets</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Green</td>
<td>6.36%</td>
<td>6.14%</td>
<td>5.21%</td>
</tr>
<tr>
<td>Green</td>
<td>3.43%</td>
<td>4.01%</td>
<td>7.17%</td>
</tr>
<tr>
<td><strong>Return on Equity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Green</td>
<td>15.48%</td>
<td>17.15%</td>
<td>11.73%</td>
</tr>
<tr>
<td>Green</td>
<td>8.23%</td>
<td>10.58%</td>
<td>15.62%</td>
</tr>
<tr>
<td><strong>5-year Stock Return</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Green</td>
<td>1.38%</td>
<td>1.29%</td>
<td>0.89%</td>
</tr>
<tr>
<td>Green</td>
<td>1.34%</td>
<td>1.30%</td>
<td>1.47%</td>
</tr>
<tr>
<td><strong>Standard Deviation of Stock Return</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Green</td>
<td>11.98%</td>
<td>11.48%</td>
<td>4.25%</td>
</tr>
<tr>
<td>Green</td>
<td>16.26%</td>
<td>15.35%</td>
<td>7.78%</td>
</tr>
<tr>
<td><strong>Stock Return vs. NASDAQ index</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Green</td>
<td>1.03%</td>
<td>0.94%</td>
<td>0.89%</td>
</tr>
<tr>
<td>Green</td>
<td>0.99%</td>
<td>0.95%</td>
<td>1.47%</td>
</tr>
<tr>
<td><strong>5-year Growth in Equity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Green</td>
<td>72.89%</td>
<td>59.31%</td>
<td>98.63%</td>
</tr>
<tr>
<td>Green</td>
<td>74.16%</td>
<td>52.21%</td>
<td>147.99%</td>
</tr>
<tr>
<td><strong>Cash flow from financing activities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Green</td>
<td>-12.20%</td>
<td>-3.47%</td>
<td>338.02%</td>
</tr>
<tr>
<td>Green</td>
<td>-6.58%</td>
<td>-61.27%</td>
<td>219.68%</td>
</tr>
<tr>
<td><strong>5-year Growth in Total Liabilities</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non Green</td>
<td>74.37%</td>
<td>51.71%</td>
<td>87.36%</td>
</tr>
<tr>
<td>Green</td>
<td>84.58%</td>
<td>37.04%</td>
<td>133.65%</td>
</tr>
</tbody>
</table>
Table 5: Stock Performance and Stock related – Matched Compared

This table presents summary statistics of the paired sample T-test and Wilcoxon signed rank test for the matched data set for the stock performance metrics such as average 5-year return, standard deviation of average 5-year return and average 5-year return versus the NASDAQ composite index. The standard deviation measures the risk involved with the stock market investment. Under mean, we present a comparison of the mean values of the non-green versus the green companies. A negative value under the column ‘paired difference’ signifies that the green outperformed the non-green in absolute percentage terms while a positive value shows that the non-green performed better.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Non-Green</th>
<th>Green</th>
<th>Paired difference</th>
<th>Level of significance</th>
<th>Standard Deviation</th>
<th>Z</th>
<th>Asymp. Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average 5-year stock return</td>
<td>48</td>
<td>0.91%</td>
<td>1.79%</td>
<td>-0.88%</td>
<td>***</td>
<td>1.30%</td>
<td>1.68%</td>
<td>-2.677a</td>
</tr>
<tr>
<td>Standard Deviation of average 5-year stock return</td>
<td>47</td>
<td>14.11%</td>
<td>16.09%</td>
<td>-1.98%</td>
<td>**</td>
<td>6.18%</td>
<td>6.86%</td>
<td>-2.148c</td>
</tr>
<tr>
<td>Average 5-year stock return vs. NASDAQ composite index</td>
<td>44</td>
<td>0.50%</td>
<td>1.12%</td>
<td>-0.62%</td>
<td>**</td>
<td>1.19%</td>
<td>1.27%</td>
<td>-2.147c</td>
</tr>
</tbody>
</table>

**Note:**
- **Symbol:**
  - *: 10% or less
  - **: 5% or less
  - ***: 1% or less
- **Level of significance:**
  - a: Based on positive ranks
  - b: Wilcoxon Signed Ranked Test
- **Asymp. Sig. (2-tailed):**
Table 6: Stock Performance and Stock related – Unmatched Compared

This table presents summary statistics of the paired sample T-test and Wilcoxon signed rank test for the unmatched data set for the stock performance metrics such as average 5-year return, standard deviation of average 5-year return and average 5-year return versus the NASDAQ composite index. The standard deviation measures the risk involved with the stock market investment. Under mean, we present a comparison of the mean values of the non-green versus the green companies. A negative value under the column ‘paired difference’ signifies that the green outperformed the non-green in absolute percentage terms while a positive value shows that the non-green performed better.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Non-Green</th>
<th>Green</th>
<th>Paired difference</th>
<th>Level of significance</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>Test Statisticsb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average 5-year stock Return</td>
<td>97</td>
<td>1.39%</td>
<td>1.34%</td>
<td>0.04%</td>
<td></td>
<td></td>
<td>0.89%</td>
<td>-0.243a</td>
</tr>
<tr>
<td>Standard Deviation of average 5-year stock return</td>
<td>97</td>
<td>11.98%</td>
<td>16.27%</td>
<td>-4.29%</td>
<td>***</td>
<td></td>
<td>4.26%</td>
<td>-4.680a</td>
</tr>
<tr>
<td>Average 5-year stock return vs. NASDAQ composite index</td>
<td>97</td>
<td>1.04%</td>
<td>0.99%</td>
<td>0.89%</td>
<td></td>
<td></td>
<td>1.48%</td>
<td>-0.007</td>
</tr>
</tbody>
</table>

Note:
Symbol Level of significance
* 10% or less
** 5% or less
*** 1% or less

a. Based on positive ranks
b. Wilcoxon Signed Ranked Test
Table 7: Operating Performance – Matched Compared

This table presents summary statistics of the paired sample T-test and Wilcoxon signed rank test for the matched data set for the operating performance metrics such as Gross margin, Return on Assets and Return on Equity. Under mean, we present a comparison of the mean values of the non-green versus the green companies. A negative value under the column ‘paired difference’ signifies that the green outperformed the non-green in absolute percentage terms while a positive value shows that the non-green performed better.

<table>
<thead>
<tr>
<th></th>
<th>T - test</th>
<th>Wilcoxon Signed Ranks Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard Deviation</td>
</tr>
<tr>
<td></td>
<td>N</td>
<td>Non - Green</td>
</tr>
<tr>
<td>Gross margin</td>
<td>45</td>
<td>32.00%</td>
</tr>
<tr>
<td>Return on Assets</td>
<td>32</td>
<td>5.05%</td>
</tr>
<tr>
<td>Return on Equity</td>
<td>33</td>
<td>10.09%</td>
</tr>
</tbody>
</table>

Note:
Symbol                           Level of significance
*                                  10% or less
**                                 5% or less
***                                1% or less

a. Based on positive ranks
b. Wilcoxon Signed Ranked Test
Table 8: Operating Performance – Unmatched Compared

This table presents summary statistics of the paired sample T-test and Wilcoxon signed rank test for the unmatched data set for the operating performance metrics such as Gross margin, Return on Assets and Return on Equity. Under mean, we present a comparison of the mean values of the non-green versus the green companies. A negative value under the column ‘paired difference’ signifies that the green outperformed the non-green in absolute percentage terms while a positive value shows that the non-green performed better.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Non - Green</th>
<th>Green</th>
<th>Paired difference</th>
<th>Level of significance</th>
<th>Standard Deviation</th>
<th>Test Statistics b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Mean</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>T - test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Standard Deviation</td>
<td>Non - Green</td>
<td>Green</td>
<td>Z</td>
<td>Asymp. Sig. (2-tailed)</td>
<td></td>
</tr>
<tr>
<td>Gross margin</td>
<td>98</td>
<td>33.71%</td>
<td>31.87%</td>
<td>1.85%</td>
<td>20.37%</td>
<td>18.82%</td>
<td>-0.431 a</td>
</tr>
<tr>
<td>Return on Assets</td>
<td>82</td>
<td>6.37%</td>
<td>3.43%</td>
<td>2.93%</td>
<td>5.22%</td>
<td>7.18%</td>
<td>-2.624 a</td>
</tr>
<tr>
<td>Return on Equity</td>
<td>79</td>
<td>15.48%</td>
<td>8.23%</td>
<td>7.25%</td>
<td>11.74%</td>
<td>15.62%</td>
<td>-2.918 a</td>
</tr>
</tbody>
</table>

Note:
Symbol              Level of significance
*                    10% or less
**                   5% or less
***                  1% or less

a. Based on positive ranks
b. Wilcoxon Signed Ranked Test
### Table 9: Raising Capital Performance – Matched Compared

This table presents summary statistics of the paired sample T-test and Wilcoxon signed rank test for the matched data set, in determining which of the greens or non-greens, are better able to raise capital. Under this broad heading, we considered capital from equity growth, cash flows from financing activities and growth in total liabilities, over a five-year period. Under mean, we present a comparison of the mean values of the non-green versus the green companies. A negative value under the column ‘paired difference’ signifies that the green outperformed the non-green in absolute percentage terms while a positive value shows that the non-green performed better.

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>T - test</th>
<th>Wilcoxon Signed Ranks Test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Non - Green</td>
<td>Green</td>
</tr>
<tr>
<td>5-year growth in equity</td>
<td>38</td>
<td>30.03%</td>
<td>72.50%</td>
</tr>
<tr>
<td>5-year growth in Cash flow from Financing</td>
<td>32</td>
<td>-82.15%</td>
<td>65.86%</td>
</tr>
<tr>
<td>5-year growth in Total liabilities</td>
<td>31</td>
<td>19.78%</td>
<td>33.85%</td>
</tr>
</tbody>
</table>

Note:
- **Symbol**
  - *: 10% or less
  - **: 5% or less
  - ***: 1% or less

- **Level of significance**
  - a. Based on positive ranks
  - b. Wilcoxon Signed Ranked Test
Table 10: Raising Capital Performance – Unmatched Compared

This table presents summary statistics of the paired sample T-test and Wilcoxon signed rank test for the unmatched data set, in determining which of the greens or non-greens, are better able to raise capital. Under this broad heading, we considered capital from equity growth, cash flows from financing activities and growth in total liabilities, over a five-year period. Under mean, we present a comparison of the mean values of the non-green versus the green companies. A negative value under the column ‘paired difference’ signifies that the green outperformed the non-green in absolute percentage terms while a positive value shows that the non-green performed better.

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Non - Green</th>
<th>Green</th>
<th>Paired difference</th>
<th>Level of significance</th>
<th>Non - Green</th>
<th>Green</th>
<th>Z</th>
<th>Asymp. Sig (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5-year growth in equity</td>
<td>87</td>
<td>72.89%</td>
<td>74.16%</td>
<td>-1.27%</td>
<td></td>
<td>98.63%</td>
<td>147.99%</td>
<td>-.402</td>
<td>0.68</td>
</tr>
<tr>
<td>5-year growth in Cash flow from Financing</td>
<td>64</td>
<td>-12.20%</td>
<td>-6.59%</td>
<td>-5.61%</td>
<td></td>
<td>338.03%</td>
<td>219.69%</td>
<td>-.100</td>
<td>0.92</td>
</tr>
<tr>
<td>5-year growth in Total liabilities</td>
<td>85</td>
<td>74.38%</td>
<td>84.58%</td>
<td>-10.20%</td>
<td></td>
<td>87.36%</td>
<td>133.66%</td>
<td>-.230</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Note:
Symbol                      Level of significance          | a. Based on positive ranks          | b. Wilcoxon Signed Ranked Test
*                             10% or less                                  |                                  |
**                            5% or less                                  |                                  |
***                           1% or less                                  |                                  |

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