Data

Overview

The starting point of my data collection was the Newsweek Green Ranking which had assessed the world's largest publicly-traded companies in the US and in the world since 2009. This ranking had been developed through a collaboration between Newsweek, Corporate Knights Capital, HIP Investor Inc and leading sustainability minds from nongovernmental organizations and the academic and accounting communities. The ranking attribute an overall green score to companies. The score is based on a weighted average of key performance indicators (KPI's). This study uses these KPIs to measure both process-based and outcome-based of the 500 largest publicly-traded companies in the United States. Due to a methodology change \footnote{As a result of making a transition to a 100% rules-based approach, the methodology for the 2014 Newsweek Green Rankings differs considerably from the framework used in the 2012 Newsweek Green Rankings. Therefore ranking results prior to 2014 and ones subsequent can not be compared.} in the 2014 Newsweek Green Rankings, only the 2014, 2015 and 2016 ranking were considered. Among those three ranking and of the 500 US companies, 405 companies were listed for each years.

Even though green rankings were published in 2014, 2015 and 2016, each company is evaluated based on the 2012, 2013 and 2014 data. Therefore, measures for financial performance of companies will be based on the 2012, 2013 and 2014 fundamental data. Financial data have been mainly collected on Stockpup, Morningstar, Ycharts, YahooFinance and Alphavantage. Of the 405 initial companies, a total of 31 were dropped because of missing data. The final sample includes 374 publicly-traded companies in the US covering the period from 2012 till 2014 inclusively.

Table 1 describes my variables and following sections deeply explained each variables.

Dependent Variables

Regarding dependent variables, @EndrikatMakingsenseconflicting2014 claim that accounting-based measures (e.g. ROA, ROE, Return on Sales) capture immediate impacts and can be used as a proxy to measure short-term CFP while market-based measures (e.g. Tobin's Q, market capitalization, market to book value) integrate estimations of a firm's future prospects and can be better used as a proxy for long-term CFP. Among scholars using both measures simultaneously, ROA and Tobin's Q are the most frequent [@Lioui2012, @Cavaco2014, @Muhammadrelationshipenvironmentalperformance2015, @Delmas2015, @Semenova2016, @ManriqueAnalyzingEffectCorporate2017]. Therefore this study uses ROA and Tobin's Q as a proxy for both short and long-term CFP.

ROA is a standard accounting measure of financial performance, which is calculated by dividing earnings before interest by total firm assets. Tobin's Q is defined as the ratio of the market value of a firm to the replacement cost of its assets [@Chung1994]. Broadly speaking, firms displaying Tobin's Q greater than one are judged as using scarce resources effectively and those with Tobin's Q less than one as using resources poorly [@Lewellen1997]. In other words, investors prefers companies with Tobin's Q superior to one. Due to the complexity of calculating the replacement cost of a firm, the literature have seen several attempts to approximate Tobin's Q [@Perfect1994]. Tobin's Q value had been directly collected on Ycharts and this platform use the simple approximation of @Chung1994 which is summarized in Equation 1.

$$Tobin's Q = \frac{MVE + PS + DEBT}{TA} \tag{1}$$

where MVE is the product of a firm's shares prices and the number of common stock shares outstanding, PS is the liquidating value of the firm's outstanding preferred stock, $DEBT$ is the value of the firm's short term liabilities net of its short-term assets, plus the book value of the firm's long-term debt and TA is the book value of the total assets of the firms.

Table 1: Variables Description

	Variables	Description
1	ROA	Earnings before interest over total firm assets
2	Tobins Q	The ratio of a firm's market value to the replacement cost of its assets
3	Carbon Productivity	Revenue ($US) / Total Greenhouse gas Emissions (CO2)
4	Water Productivity	Revenue ($US) / Total water (m3)
5	Waste Productivity	Revenue ($US) / [Total waste generated (metric tonnes)–waste recycled/reused (tones)]
6	Sustainability Pay Link	A mechanism to link the remuneration of any member of a company's senior executive team with the achievement of environmental performance targets. Dummy variable which equals 1 if such a link exists and 0 otherwise
7	Sustainable Themed Commitment	Refers to the existence of a committee at the Board of Directors level whose mandate is related to the sustainability of the company, including but not limited to environmental matters. Dummy variable which equals 1 if such a committee exists and 0 otherwise
8	Audit Score	Refers to the case where a company provides evidence that the latest reported environmental metrics were audited by a third party. Dummy variable which equals 1 if such evidences exist and 0 otherwise
9	Capital Structure	The ratio of long-term debt to common shareholders' equity (shareholders equity minus preferred equity)
10	Growth	The ratio of earnings to revenue
11	Firm Size	Log of total assets
12	Industry	Global Industry Classification Standard (GICS) of the firm. The variable take a value from 1 to 10 where 1 = Consumer Discretionary, 2 = Consumer Staples, 3 = Energy, 4 = Financials, 5 = Health Care, 6 = Industrials, 7 = Information Technology, 8 = Materials, 9 = Pharmaceuticals / Biotechnology, 10 = Telecommunication Services and 11 = Utilities
13	Financial Risk	Jensen's alpha measured as the stock return - [Risk Free Rate + Stock Beta * (Market Return - Risk Free Rate)]

Table 2 contains a sample of my database. Some missing values appears in the TobinsQ column. Compared to ROA, calculating Tobin's Q requires a relatively high number of financial variables and is more susceptible to missing values. This creates a disparity among the number of observations for each dependent variables. @Delmas2015 encountered the same issue and conducted an identical analysis to check whether this introduces sample bias. **Therefore I will do the same and depending on the robustness of results I will use one or two sample spaces in my study. I still need to figure out how to perform this test in R.**

Table 2: Sample selection of the database

	Companies	Year	ROA	TobinsQ
1-2013	1	2013	0.07	1.07
1-2014	1	2014	0.05	1.03
1-2015	1	2015	0.05	1.54
2-2013	2	2013	0.08	0.36
2-2014	2	2014	0.06	
2-2015	2	2015	0.06	
3-2013	3	2013	0.18	1.42
3-2014	3	2014	0.19	1.53
3-2015	3	2015	0.19	1.63
4-2013	4	2013	0.06	2.18

Independent Variables

Concerning independent variables, both process-based and outcome-based CEP had been approached with the KPI's of the Newsweek Green Ranking. More precisely, I have used "Sustainability Pay Link", "Sustainability Themed Committee", and "Audit" as a proxies for process-based CEP and "Energy Productivity", "Carbon Productivity", "Water Productivity" and "Waste Productivity" as a proxies for outcome-based CEP [1].

A Sustainability Pay Link is a mechanism to link the remuneration of any member of a company's senior executive team with the achievement of environmental performance targets. A score of 1 accrues to the company when such a link exists and a score of 0 is attributed if there is no such link in place.

A Sustainability Themed Committee refers to the existence of a committee at the board of directors level whose mandate is related to the sustainability of the company, including but not limited to environmental matters. A score of 1 accrues to the company when such a link exists and a score of 0 is attributed if there is no such link in place.

An Audit Score refers to the case where a company provides evidence that the latest reported environmental metrics were audited by a third party. A score of 1 if such an audit has been performed, and a score of 0 is given when such audit was not performed.

Carbon Productivity (i.e. CaP), Water Productivity (i.e. WatP) and Waste Productivity (i.e. WastP) are calculated through equation 2, 3 and 4.

$$CaP = \frac{Revenue}{TGGE} \tag{2}$$

$$WatP = \frac{Revenue}{TW} \tag{3}$$

$$WastP = \frac{Revenue}{(TWG - TWRR)} \tag{4}$$

where $Revenue$ is the total revenue in US\$, $TGGE$ is the total greenhouse gaz emissions in co_2, TW is the total water in m_3, TWG is the total waste generated in metric tons and $TWRR$ is the total waste recycled and reused in metric tons.

[1] Newsweek Green Ranking have another KPI that capture outcome-based CEP, namely Energy Productivity. Inserting this variable into my models create multicollinearity (Variance Inflaction Factor superior to 5 for both Energy and Carbon Productivity). Consequently I do not consider this KPI in my models.

Control Variables

Several scholars [@Telle2006, @McWilliams2006, @Surroca2010] have argued that misspecified models may be the reason for the inconsistency of the empirical results in the CEP-CFP nexus. In order to improve the construct and to avoid the endogeneity issue due to omitted variables [@Roberts2013], @EndrikatMakingsenseconflicting2014 have highlighted potential determinants of the relationship between CEP and CFP : firm size, industry sector, financial risk, R&D activities, advertising intensity and capital structure (i.e leverage). In a meta-analysis study, @Ludecadedebatenexus2014 argued that growth rate is equally important. Consequently this study use those seven variables control.

The common way to approach *firm size* is to use the natural logarithm of total assets [@Delmas2015, @MiroshnychenkoGreenpracticesfinancial2017]. To approach the company *industry sector* I use the Global Industry Classification Standard (GICS) [2]. A dummy for each industry sector had been included in the model. The Beta/Jensen's alpha (**to be defined**) is adopted as aproxy for *financial risk*. *Capital structure* is approximated with the ratio of long-term debt to common shareholders' equity (shareholders equity minus preferred equity). *R&D activities* had been measured as ... (**see Ycharts**). *Advertising intensity* had been... (**see when find a way to get those data**)

[2]The GICS classification is composed of eleven industry sectors, namely : Consumer Discretionary, Consumer Staples, Energy, Financials, Health Care, Industrials, Information Technology, Materials, Pharmaceuticals / Biotechnology, Telecommunication Services and Utilities.