This is the title of my thesis

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Abstract

This is an abstract

Aknowledgments

I would like to thank some of you ...

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Introduction

Over the past decades, humanity is progressively becoming aware of the finiteness of earth's resources and its impact on the current global warming. On the one hand, Houghton and Change (1996) anticipated in their first report an average global warming between +1° and +3.5° C until 2100 relative to the temperature of 1990. They also warned that an increase of temperatures superior to +2° C could have some harsh climatic repercussions. On the other hand the Kyoto Protocol had been written in 1997, enforced in 2005 and led to the first Global Agreement on global warming during the Paris Conference in 2015. Those different solutions implemented over the past decades did not have any significant impacts on the fight against global warming. Greenhouse Gas Emissions (GGE) have still increased considerably across years. Although the environmental consciousness-raising had already gained ground, according to Jean Jouzel (2017) human being have to act now if he we want to have a chance to reduce effects of climate change.

For the last several decades, companies have been more and more considered as entities responsible for stewardship of the natural environment (Majumdar and Marcus 2001; J. Przychodzen and Przychodzen 2015). Ecosystem degradation and resources depletion engender a threat to firm's longevity (Dowell, Hart, and Yeung 2000), and as a reaction, firms have to pro-actively adopt an environmental strategy (S. L. Hart 1995). In his speech at Lloyds of London 2015, Mark Carney, Governor of the Bank of England and Chair of the Financial Stability Board (FSB), identified climate change as one of the most material threats to financial stability (Elliott 2015). To this end, companies facing higher risks associated to climate change are ones subject to greater incentives to develop green strategies (Hoffman 2005). However, both economic benefits and strategic opportunities deriving from sustainable development are usually underestimated by managers and still too many companies do not feel concerned about global warming (Berchicci and King 2007; S. L. Hart 1995). Moreover, according to Scarpellini, Valero-Gil, and Portillo-Tarragona (2016), green projects are not common in companies of many countries because of significant barriers and a negligible culture of excluding sustainable development from an organization's strategy. If we consider that people's actions reflect a variable mix of altruistic motivation, material self-interest, and social or self-image concerns (Bénabou and Tirole 2006), demonstrating that green development is a significant interest for firms could be a serious step forward in the fight against

global warming.

To be continued...

1 Literature Review

According to...

- The link between CEP and CFP. Literrature have shown that it pays to be green. However answering the question "When an how does it pay to be green?" remains unclear.
- Citation from (Endrikat, Guenther, and Hoppe 2014)

  Over the last four decades, myriad studies have sought to identify the relationship between these performance constructs. In this context, one of the most fundamental issues shaping research on the focal relationship refers to the direction of causality (i.e., whether CEP influences CFP, whether CFP influences CEP, or whether there is a bidirectional relationship) ## Subsection 1
-

1.1 Subsection 2

2 Hypotheses

Here are my three hypotheses based on Li, Ngniatedema, and Chen (2017) and Chen, Ngniatedema, and Li (2018) :

- **H1:** The higher the level of green initiatives (Pay Link, Sustainability Themed Committee and Audit), the higher the level of green performance (Energy Productivity, Carbon Productivity, Water Productivity, Waste Production and Green Revenue).
- **H2:** The higher the level of green performance (Energy Productivity, Carbon Productivity, Water Productivity, Waste Production and Green Revenue), the higher the level of financial performance (ROA and Tobin's Q).
- **H3:** The higher the level of green initiatives (Pay Link, Sustainability Themed Committee and Audit), the higher the level of financial performance (ROA and Tobin's Q).

3 Data

3.1 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 green initiatives and green performance of the 500 largest publicly-traded companies in the United States. Due to a methodology change 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 and in case of missing values I have completed with data coming from morningstar and ycharts. Of the 405 initial companies, a total of 6 companies were dropped because of missing data. The sample final includes 399 publicly-traded companies in the US covering the period from 2012 till 2014 inclusively.

The Table 3.1 contains a sample of my database. The Table 3.2 describes my variables.You can notice that there are some missing values in the TobinsQ column. Indeed,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. Delmas, Nairn-Birch, and Lim (2015) 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.

In the meantime, the function *pdim()* extracts the dimensions of both panel data,

namely *DB_Roa* and *DB_TobinsQ*, and we can observe that both are characterized as *unbalanced*. Indeed I had to remove some year observations due to missing values.

```
library(plm)
# Apply pdim on the full panel data
pdim(DB_Roa)
```

```
## Unbalanced Panel: n = 399, T = 1-3, N = 1192
```

```
# Apply pdim on the panel data without missing values of TobinsQ
pdim(DB_Tobin)
```

```
## Unbalanced Panel: n = 360, T = 1-3, N = 1060
```

Table 3.1: Sample selection of the data base

	Companies	YearFinancialIndicator	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

3.2 Dependent Variables

3.3 Independent Variables

3.4 Control Variables

Table 3.2: Variable Definition

	Variables	Description
1	Tobin's Q	The ratio of a firm's market value to the replacement cost of its assets
2	Return on Asset	Earnings before interest over total firm assets
3	Energy Productivity	Revenue ($US) / Total Energy Consumption
4	Carbon Productivity	Revenue ($US) / Total Greenhouse gas Emissions (CO2)
5	Water Productivity	Revenue ($US) / Total water (m3)
6	Waste Productivity	Revenue ($US) / [Total waste generated (metric tonnes)–waste recycled/reused (tones)]
7	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. The existence of such a link is awarded a score of 100%. A score of 0% is attributed if there is no such mechanism in place
8	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. A score of 100% accrues to the company when such link exists and a score of 0% is attributed if there is no such link in place
9	Audit Score	Refers to the case where a company provides evidence that the latest reported environmental metrics were audited by a third party. Newsweek and their research partners award a score of 100% if such audit has been performed, and a score of 0% is given when such audit was not performed.
10	Leverage	The ratio of long-term debt to common shareholders' equity (shareholders equity minus preferred equity) in abolute values
11	Net Margin	The ratio of earnings to revenue
12	Firm Size	Log of total assets
13	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

4 Methodology

Here is my methodology...

4.1 Panel Data

4.1.1 Definition of panel data

Panel data, also called longitudinal data or cross-sectional time-series data include observations on N cross section units (i.e., firms) over T time-periods.

4.1.2 Advantages of panel data :

As panel data analysis uses variation in both these dimensions, it is considered to be one of the most efficient analytical methods for data (Dimitrios Asteriou 2006). It usually contains more degrees of freedom, less collinearity among the variables, more efficiency and more sample variability than one-dimensional method (i.e.cross-sectional data and time series data) giving a more accurate inference of the parameters estimated in the model (Hsiao 2007, Hsiao (2014)).

4.1.3 Fixed or random effect model

Panel data may have individual (group) effect, time effect, or both, which are analyzed by fixed effect and/or random effect models. *A fixed effect model* examines if intercepts vary across group or time period, whereas a *random effect model* explores differences in error variance components across individual or time period. (Park 2011).

!! I need to test the fixed-random effect model of my database before moving forward !!

- Ng and Rezaee (2015) used the two-stage-least-square regressions to estimate its models.

** In case of presence of endogeneyity in an econometric model, OLS is not capable of delivering consistent parameter estimates (Wooldridge 2008).**

Citation from (Wooldridge 2008) :

> The general concept is that of the instrumental variables estimator; a popular form of that estimator, often employed in the context of endogeneity, is known as two-stage least squares (2SLS)

4.1.4 Endogeneity test

Even if panel data have a lot of advantages...

Two issues involved in utilizing panel data, namely heterogeneity bias and selectivity bias (Hsiao 2014).

Citation from Hsiao (2014):

> It is only by taking proper account of selectivity and heterogeneity biases in the panel data that one can have confidence in the results obtained.

Dang, Kim, and Shin (2015) examine which methods are appropriate for estimating dynamic panel data models in empirical corporate finance,especially in short panels of company data, in the likely presence of (1) unobserved heterogeneity and endogeneity, (2) residual serial correlation, or (3) fractional dependent variables. The bias-corrected fixed-effects estimators, based on an analytical, bootstrap, or indirect inference approach, are found to be the most appropriate and robust methods.

But Miroshnychenko, Barontini, and Testa (2017) used the OLS regressions in micro panel using the Huber-White sand wich estimator, to account for the heteroscedasticity problem... **Which method should I use?**

Hausmann test to test the random effects model for both dependant variables?

4.2 Econometric Model

The first hypothesis will be tested with T-tests on the impact of each green initiative on green performance.

Both Hypotheses two and three will be tested by regression analysis. Econometric models are based on Delmas, Nairn-Birch, and Lim (2015) and Miroshnychenko, Barontini, and Testa (2017) and started from the general form:

$$Y_{t+1} = \beta_0 + \beta_1(X_{it}) + +\beta_2(C_{it}) + \varepsilon_{it} \tag{1}$$

where Y_{t+1} is the financial performance of firm i in year $t+1$, β is the vector of estimated regression coefficients for each of the explanatory variables X_{it}, C_{it} is a vector of control variables that include financial leverage, firm size and industry sector, $\varepsilon_{it}$is the error term.

More precisely I will test six models :

Model 1 : Green Initiatives on Tobin's Q

$$TobinsQ_{it+1} = \beta_0 + \beta_1(SP_{it}) + \beta_2(ST_{it}) + \beta_3(AS_{it}) + \beta_9(C_{it}) + \varepsilon_{it} \tag{2}$$

Model 2 : Green Initiatives on ROA

$$ROA_{it+1} = \beta_0 + \beta_1(SP_{it}) + \beta_2(ST_{it}) + \beta_3(AS_{it}) + \beta_9(C_{it}) + \varepsilon_{it} \tag{3}$$

Model 3 : Green Performance on Tobin's Q

$$TobinsQ_{it+1} = \beta_0+\beta_1(EP_{it})+\beta_2(CP_{it})+\beta_3(WatP_{it})+\beta_4(WasP_{it})+\beta_5(GP_{it})+\beta_9(C_{it})+\varepsilon_{it} \tag{4}$$

Model 4 : Green Performance on ROA

$$ROA_{it+1} = \beta_0+\beta_1(EP_{it})+\beta_2(CP_{it})+\beta_3(WatP_{it})+\beta_4(WasP_{it})+\beta_5(GP_{it})+\beta_9(C_{it})+\varepsilon_{it} \tag{5}$$

Model 5 : Both Green Performance and Green Initiative on Tobin's Q

$$TobinsQ_{it+1} = \beta_0+\beta_1(EP_{it})+\beta_2(CP_{it})+\beta_3(WatP_{it})+\beta_4(WasP_{it})+\beta_5(GP_{it})+\beta_6(SP_{it})+\beta_7(ST_{it})+\beta_8(AS \tag{6}$$

Model 6 : Both Green Performance and Green Initiative on ROA

$$ROA_{it+1} = \beta_0+\beta_1(EP_{it})+\beta_2(CP_{it})+\beta_3(WatP_{it})+\beta_4(WasP_{it})+\beta_5(GP_{it})+\beta_6(SP_{it})+\beta_7(ST_{it})+\beta_8(AS_{it})+ \tag{7}$$

where :

- $TobinsQ_{it+1}$ = a proxy for a firm's financial performance
- ROA_{it+1} = a proxy for a firm's financial performance
- EP_{it} = a proxy for a firm's energy productivity
- CP_{it} = a proxy for a firm's carbon productivity
- $WatP_{it}$ = a proxy for a firm's water productivity
- $WasP_{it}$ = a proxy for a firm's waste productivity
- GP_{it} = a proxy for a firm's green reputation
- SP_{it} = a proxy for a firm's sustainability pay link
- ST_{it} = a proxy for a firm's sustainability themed commitment
- EP_{it} = a proxy for a firm's audit score
- C_{it} = a vector of control variables that include financial leverage, firm size and industry sector
- ε_{it} = the error term

Dans l'Equation 2, blabla ou dans l'équation 2

4.3 Sensitivity Analysis

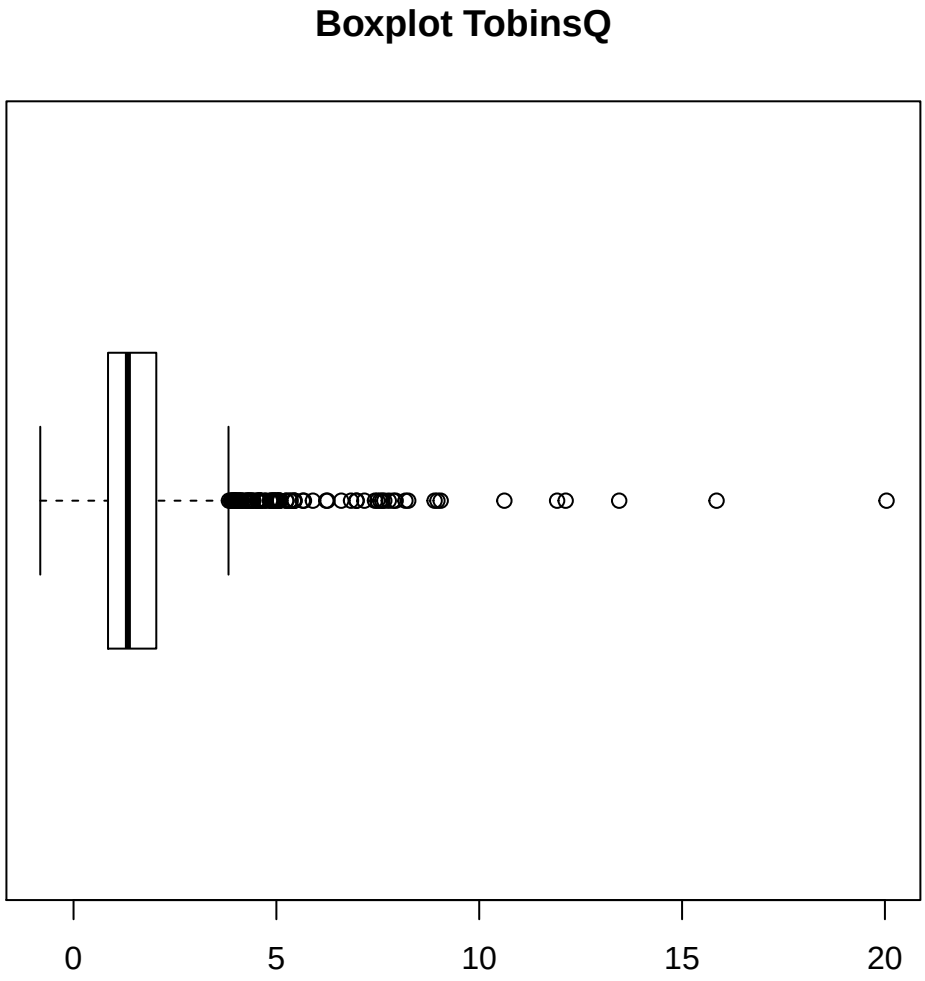
5 Results

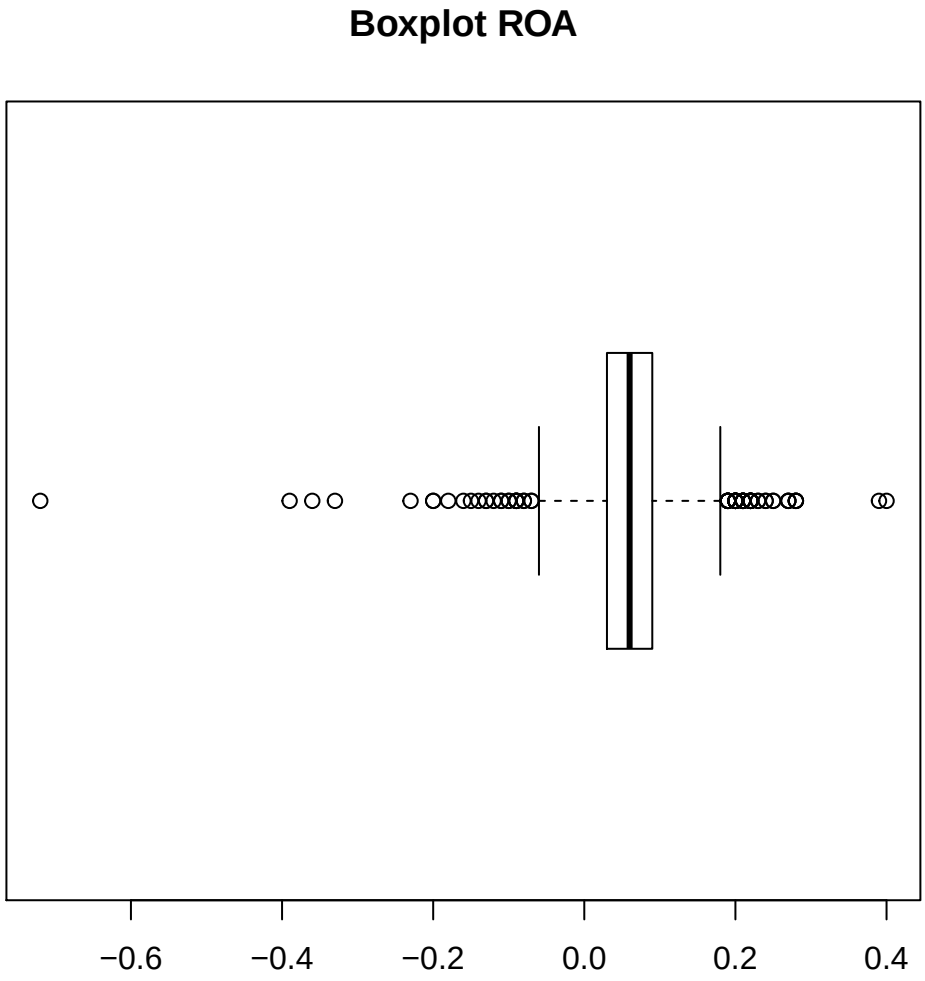
5.1 Descriptive Statistics

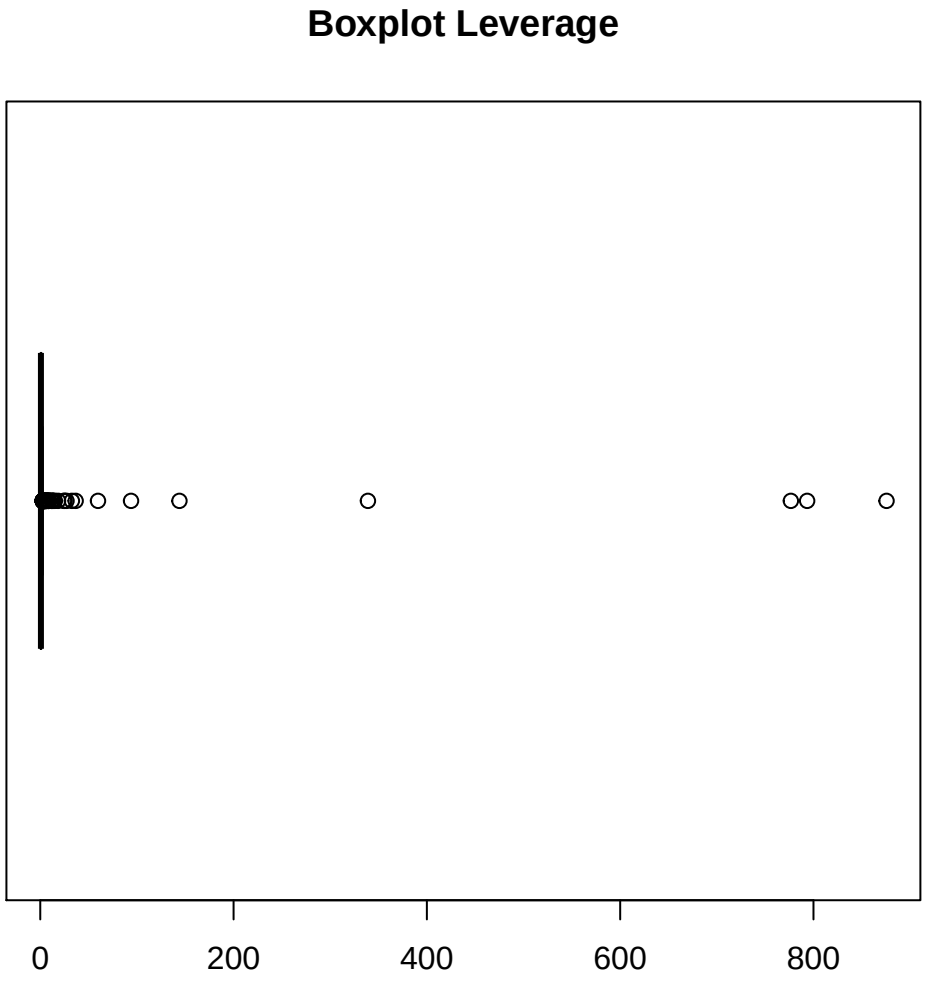
Table 5.1: Statistic Descriptive

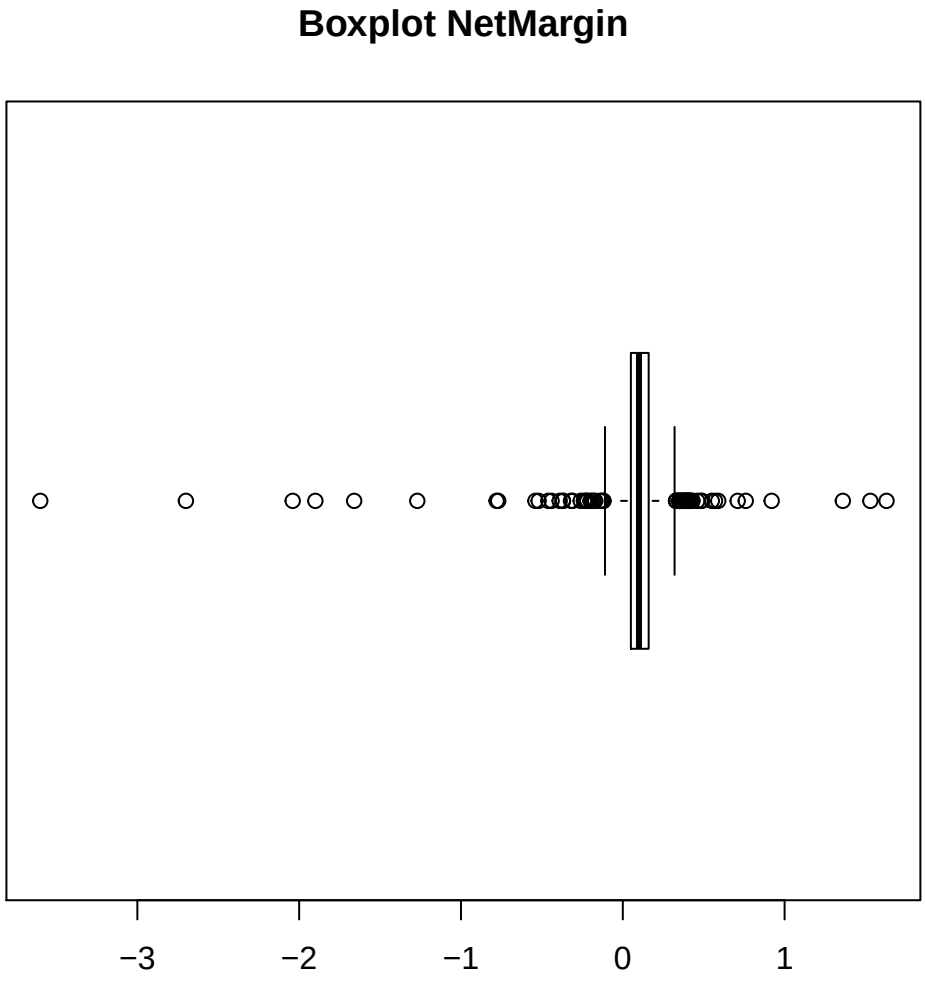
Statistic	N	Mean	St. Dev.	Min	Max
Companies	1,192	199.735	115.312	1	399
YearFinancialIndicator	1,192	2,014.001	0.817	2,013	2,015
ROA	1,192	0.062	0.070	−0.720	0.400
TobinsQ	1,060	1.738	1.679	−0.820	20.040
EnergyProductivity	1,192	0.110	0.200	0.000	0.970
CarbonProductivity	1,192	0.119	0.182	0.000	0.970
WaterProductivity	1,192	0.085	0.184	0.000	0.990
WasteProductivity	1,192	0.072	0.169	0.000	0.970
SustainabilityPayLink	1,192	0.049	0.050	0.000	0.100
SustainableThemedCommitment	1,192	0.024	0.025	0.000	0.050
AuditScore	1,192	0.023	0.025	0.000	0.050
Industry	1,192	4.589	2.666	1	11
FirmSize	1,192	10.374	0.598	8.740	13.910
Leverage	1,192	3.798	42.377	0.000	875.590
NetMargin	1,192	0.105	0.220	−3.600	1.630

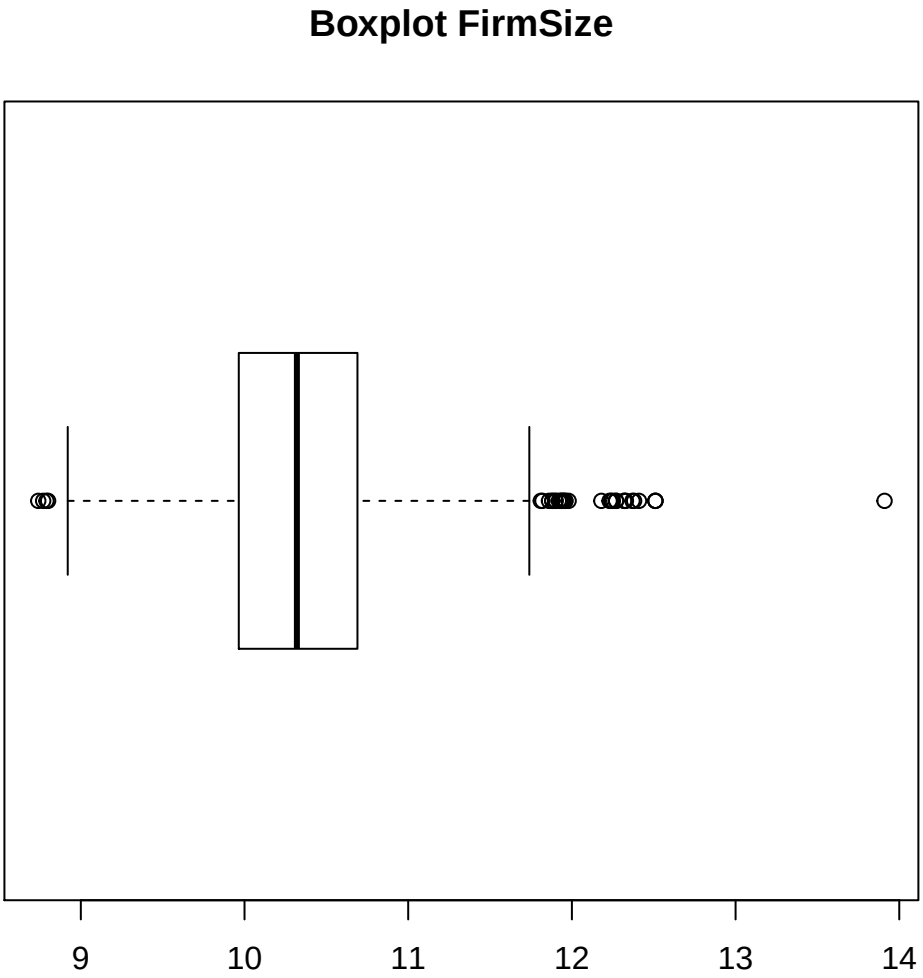
5.2 Some boxplots




Boxplot ROA
−0.6
−0.4
−0.2
0.0
0.2
0.4


Boxplot Leverage
0
200
400
600
800


Boxplot NetMargin
−3
−2
−1
0
1



5.3 ...

6 Discussion

Let's speak...

Conclusion

This is my conclusion...

Appendix

Appendix A : This is an appendix a

Appendix B : This is an appendix b

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