EXPLORING THE LINKS BETWEEN CARBON EMISSIONS PERFORMANCE, SHARE PRICE, AND DISCLOSURE

Ennis, Christopher J[a], **Tarek Montaser, Idoko Don Idoko, Samuel Idamu, Adbulla Munir, Court, Richard and Gharfalkar, Mangesh.**

[1] University of Teesside, UK

[a]c.ennis@tees.ac.uk

ABSTRACT

Increasing pressure on economic actors has produced a degree of standardization and commensuration of carbon emissions reporting and an increasing amount of comparable data is in the public domain. We have recently developed a method for interpreting this data-set to produce a league table of sustainability performance: actors are ranked according to a Performance Score comparing actual performance to the ideal direction of change of the underlying (environmental and economic) parameters, allowing direct and meaningful comparison between actors of quite different natures. The league table is applied to investigate links between emissions performance and both financial performance and the quality of voluntary disclosure of carbon performance data. Using emissions data for FTSE350 companies – publically available via the Carbon Disclosure Project – we analyze correlations between company league table performance and, on the one hand, relative share price movement and, on the other, position in the Carbon Disclosure Leadership Index. We have found no detectable indication of a link between carbon emissions performance (as measured by position in the league table) and either the quality of carbon disclosure or the financial performance of a company. The lack of linkage between carbon performance and either disclosure of share price may be due to a number of reasons: paucity of data/small effect sizes (it may be too early to see the effects); immaturely established causal mechanisms (it may be too early for the effects to manifest); share price and disclosure are not strongly related to emissions performance.

Keywords: Carbon Disclosure, Carbon Disclosure Project, Decarbonisation

1. INTRODUCTION

Climate change is a pressing issue: since the publication of the first report from the Intergovernmental Panel on Climate Change (IPCC) in 1990 global greenhouse gas (GHG) emissions have increased by 24% from 39.4 GtCO2-eq per year to 49.0 GtCO2-eq per year (IPCC, 2007). In the same period the atmospheric carbon dioxide concentration, a principle driver of global warming and climate change, increased from 354.19 ppm to 385.34 ppm (Keeling et al., 2009). Meanwhile, eleven of the twelve hottest years on record fell in the twelve year period 1995 – 2006 (IPCC, 2007), strongly suggesting a warming response of the climate system to this anthropogenic forcing.

The emission scenarios contained in the IPCC"s Special Report on Emission Scenarios (SRES) (IPCC, 2000) have been used to model a range of different possible future emission paths and forecast the end-of-century temperature ranges expected to result from them. The most optimistic scenario leads to a stabilization of the global average temperature at 2 °C above the average temperature of the last two decades of the 20th century. This scenario relies on emissions stabilization by mid-century, with a reduction in emissions growth rate before 2020. Presently, however, emissions rates are continuing to grow. Furthermore, the rate of emissions growth is on the rise: not only is the globe accelerating away from a stable future climate; the rate of acceleration is itself increasing! Raupach et al. (2007) have reported an increase in the global average emissions growth rate from 1.1% per year in the last decade of 20th century to in excess of 3% in the first four years of the 21st century. Important drivers of this increasing emission rate include increases in the carbon intensity of GDP (a reversal in the previous trend) and a decreased capacity of global ecosystems to absorb excess CO_2 (Canadell et al., 2007). Raupach et al. (2007) further make the point that all IPCC SRES emissions scenarios postulate a decrease in global carbon intensity of GDP in order to achieve a global emissions growth rate lower than that of the global economy; that is, the real trend in carbon emissions in the early part of the present century has exceeded even the most pessimistic IPCC SRES scenario.

However, there exists a tension between emissions reduction and economic growth – increased economic growth implies increased emissions unless the carbon intensity of GDP (or revenue) is reducing at a higher rate (Canadell et al. (2007) show that this is not the case at a global scale).

As a result of this tension, and the very real economic concerns underlying it, emissions performance is variously reported as changes in either extensive or intensive emissions reductions, or both. This mixed targeting and hence reporting regime leads to a general, and problematic, lack of comparability between actors.

2. DISCLOSURE AND PERFORMANCE

Outside formal emission reduction schemes such as the EUETS, carbon management is largely driven by voluntary disclosure and it is held that carbon disclosure has a role to play in climate change mitigation (DEFRA 2010). However, there is very limited literature investigating the actual relationship between carbon disclosure and carbon performance. Stanny and Ely (2008) find that large firms that are subject to close scrutiny tend to disclose more; conversely, firms with high carbon intensity are not more likely to disclose. Furthermore, Delmas and Blass (2010) find a negative correlation between carbon disclosure and carbon performance. Stanny and Ely (2008) also find no relationship between carbon disclosure and investment, lending further support to the conclusion that carbon performance is not driven by carbon disclosure. In this study, we aim to investigate whether links do exist between carbon performance (as measured by the Economically Sustainable Decarbonisation, ESD performance indicator) and both disclosure performance (measured by the Carbon Disclosure Project's Carbon Disclosure Leadership Index, CDLI) and financial performance (measured by average share price movement) of companies in the FTSE 350.

3. METRIC DEVELOPMENT

A wide range of indicators for sustainability has been devised, developed and put to use across industries and economies. (Moffat et al, 2001). However, many of these indicators become increasingly complex as they become more comprehensive (Gaussin et al, 2013). In addition even within specific types of indicator, such as the calculation of GHG emissions (PAS 2050:2011) or carbon footprint, there can be significant differences in values calculated using different methodologies (Padgett et al, (2008), in Gaussin et al, 2013). These difficulties present an opportunity to develop new approaches, such as the ESD indicator, which are specifically designed to allow comparisons between organizations using different methods, since the key aspect is that as long as the organization uses the same method from year-to-year, a valid comparison can be made on whether improvements are being made.

An absolute, external yardstick for GHG performance does exist: actors (companies, countries, governmental organizations, etc.) ultimately need to reduce emissions to a level within the carrying capacity of the environment within which they operate (Ehrenfeld, 2005). In addition, it is desirable to maintain economic prosperity. An actor whose emissions are increasing is performing less well, in one dimension, than an actor whose emissions are decreasing. Similarly, an actor whose carbon intensity is increasing is performing less well, albeit in a second dimension, than an actor whose carbon intensity is decreasing.

In both measurement dimensions the important metric is the change in the reported quantity, i.e. is the actor's performance improving or worsening? By constructing a function that simultaneously captures the change in both carbon footprint and carbon intensity, an indicator can be developed that allows measurement and comparison of GHG performance.

We have previously reported (Ennis 2010) our development of a metric that reflects historic performance and also responds to changes in carbon efficiencies (and hence underlying economic performance.

There follows a brief review of the operation of this performance indicator. For a particular actor the relative change in carbon intensity is defined as:

$$\Delta CI_n = \frac{CI_n}{CI_{n-1}} - 1$$

Where ΔCI_n is the change in carbon intensity for the *nth* reporting period of the actor. Similarly, the relative change in the carbon footprint is defined as:

$$\Delta CF_n = \frac{CF_n}{CF_{n-1}} - 1 \qquad (2)$$

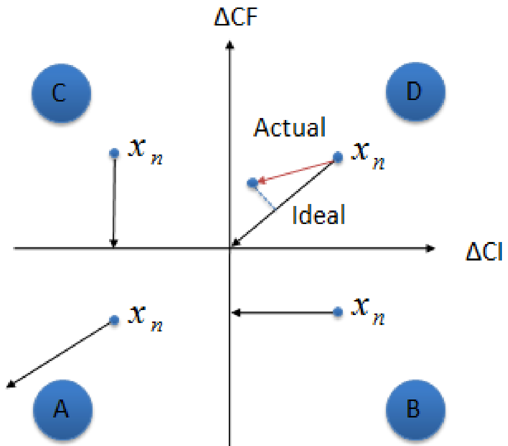
Where ΔCF_n is the change in carbon footprint for the *nth* reporting period of the actor.

Hence, changes in carbon intensity and in carbon footprint for a given reporting period, relative to the previous reporting period, define a point on a plane,

$$x_n = (\Delta CI_n, \Delta CF_n) \qquad (3)$$

The four permutations of the signs of ΔCI_n and ΔCF_n are used to define four Divisions, A to D, to one of which the actor will belong in reporting period n.

To quantify the performance of the actor within the Division to which it belongs, an ideal vector is defined that represents the future trajectory that is required to achieve the next step in the process of absolute emissions reductions. Actual performance against the ideal vector can then be quantified and used to assign a numerical measure of performance within each Division. Although the full implementation of this Economically Sustainable Decarbonisation (ESD) performance indicator is unnecessary for the work presented here, it is summarized in Figure 1 and the interested reader is directed to Ennis (2010).



$$Performance = P_{n+1} = \frac{\mathbf{A}_{n+1}^{\mathbf{T}}\mathbf{I}_{n+1}}{|\mathbf{I}_{n+1}|^2}$$

Figure 1; the operation of the ESD performance indicator, showing the four Divisions, A to D, in the quadrants.

4. SAMPLING

Companies were selected from the FTSE 350 index according to their meeting the following set of criteria:

1. Reporting scope 1 and scope 2 emissions to the Carbon Disclosure Project in the relevant years
2. Reporting emissions according to recognized protocols
3. Give a CDLI ranking in the years of interest
4. Having coincident financial and emissions reporting periods
5. Having readily available revenue data in the years of interest.

5. RESULTS

The relationship between carbon performance, as measured by the Division a company is in in a given year, and carbon disclosure performance, as measured by position in the Carbon Disclosure Leadership Index, was assessed by performing ANOVA. In 2007 there was no significant difference between the CDLI score of companies in the four divisions, the spread of CDLI score by Division being shown in Figure 2.

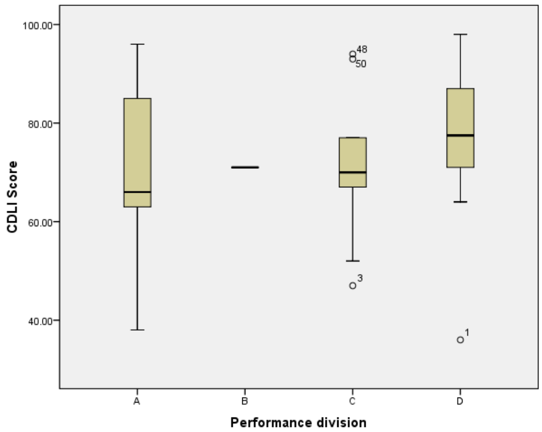


Figure 2: CDLI Score by Division for qualifying FTE 350 companies, 2007.

In 2008, using the same group of companies as were analyzed in 2007, ANOVA analysis indicated a significant difference and post-hoc tests indicated that Division C companies were likely to have higher CDLI scores than companies in Divisions B or D. Similarly, using an expanded sample reflecting improved reporting standards, significantly different scores were demonstrated by ANOVA, with post-hoc tests indicating higher CDLI scores for Division C relative to Division B.

However, in 2009, using the expanded sample, significant differences in CDLI score between Divisions had vanished.

ANOVA results for CDLI score against Division are gathered together in Table 1.

Similarly, the relationship between Division and relative share price movement, with this latter value being the change in monthly average share price for the company in the reporting year of interest, was assessed by performing ANOVA. The data set for these analyses is smaller than for the foregoing analysis of carbon disclosure performance die to share-prices being unavailable (due, for instance, to merger-and-acquisition activities).

	Degrees of freedom	*F*-ratio	*p*-value
2007	(3, 52)	0.773	5.15
2008	(3, 50)	5.28	0.003
	(3, 70)	3.505	0.020
2009	(3, 70)	0.293	0.830

Table 1: ANOVA results for CDLI score by Division.

In 2007, there was seen to be no significant effect of Division on share price. The spread of relative share price movements with Division is shown in Figure 3.

Similarly, and in contrast to the results for CDLI performance, there were no significant effects of Divisions on relative share price performance in either of the subsequent years. The ANOVA results for the analyses of the effect of Division on share price movements are gathered together in Table 2.

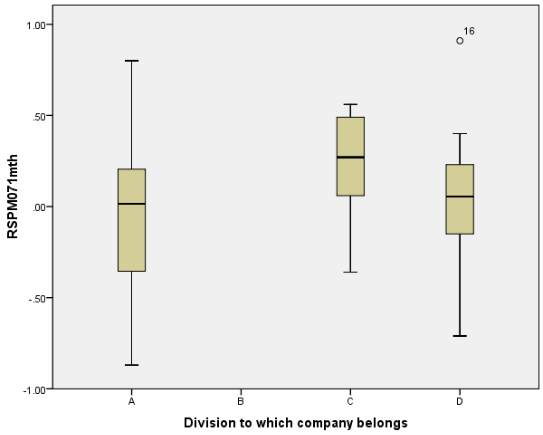


Figure 3: Annual relative share price movement (one month average) by Division for qualifying FTE 350 companies, 2007.

	Degrees of freedom	F-ratio	p-value
2007	(3,39)	0.964	0.400
2008	(2, 38)	3.08	0.058
2009	(3, 66)	1.630	0.191

Table 2: ANOVA results for relative share price movement by Division.

6. DISCUSSION

The Economically Sustainable Decarbonisation performance indicator described here is a measure of the ability of an actor to enhance their financial performance whilst increasing their environmental performance (making the assumption that environmental burden is well approximated by carbon emissions).

The results from the present study seem to indicate that share price performance and the quality of disclosure of performance are not (yet) strongly correlated to actual underlying performance.

Economic theory indicates that actors with superior performance will seek to disclose fully that performance in order to avoid information asymmetry and to differentiate themselves from inferior performers: that is, the market incentivizes disclosure among the community of good performers (Verrecchia 1983). Hence, it is expected that performance and disclosure should correlate, at least from an economic perspective.

Conversely, however, social science models demonstrate that actors whose performance is inferior will seek high levels of (perhaps low quality) disclosure in order to enhance their reputation with stakeholder communities (Clarkson et al 2008) Similarly, although stakeholder (especially institutional investor) interest and economic efficiency are drivers for carbon performance there is no clear signal that this is yet having an influence on share price. This is not surprising considering the strong financial and speculative influences on this metric. However, it is perhaps a disappointing finding that there is as yet no correlation between the best financially performing companies and the best carbon performers; that is, with the causal link operating such that, rather than good carbon performance positively influencing share price, economically excellent actors take a lead in decarbonisation.

It may be simply, though, still too early to see any such emerging causal mechanisms – driven by either excellent economic performance or excellent disclosure practices – manifesting in actual carbon performance improvements. It may also be that the signals are present but are unable to be distinguished from the noise inherent in the as yet small data sets.

In conclusion, the ESD performance indicator is a useful tool by which to analyse the performance of a variety of actors and by which to investigate drivers of carbon performance. As increasing amounts of good quality data is reported under voluntary disclosure schemes such as the Carbon Disclosure Project clearer pictures will emerge as to whether corporate strategies with respect to climate change are effective, or otherwise, at bringing about the change that is ultimately required: economically sustainable decarbonisation.

REFERENCES

Canadell, J. G., C. LeQuere, M. R. Raupach, C. B. Field, E. T. Buitenhuis, P. Ciais, T. J. Conway, N. P. Gillett, R. A. Houghton and G. Marland, (2007), "Contributions to accelerating atmospheric CO2 growth from economic activity, carbon intensity, and efficiency of natural sinks", Proceedings of the National Academy of Science, 104 (47), 18866 – 18870.

Clarkson, P. M., Y. Li, G. D. Richardson and F. P. Vasvari: (2008), "Revisiting the Relation Between Environmental Performance and Environmental Disclosure: An Empirical Analysis", Accounting, Organizations & Society 33(4/5), 303–327.

DEFRA (2010) The contribution that reporting of greenhouse gas emissions makes to the UK meeting its climate change objectives: A review of the current evidence

Delmas, M. and V. Doctori Blass (2010) "Measuring Corporate Environmental Performance: the Trade-Offs of Sustainability Ratings." Business Strategy and the Environment 19, 245 – 260.

Ehrenfeld, J. R., (2005), "Ecoefficiency: Philosophy, theory and tools", Journal of Industrial Ecology, 9 (4), 6 – 8.

Ennis, C. J., (2010) "A League Table for Economically Sustainable Decarbonisation", Proceedings of the Greening of Industry Network Conference GIN2012, Seoul, South Korea.

Gaussin, M., G. Hu, S. Abolghasem, S. Basu, M. R. Shankar, and B. Bidanda, (2013), "Assessing the environmental footprint of manufactured products: A survey of current literature", International Journal of Production Economics, 146, 515-523.

IPCC (Intergovernmental Panel on Climate Change), (2000), "Emissions Scenarios: summary for Policy makers, a special report of working group III of the Intergovernmental Panel on Climate Change", CUP (available online), IPCC, Switzerland, Geneva, 1 – 27.

IPCC (Intergovernmental Panel on Climate Change), (2007), "IPCC Fourth Assessment Report: Climate change in 2007. Contribution of Working Groups I, II and III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change", Pachauri, R.K. and Reisinger, A. (Eds.), IPCC, Geneva, Switzerland, 1-104.

Keeling, R. F., Piper S. C., Bollenbacher A. F. and Walker S. J., Carbon Dioxide Research Group, Scripps Institution of Oceanography (SIO), University of California, available online at http://cdiac.ornl.gov/ftp/trends/co2/maunaloa.co2. Accessed December 2009.

Moffat, I, Hanley, N, Allen, S., Fundingsland, M. (2001) "Sustainable prosperity: Measuring resource efficiency", Report to the Sustainable Development Unit, Department of the Nevironment, Transport and the Regions, UK.

PAS 2050:2011. "Specification for the assessment of the life cycle greenhouse gas emissions of goods and services." BSI.

Raupach, M. R., Marland G., Ciais P., LeQuere C., Canadell J. G., Klepper G. and Field C. B., (2007), "Global and regional drivers of accelerating CO2 emissions", Proceedings of the National Academy of Science, 104 (24), 10288 – 10293.

Stanny, E. and K. Ely (2008) "Corporate environmental disclosure about the effects of climate change." Corporate Social Responsibility and Environmental Management 15, 338-348.

Verrecchia, R. E.: (1983) "Discretionary Disclosure", Journal of Accounting and Economics 5(3), 179–194.

.