University of Zurich

Institute for Banking and Finance
Prof. Dr. Marc Chesney

Master Thesis

Developing a Low Carbon Equity Index Based on the S&P 500

Author:

Fabian Meister

Field of study: Business Administration

Supervisor: Brigitte Maranghino-Singer

Hand in: Zurich, 19th October 2016

Abstract

Climate risk is a severe threat to the world and polluting the air needs to stop as soon as possible. Greenhouse gas emissions, such as carbon dioxide, traps the heat in the atmosphere and are the main cause for global warming. At present, carbon emissions are still for free; but it will not stay this way, as current international climate negotiations, such as the COP 21 in 2015, have shown. Currently, there are several pricing methods being discussed which connect fees to the causes of air pollution and thus create an incentive to stimulate innovation in clean technology.

Most investors are not fully aware of the carbon exposures in their portfolios. This master thesis shows, how an investor could reduce the risk of being impaired by a global or national carbon pricing mechanism, while not underperforming the benchmark index. The aim is to develop a low carbon emission index, based on the S&P 500, using a sector-by-sector filtering approach. In a first step, considering sector specific characteristics, each company gets ranked within its sector. Afterwards, the worst performers of each sector are excluded or underweighted, depending on the threshold level. To minimize the risk of subsector differences within a sector and to maximise subsector competition, the filtering approach also compares corporation within subsectors. The so constructed indices have a higher performance and a lower carbon risk, than the benchmark index, for the tested time period.

Executive Summary

The effects of global warming are becoming more and more evident. In comparison to previous decades, the increase in temperature and its global consequences are no longer a negligible risk. Today, mankind's influence on the climate change is at least 95 per cent certain (IPCC (2014)). The major cause of global warming is greenhouse gas (GHG) emissions, caused by burning fossil fuels (IPCC (2014)). Most of today's energy demand is currently supplied by non-renewable energy. Since the whole world is affected by these changes, it is necessary that countries team up in the near future and start acting collectively to find global solutions. The Conference of Parties (COP) 21 of last December has shown that the willingness to participate is high. Negotiators from 195 countries signed an agreement to keep global temperatures "well below 2 degrees Celsius above pre-industrial levels" while pursuing "efforts to limit the temperature to 1.5 degrees Celsius" by 2100 (UNFCCC (2015b)). To fulfil this ambitious but desirable goal, carbon emissions have to decrease drastically as soon as possible.

The consequence for the economy is a radical transition towards a decarbonisation of the industry. At the moment, most investors are not fully aware of this process and underestimate carbon risks in their portfolios. For example the S&P 500, one of the most commonly followed equity indices, is highly exposed to carbon intensive sectors such as Energy or Utilities. With high probability carbon emissions will not be for free in the future (UNFCCC (2015a)). Thus, it is necessary to examine the composition of the equity portfolio in more detail and underweight or divest from critical companies and overweight companies producing or using clean technology.

The significance of divestment and portfolio screening strategies is rapidly growing, especially after establishing binding climate targets, at COP 21, last December. Since an international standard for sustainable investment does not yet exist, the need for further research and development of academic theories is highly recognised.

The aim of this master thesis is to remind investors of a potential carbon risk inherent in their portfolios and to disclose alternatives for reducing these risks. Especially, large investors such as pension funds and insurance companies, could minimize the long-term risk by underweighting problematic stocks and overweighting companies with lower carbon emissions in the same sector, while avoiding an underperformance against the benchmark. Therefore the sectors of the S&P 500 are analysed and companies in each sector are ranked by using sector specific criteria. This sector-by-sector filtering approach would lead to greater competition amongst companies to stay in the index. To avoid a bias against the largest companies, which are also likely to be the companies with the largest footprints, it is necessary to normalize the company's footprints. This could be achieved in the Energy Sector, by dividing carbon emissions by tons of output. Afterwards,

according to the ranking, the worst performers are underweighted or excluded with the objective of reducing overall carbon emissions in each sector. The primary source of carbon emission data is from the Carbon Disclosure Project (CDP) database. Since companies voluntarily disclose their carbon emission data themselves, the scientific background is problematic. To support the data, it will be double checked with different sources. Further, the author is researching papers about voluntary environmental disclosure and will use the findings on the data.

The pledges of the COP21 agreement and especially the U.S. pathway of emission reduction until 2050 are used to set three target scenarios of carbon emission reductions. Doing this, the author always want to keep in mind to achieve a low tracking error of the newly constructed index compared to a benchmark index based on the S&P 500. Especially when carbon emission prices are low, as we are experiencing right now, a low tracking error is much appreciated to avoid an underperformance (UNFCCC (2015a)). Once carbon emission prices increase, the constructed low carbon index should outperform the benchmark (Andersson, Bolton and Samama (2014)). The so constructed indices all outperformed the adjusted S&P 500 index for the analysed time period. One reason for this could be that companies with lower carbon emission footprints compared to their peers, are also more likely companies which are more established in their sector and have more financial resources.