Hochschule für
Wirtschaft und Recht Berlin
Berlin School of Economics and Law

Empirical Comparative Analysis Between Green and Non-Green Exchange-Traded Funds

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Submitted by Sofia Viana Cruz (607568)

Faculty of Business and Economics
Berlin School of Economics and Law

Supervised by:
1st Supervisor: Sebastian Block LL.M.
2nd Supervisor: Prof. Dr. Martin Uzik

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One way to invest in the financial markets while tackling climate change is through green exchange-traded funds (ETFs), which are the topic of this master thesis. As defined in Sabbaghi (2011a) and Sabbaghi (2011b), green ETFs are marketable securities that invest in stocks exhibiting positive environmental, social and governance characteristics, and track an index composed by environmentally friendly companies.

As recognized by the United Nations, climate change is anthropogenic and represents a threat to the planet and to human societies. It is an uncertain and complex issue, which is characterized by the concentrations of carbon in the global atmosphere, the degradation of forests, lakes and soils, and the decrease of water quality (Jackson 2009). As in Perkins (2003), climate change is the result of the rapid development of society, based on the abundant and limited stock of fossil fuels. This dependency has turned out costly and its consequences are of global scale, thus requiring taking action at an international level.

The signature of the Paris Agreement in 2015 marked a milestone on climate negotiations, as it was the first treaty between all nations, including the United States of America. As reported in Article 2, the main target is "Holding the increase in the global average temperature to well below 2ºC above preindustrial levels and to pursue efforts to limit the temperature increase to 1.5ºC above preindustrial levels, recognizing that this would significantly reduce risks and impacts of climate change" (United Nations 2015, p. 22). The necessary amount of climate-aligned investments required to meet this target and contribute to the low-carbon transition vary according to the calculations of each institution: USD 100 billion per year by 2020 according to the United Nations (United Nations 2015, p. 8); USD 53 trillion in the energy sector alone by 2035 as reported by the International Energy Agency (IEA 2014); and USD 93 trillion across the whole economy by 2030 in accordance with the New Climate Economy Research (Climate Bonds Initiative 2016). Apart from the numbers, it is clear that to step up against climate change, collective action must be taken in order to re-orientate financial flows from fossil fuels to clean forms of development, requiring a transformation of both economic and financial systems.

To reach economic prosperity, defined by Jackson (2009) as the ability to flourish as human beings taking into consideration the ecological limits of our finite planet, it is necessary to question the existing economic model and start the transition to a new one. A green economy is one that addresses poverty, improves human well-being, and develops social equity, at the same time that prevents environmental degradation, biodiversity loss, and unsustainable use of natural resources. This environmentally sustainable growth model is based on low carbon emissions and resource efficiency and it is the optimum trade-off between slowing down climate change while, at the same time, pursuing economic growth through cleaner sources. To achieve green growth, the capital invested in resource-intensive and polluting technologies must be shifted to newer and cleaner energy sources (Della Croce et al. 2011). The reallocation of capital means that the greening of the global financial system is crucial.

As explained by Bergman et al. (2014), financial systems are complex and are able to impact the entire economy but, at the same time, their role in sustainability is also ambivalent, as they invest both in sectors that are causing climate change, as well as in potential solutions to save the environment. According to Trapolino (2016), the private sector alone is able to reduce emissions by 40% and decrease the fossil fuel bill by USD 2 trillion. Therefore, it is important

to catalyse sufficient equity capital to finance a low-carbon and environmentally friendly economy that aims to mitigate the effects of climate change. Currently, many financial institutions are implementing environmental aspects in their businesses and, as a result of this new trend, a number of new financial instruments have emerged, including carbon finance, green funds, green bonds, international and national climate funds, green infrastructure, and socially responsible funds (Ryszawska 2016).

This paper focuses in one of those new trends: green exchange-traded funds. The main objective is to analyse the financial performance of green ETFs based on its historical returns and compare the results against non-green ETFs and the S&P500 index.

The dataset consists of 30 ETFs, trading on NASDAQ and NYSE, identified from two sources: http://etf.com and http://etfdb.com. In this study, historical financial returns are calculated based on the monthly closing price of ETF shares and downloaded from the Yahoo! Finance database, covering the period from June 2008 to May 2019.

The primary purpose of this study is to empirically investigate the extent to which environmental screening affects the level of diversification and overall performance of ETFs. In order to perform that, the methodology of the study is divided in three parts. The first part focuses on the profile of green and non-green ETFs by analysing the return generating process and performance of both groups of green ETFs and non-green ETFs. The second part studies the relationship between investment performance and degree of diversification of both groups, using measures like the Jensen's alpha, the Sharpe ratio, the excess standard deviation adjusted return and the residual variance. Finally, the third part consists in creating two equally weighted portfolios and compare their performance against each other and the S&P500 index.

In general, the analysis concluded that green ETFs have negative to zero monthly returns on average, whether including or excluding the global financial crisis. Also, the green portfolio is not immune to market volatility and green ETFs are a highly volatile instrument in both sample periods. From the analysis of three investment performance measures (Jensen's alpha, Sharpe ratio, and eSDAR), the results show that both green and non-green ETFs have a similarly poor performance with non-significant differences (at a 5% level). Green ETFs show a higher degree of diversification than non-green ETFs, but the differences lost significance in the sample period from January 2010 to May 2019. The two variables (investment performance and degree of diversification) are significantly correlated with each other only in the case of green ETFs. From the portfolios' analysis, the S&P500 index outperforms green and non-green ETFs. When comparing the two equally weighted portfolios against each other, both have negative to zero monthly returns, on average. One interesting point is that, when the last phase of the financial crisis is included in the analysis, the non-green portfolio performs slightly better than the green portfolio, while when excluding that period, the situation reverses. In that case, the green portfolio outperforms the non-green, which is also visible in the results of the arithmetic and geometric mean returns. This may be explained by the higher standard deviation of the green portfolio when compared to the non-green and the S&P500 index. Thus, green ETFs experience higher market volatility, which affected their returns during the financial crisis. After 2014, cumulative returns of both portfolios are getting closer, even though they are still negative, and in 2019 the green portfolio is able to outperform the non-green.

From this study, two main conclusions are derived regarding the performance of green ETFs. The first one is that, even until today, green ETFs are not able to outperform the S&P500 index, which goes in line with previous studies. The second one is that green ETFs are improving their performance over the years. One possible reason for the lower returns and poorer performance of green ETFs when compared to non-green ETFs in the first years of this study may be the high volatility of these instruments, thus being more negatively affected by the global financial crisis in 2008 and 2009. Other reason may be that the "green" trend in financial markets was still recent and, by that time, lacked consensus in definitions, as well as there was practically no regulation on measures and practices. Independently from what caused the bad performance of the green portfolio, it is visible that year after year is getting closer to the performance of the non-green portfolio. In my personal opinion, this proves the increasing concern over greener financial and economic systems and a cleaner growth for the society, as well as the overall sustainability of planet Earth.

This study has three main limitations: the observation period and sample data are not large enough, which can restrict the results; it considers only financial factors, disregarding behavioural considerations or other non-financial aspects that might influence performance; it is based on separating "green" from "non-green", which is not simple. The latter means that labelling a company as green does not guarantee the investor that all business procedures and processes are sustainable. For example, a clean energy investment can inadvertently destroy critical habitat. The other way around is also possible, since a non-green company may already be implementing sustainable practices in their businesses.