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Multivariate volatility in environmental finance

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Abstract

There exist several important benchmark indexes in environmental finance, some computed by well-known financial index providers such as the Dow Jones group and others by independent agencies specializing in environmentally and socially responsible investing in finance. The construction of these sustainability indexes relies on two distinct screening methods, positive and negative, which aim to include or exclude candidate companies according to sustainable economic, environmental, social and ethical criteria. We investigate the presence and the importance of multivariate effects in conditional volatility in two major financial time-series indexes, namely the Dow Jones Sustainability Index (DJSI) World and the Ethibel Sustainability Index (ESI) Global, as a way to analyse their relative inherent risk. We further investigate empirically the existence of risk spillovers across these four indexes as a mean to assess the impact of the different screening criteria. Finally, the trends and volatility of two prominent financial indexes, the DJIA and S&P500, are analysed in the same manner to provide a comparison of the performance of the two types of indexes.

JEL classification: Q5; G1; C32

Keywords: Environmental risk; Socially responsible investment; Financial risk; Shocks; Spillovers

1. Introduction

Environmental issues have become increasingly important in economic research and policy for sustainable development. Such issues are tracked by the Dow Jones Sustainable Indexes (DJSI) and Ethibel Sustainability Index (ESI) through financial market indexes that are derived from the Dow Jones Global Indexes and Standard & Poor's (S&P). The environmental sustainability activities of firms are assessed using criteria in three areas, namely economic, environmental and social. Risk (or uncertainty) is analysed empirically through the use of conditional volatility models of investment in sustainability driven firms that are selected through the DJSI and ESI (for further details see references [10,11]).

Sustainability indexes much like other stock market indexes are constructed following the traditional financial methodologies proper to the specific agencies. Aside from these traditional methodologies, sustainability indexes feature specific environmental, social and ethical screening criteria. There exist two types of screening criteria to deem a company fit to integrate in a sustainability indexes namely positive and negative. Positive screening criteria aim to

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select firms that adopt a pro-active attitude towards social, ethical and environmental issues, whereas negative screening criteria aim to exclude only those firms acting in a negative way towards these issues.

In this paper, our main interest lies in investigating whether the social and environmental screening criteria used to select firms into diverse sustainability indexes make a quantitative difference when assessing empirically the time-varying conditional variance (or risk) associated with investing in leading sustainability driven firms using multivariate models of conditional volatility. Moreover, we hypothesise that sustainability indexes featuring positive screening criteria are less susceptible to be impacted by the global market, than the sustainable indexes featuring negative screening criteria. Multivariate extensions of GARCH models such as the constant conditional correlation (CCC) GARCH model of reference [3], vector autoregressive moving average GARCH (VARMA-GARCH) model of reference [15] and VARMA Asymmetric GARCH (VARMA-AGARCH) model of reference [9] allow us to measure the spillovers across financial indexes and which ultimately enable us to test our hypothesis.

To date there seem to have been only a few empirical studies of such sustainability indexes. It is only recently that time-varying models of heteroskedasticity have been applied to sustainability indexes (see reference [10]).

The plan of the paper is as follows. Section 2 presents the environmental sustainability indexes, namely Dow Jones Sustainability and the Ethibel Sustainability Index and discusses their key features. Multivariate conditional volatility models for daily observations on the sustainability and financial indexes are presented in Section 3. The data are described in Section 4, and the empirical results are analysed in Section 5. Some concluding remarks are given in Section 6.

2. Sustainability indexes

2.1. Screening methods

The two sustainability indexes that we use in our multivariate analysis feature two different types of screening method, as a way to select firms that will be covered by the sustainability index. The type of screening methods is either positive or negative. An index may well contain positively or negatively screened companies, or sometimes both. The Ethibel Sustainability Indexes feature positive screening criteria, whereas the Dow Jones Sustainability Indexes feature negative screening criteria.

Those companies listed by the ESI tend to be pro-active in adopting and moving towards best practice on sustainability issues as required by a positive screening method. The specific criteria that are used to evaluate the positive actions and contributions to ethically, socially and environmentally sound economic activities are briefly described in Section 2.3. The criteria used may vary across the different index family. An extensive review of the different sustainability indexes and their corresponding screening criteria is provided in reference [11].

The DJSI, on the other hand, feature negative (or exclusionary) screening method. This framework seeks to exclude companies that are involved in specific and/or controversial activities such as investing in tobacco companies or the building of weapons. Typical exclusionary criteria require companies not to be involved in business activities such as environmental degradation, questionable ethics or socially unfriendly practices. We continue with a brief description of the two families of sustainability indexes.

2.2. Dow Jones Sustainability Indexes

Dow Jones Sustainability Indexes commenced in 1998, and report on the financial performance of leading sustainability driven firms worldwide (for a discussion of the DJSI indexes, see reference [10]). These sustainability indexes were created by the Dow Jones Indexes, STOXX Limited and the SAM group.

The main purpose of the DJSI is to provide asset managers with a benchmark to manage sustainability portfolios, and develop financial products and services that are linked to sustainable economic, environmental and social criteria. DJSI indexes quantify the development and promotion of sustainable values on the environment and society by the business community. They also enable the promotion of sustainability within the private sector by informing investors about firms that behave in an environmentally sustainable manner.

As for the Dow Jones Global Indexes, the DJSI features the same methods for calculating, reviewing and publishing data. The DJSI is used in 14 countries, with 50 licenses having been sold to asset managers. There are two sets of DJSI indexes, namely the DJSI World and the DJSI STOXX (which is a pan-European index). The latter index is also