Estimating Financial Risks from the Energy Transition: Potential Impacts from Decarbonisation in the European Power Sector

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Climate risk poses a significant financial risk to corporations and governments. Fearing wide-spread financial losses and a threat to financial stability, both investors and regulators are growing concerned about these risks and about how to identify, quantify and manage them. While the climate integrated assessment models (IAM) lack the financial sector model, it is essential for evaluation of companies' performance and survival, for estimating whether the financial sector is in a position to support the energy transition, and thus whether the net zero goal can be reached. This paper integrates an IAM with the adaptive capacity of the companies to meet the energy transition requirements via a structural economic model. Climate risks come in two main flavours: physical (increased danger of acute natural disasters like hurricanes, floods and droughts and chronic risks from rising sea levels and temperature changes) and transition risk (caused by the restriction and adaptation to carbon reduction policies, the evolution of new technologies and consumer preferences). The study highlighted here focused on the purely on transition risks.

The methodology allows for a comprehensive evaluation of potential financial stresses on firms, subject to binding emissions constraints. We pilot the methodology using electric utilities in the EU-27+1 and evaluate the sustainability of their corporate strategies and their financial metrics, including the probability of default and equity valuation as well as the wider implications on the sector and potential loop back into the economy.

We use the outputs of the GEM-E3/POLES IAM that provides a detailed simulation of the EU electricity market for three scenarios: business as usual, 2° and 1.5°. The key data utilised for each scenario include the target capacity per technology, capital and O&M expenditure. The total capacity from the 29 utility companies in this study is mapped across the next 30 years to the capacity prescribed by the IAM, although it assumes the extension of the current technological expertise and limiting the generation technology mix to the companies' current portfolios (with an add-on of CCS in case of fossil fuel generation). In addition to the capacity target objective, there are several corporate financial strategy constraints imposed: no new equity is raised by the companies, and the dividends are to be paid in line with the currently observed levels, the debt financing is constrained by a cap on Debt to EBITDA ratio at its current levels, the companies prefer to invest their cash over raising additional debt, and the generating capacity from companies in default continues being productive, though the ownership is transferred to a custodian (e.g. a government). Furthermore companies are taken to preserve current margins over this period. Technology demand and capital structure constraints have a significant impact on the ability of companies to adapt over time and hence the risk to bond and equity investors, this is the first time these have been combined in a dynamic evolution of a set of companies within a the EU utility market.

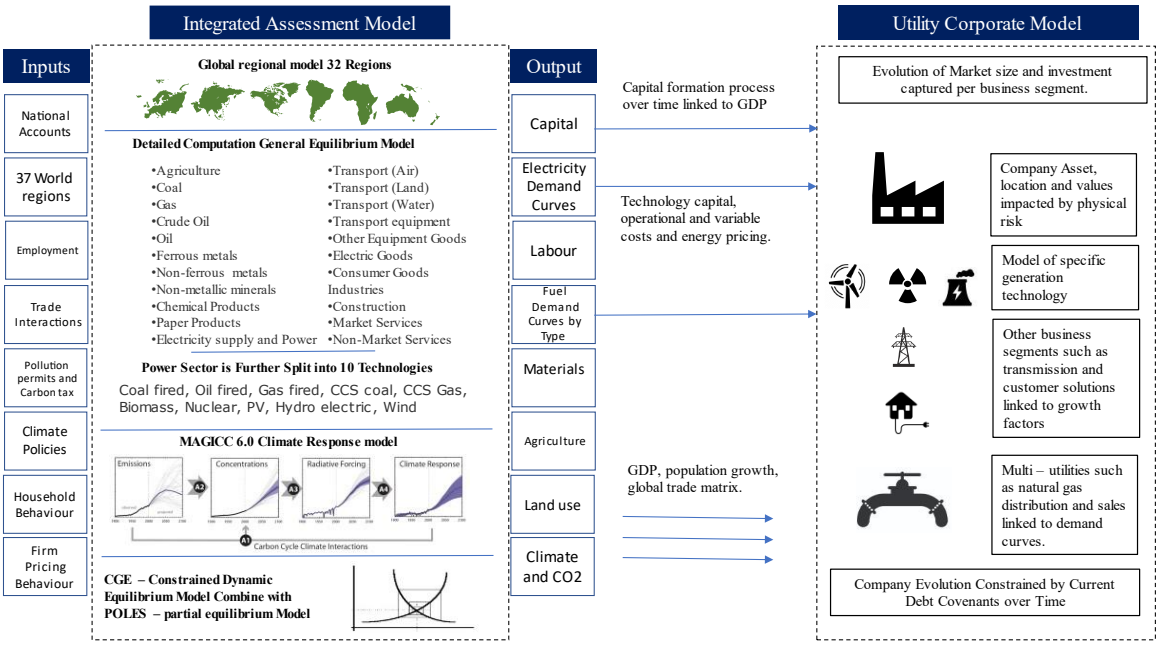

Figure 2: Diagram demonstrating the integration of a Utility Company with the Integrated Assessment Model

The companies' revenue generation is then modelled for the following 30 years, and as a result, the authors observe some divergence of the corporates' probabilities of default. Out of 29 companies, 3 are estimated to default within 5 years. Besides, the companies cumulatively do not meet the energy capacity requirement in the short term, which would have a deeper implication on the macroeconomic situation of the affected countries or create opportunities for newcomers in this industry. The latest observation holds under various electricity price assumption scenarios (linked to the currently observed profit margins).

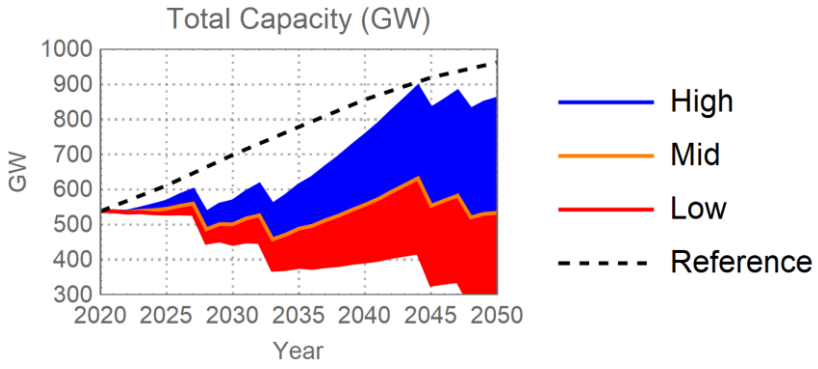

Figure 1 Plot showing the range of total capacity built for the high medium and low price

These issues are a direct consequence of the current balance sheets of the utility companies and their ability to finance the daunting infrastructure required. This creates a notable challenge for these companies to meet these needs, especially in areas such as nuclear power and renewables.

This unique multi-model combination provides a way to explore the risks and opportunities for each company and sector. The model framework produces a suite of financial metrics of the companies including equity valuation and assessment of the credit rating and credit spread. Importantly, it

provides detailed instrument level exposures (equity and bond valuations), as well as the tools for investors and risk managers to assess and make clear judgements on the model output and its assumptions.

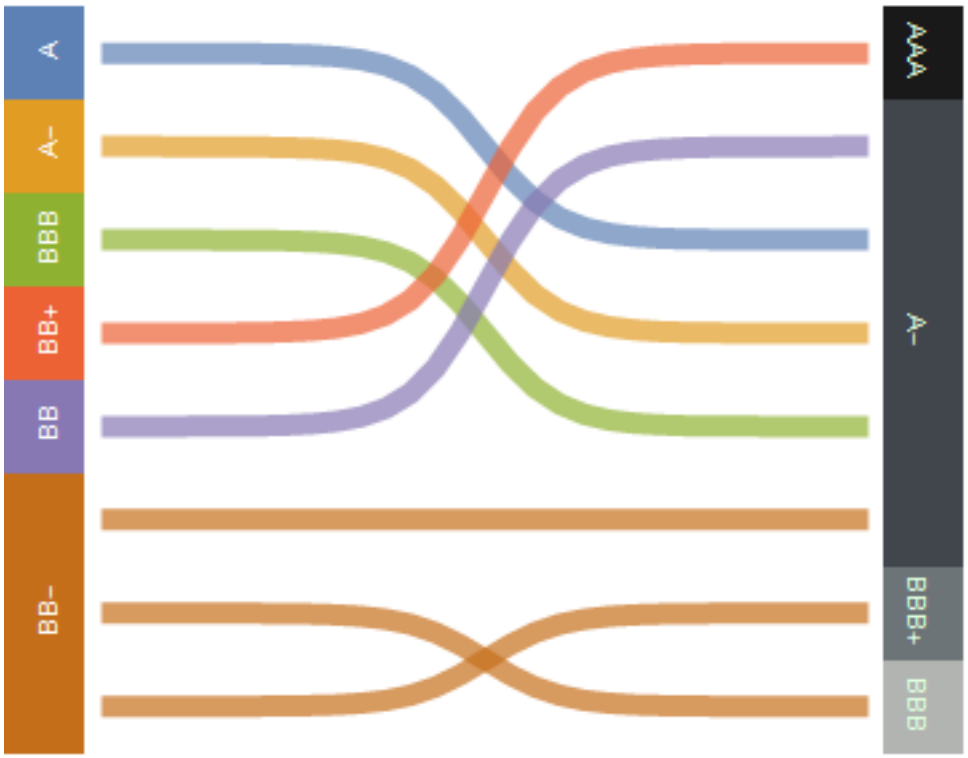

*Figure 2: Plot of rating migration from 2020 (left) – 2050 (right) for Fossil Fuel Dominated Companies (where currently over 75% of the generation capacity is provided by burning **fossil** fuels). The prices used were those derived from the GEM-E3 Model.*

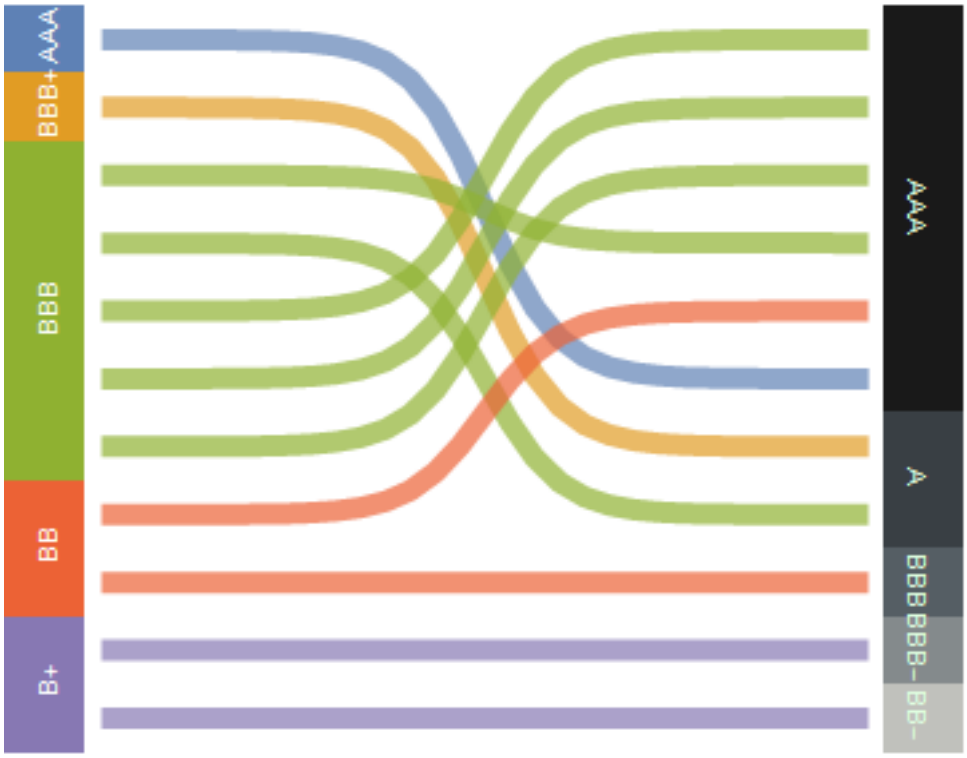

*Figure 3: Plot of rating migration from 2020 (left) – 2050 (right) for "Green" dominated companies (where currently over 75% of the generation capacity is provided from **non-fossil fuel** sources. The prices used were those derived from the GEM-E3 Model.*

This is the first time a constrained company analysis has been combined with the macro modelling framework of an IAM. The results show that aggressive climate mitigation policies affect both net profit margins and the required rate of capital expenditure. The model also produces the Initial estimates of changes in equity returns and credit quality for these firms.

For more details on the flexibility of the modelling framework the paper is available on SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3598183

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