WEATHER RISK MANAGEMENT THROUGH WEATHER DERIVATIVES - A STUDY WITH SPECIAL REFERENCE TO INDIAN POWER SECTOR

ABSTRACT

The financial exposure of a company’s earnings and cash flows attributable to fluctuating weather is termed as weather risk. Weather risk is present across many businesses and hedged by using different financial instruments or strategies, among which weather derivative is the most common one. Weather derivatives are financial derivative instruments i.e. futures and options with synthetic weather index as underlying. In recent past, weather derivative has gained huge popularity in the US and European economies, but the same is yet to be explored in India. The present study aims to assess the applicability and efficiency of weather derivative in Indian power sector, a sector which is pioneer in applying weather derivatives to mitigate weather risk. The study considers a representative power firm, Damodar Valley Corporation (DVC) to assess the weather risk mitigation efficiency of weather derivative from both generation (supply) and distribution (demand) side. The hydroelectricity generation of DVC is exposed to rainfall risk where a less than adequate monsoon rain affects the generation significantly, and the domestic demand for power is exposed to temperature risk where less than normal summer temperature adversely affects the cooling demand for power. Both of these risks are statistically assessed using regression analysis. A Put option contract based on accumulated monsoon rainfall is found suitable for hedging fluctuation of hydroelectricity production and a Put option based on accumulated cooling degree day (CDD) is found suitable to hedge the demand risk of DVC. The parameters of these instruments are estimated based on historical temperature and rainfall data and the estimated dependency of power demand and power supply on these two weather variables respectively. Next, these instruments are priced using actuarial principle. Historical burn analysis, index modeling and simulations are used for pricing purpose, with discrete time series modelling of daily temperature data in addition. The efficiency is judged through simulating the profitability of DVC with and without the weather derivatives. The study reveals that even under current semi-administrative pricing structure that exists in Indian power sector, the volumetric risk arising from rainfall or temperature fluctuation can be successfully hedged using weather derivatives and it is possible for the representative firm to attain a superior position in the efficient frontier through managing weather risk.

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