

PRICING WEATHER DERIVATIVES

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Many businesses across different sectors are exposed to weather risk. Since 1997 the weather derivatives market has provided a new approach towards reducing financial loss, effectively providing insurance against the wide variety of weather events, while presenting new speculation opportunities. These derivatives differ significantly from other financial derivatives in several ways, the most relevant being the role of physical modelling to price weather derivatives.

In more traditional financial markets prices of derivatives are calculated using techniques similar to the Black-Scholes pricing methodology, where a unique price of a derivative can be found, providing that the underlying variable can be continuously traded. For weather derivatives the underlying variable is the weather, which is not a traded asset, and the market is not liquid. Initially, prices were computed using actuarial techniques, where expected future payoffs are calculated using historical data only. This contribution explores a variety of options for going beyond the use of historical data. The aim here is not the use of forecast data near the expiry, but the generation of realistic time series of the relevant weather variable(s) which can then be used to extend the historical record. Such “weather generators” may be empirically based or they may incorporate simulation models.

Both approaches are discussed, and a new contribution to empirical modelling is presented, based upon a generalisation of the Random Analogue Predictors (RAP) of Paparella et al *Phys. Lett. A* **235**:(3) 233–240 (1997). The comparison of statistical weather generators with simulation models should provide useful feedback for simulation modellers.