

# Managing Correlated Price and Volume Risk in Electricity Markets Using Weather Derivatives

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Weather derivatives are gaining popularity as financial instruments that enables weather sensitive industries, particularly energy and agriculture, to hedge and diversify profit exposure to weather related risk. Such exposure comes from price and volume uncertainty both of which are correlated with weather. The importance of weather derivatives as risk management instruments is underscored by their rapidly growing value of trade on the Chicago Mercantile Exchange which, in 2006 reached \$45 Billion. Unlike commodity and equity derivatives whose underlying assets are tradable and have intrinsic values, weather attributes such as temperature upon which the payoff of weather derivatives are based, are not valued assets. Consequently, the market for weather derivatives is an incomplete market which is not amenable to classical pricing approaches that are based on replication and on no-arbitrage arguments. The goal of this project is to develop an equilibrium model for pricing weather derivatives where the price of such instruments is determined endogenously from their demand resulting from hedging activities and supply by financial entities willing to underwrite weather risk. We will derive optimal hedging strategies for joint price and volume risk using weather derivatives, calculate the implied equilibrium price and quantify the gains due to weather derivatives attributable to hedging and to risk sharing effects.