Valuation of spread options in presence of price spikes

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Abstract: Energy companies frequently exchange commodity (oil, gas, electricity) at one location for commodity at another location. For example, gas that a company stored far away from the place where it is actually needed can be exchanged for gas as a fuel for its power plant. Another example is conversion of one commodity into another. Gas or other fuels are converted into electricity at the power plants. Transportation of commodities can also be considered as exchange.

Exchange of one standardized commodity for another can be traded. This instrument is known as a spread option, deriving its name from the price spread between two commodities or commodity types. Its value depends on (obviously, correlated) commodity prices at both locations. A bivariate stochastic process is used to model the prices, an analogue of Black-Scholes equation is derived, and an exact solution is obtained for the value of a spread option with a fixed strike.

Application to power prices is more complex because of the possibility of sudden and very significant surges - spikes. A hidden Markov model reflects this multiphase behavior and allows to account for spikes in spread option valuation.