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MODEL ANALYSIS OF MARKETING MANAGEMENT IN THE CONTEXT OF ROMANIAN ENERGY CONTRACTS

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Abstract: *In today's economy energy market plays a major role, both by volume and value of transactions by the speed with which changes the conditions for negotiation. Romania, which has geostrategic position and its size as a producer and consumer of energy, plays an important role at the south-eastern Europe in this context. Energy markets are fundamentally different from other markets that the securities markets. Energy markets, to address different economic cycles and events compared to securities markets natural for us that energy prices have a more complex dynamic than the prices of financial assets, including succession average, heteroscedastic season and jumps.*
Key words: *energy market, management of energetic contracts*

1. INTRODUCTION

The current approach in swing contracts evaluation uses tree structure (Lari-Lavassani, Simchi & Ware, 2000 or Jaillet, Ronn & Tompaidis, 1997). This paper emphasizes a different view for evaluation and estimation of the optimum limit based on Monte Carlo Simulation, using regressive procedure. This procedure was offered by Carriere in 1996 and Longstaff & Schwartz in 2001 for the U.S. Contracts. Because Lonstaff & Schwartz paper is new, we will use this under the LSM acronym.

2. RISK- NEUTRAL EVALUATION PROCESS

2.1 Continuous process

The development of a stochastic model for electricity price represents an important area of research at the global level. Kaminski in 1997 shows that the classical GBM equation for risk-neutral which is the most common for the evaluation of financial instruments and it is not proper for energetic contracts. The main reason it's that the energy is not really a consumer good and in this case the *r* constant must be replaced with a variable parameter.

$$dSt = rStdt + \sigma StdBt \quad (1)$$

A geometric process Ornstein-Uhlenbeck (GOU) could be expressed by the next equation and could be used for modeling the reversion process. The speed reversion is controlled by α parameter. The level of equilibrium is e^k, but the level where we can find the mean reversion is not a constant usually.

$$dSt = \alpha(k - log(St))Stdt + \sigma StdBt \quad (2)$$

An important characteristic of the mean reversion process is half-time. The original concept of ***half-life*** probably comes from Physics: measuring the rate of decay of a particular substance, half-life is the time taken by a given amount of the substance to decay to half its mass. Let us define this time $t_{0.5}$

In other words t_0 is $log(k)+\mu^0$, half-life will be the time … $t_0 + t_{0.5}$ is $log(k)+\mu_0/2$.

For the second $t_{0.5}$ we supposed that the evaluation process has not random fluctuation in correlation with t_0, that is σStdBt = 0 and in this way the equation (2) becomes and the solution of the equation (3) is:

$$dSt = \alpha(k - log(St))Stdt \quad (3)$$

$$St = exp\{k + e^{-\alpha(t-t0)}(log(St_0) - k)\} \quad (4)$$

Half-life must meet the condition $\frac{S_{t_0}}{S_{t_o} + t_{0.5}} = \frac{S_{t_0} + t_{0.5}}{e^k}$ which means $t_{0.5} = \frac{log(2)}{\alpha}$.

Half-life of the GOU is $\frac{log(2)}{\alpha}$. For example, if α = 0.8, half-life is 316 days, if α = 8, half-life will be around one month, and for α = 80, it will be 3 days. See more about energy markets and mean-reversion rate in (Clewlow, Strickland & Kaminski, 2000).

LSM approach used in this paper (Longstaff & Schwartz 2001) works with the American instruments when the basic process is GBM. LSM could be considered a special situation of the value iteration.

2.2 Jump processes

In this section, we will take into consideration some methods used when the core process have discontinuities. Jumps are important characteristics of electricity evaluation. These evaluations are useful when specific events, like heat waves appear. Pham in 1997 shows the equivalence between the evaluation of U.S. Contracts and the solution of the variation complex inequalities when the evaluation process supposes jumps. The Meyer's (1998) proposal is a numerical procedure based on linear method for solving US Contracts, evaluation problems using Riccati's iterative method. The convergence of the methods is demonstrated just for the European case.

The mixture between 3 processes is considered a reasonable approach involving all these characteristics. An example like GBM for modeling the mean level of reversion on a long term, means the reversion process GOU to take into consideration the behavior on a short term and jump process (Poisson process) for the extremities. The equations are:

$$dS_t = \alpha(k_t - \log(S_t))S_t dt + \sigma S_t dB_t + dq \quad (5)$$

$$dk_t = \mu k_t dt + \sigma_k S_t dB_t \quad (6)$$

where k_t modeling the level of the mean reversion on the long term, σ_k is a parameter and dq is the jump component. In this paper, we will consider a constant level of the mean reversion.

Empirical figures are not totally compatible with the model described by the previous equations because nowadays prices decrease rapidly after the jump, but the proposed process is slow. We have many solutions for solving this difficulty but the structure of the process becomes very complex. This complex dynamics is easy to be incorporated in Monte Carlo Simulation but this is difficult to be included in other methods.

3. ENERGY CONTRACTS AND THEIR EVALUATION MODELS

Due largely to consumers' needs, electricity contracts often predict highly Option. Such a contract is the contract "Swing" which allows the holder to repeatedly exercise the right to receive additional amounts of energy within a fixed period. Exercising their individual right, known as “the swing”, can be a time (strike) between two discharges, variable or fixed K, which is agreed at the beginning of the contract.

The current approach in evaluating contracts usually “swing” using tree structures (Bins, Lavassani, Simcha & Ware, 2000) and (Jaillet, Ronn & Tompaidis, 1997). Optimal threshold evaluation and assessment of these contracts is based on Monte Carlo simulation. In order to continue the contract value, it is estimated by a regression procedure. This regression approach was proposed by (Carierre, 1996) and (Longstaff & Schwartz, 2001) for evaluating contracts with American-style features. Due to the popularity of Longstaff and Schwartz paper, we refer to it as the LS method (LSM).

The methods are easy to implement since linear regression is a standard statistical procedure, being used in all statistical software packages. In the process of approximation to swing contract idea is to estimate the limit exercise each swing has in a sequence.

It is known from classical theory of valuation of contracts that their prices are highly dependent on correct specification of the estimation process. Regarding energy contracts, specifying the problem we face an evaluation process much more complex than the common Geometric Brownian Motion (GBM) often used in contracts for the valuation of securities. Relative ease of incorporation of such dynamics is one of the attractions of the Monte Carlo method.

3.1. American type contracts evaluation of the Monte Carlo

Until recently, US-style contingency needs assessment were generally considered to be outside the simulation. Unlike European-type contracts, the contract year depends on developments in U.S. asset values and ownership decision. Supposing that the dynamics of neutral risk assessment is given by the following stochastic differential equation:

$$dS_t = \alpha(S_t, t)dt + \sigma(S_t, t)dB_t \tag{7}$$

Where B_t is a Brownian motion on a probability field (Ω, F, P). Whether the economy and interest rate r t is time when the contract matures. Let us denote $\{F_t\}_{0\le t\le T}$ by filtration generated by Brownian B_t motion,

$$F_t = \sigma(B_s, 0 \le s \le t) \tag{8}$$

We want to estimate:

$$P(t,x) = sup E\left[e^{-r\tau}h(S_\tau)\middle|S_t = x\right] = E\left[e^{-r\tau^*}h(S_{\tau^*})\middle|S_t = x\right] \tag{9}$$

Where h (S^t) is the payoff when the contract is the asset price S^τ, the supremum over all periods stoppage $t \le \tau \le T$ on the filtration $\{F_s\}_{t\le s\le T}$ and the τ* optimal time of stoppage.

There have been proposed several Monte Carlo estimations for evaluating U.S. contracts, including (Tilley, 1993), (Grant 1994), (Barraquand & Martineau, 1995). All these works proposed estimate predispositions.

The authors do not show how to estimate the magnitude of the predisposition. (Broad & Glasserman, 1997) show that no class has unpredisposed values. They avoid debating the issue of predisposition, by creating three values which are predisposed asymptotic. Another approach is proposed by Garcia in 1999.

All these works use the stratification or the parameter methods in order to estimate the transition probability and the optimum limit of the exercise or to generate links to limit the exercise.

Another direction of U.S. contracts simulation involves assessing prospects for future profits in the process of evaluating the contract. Carrier (1996), Tsitsiklis and Van Roy (1997) were the first ones to propose this idea. Carrier used regression spines to estimate the payoff function in reverse induction algorithm. A modified approach was presented by Longstaff and Schwartz in 2001. They presented the approach which improves the efficiency of general method of estimating continuous regression value and showed the applicability of the method for complex derivatives with finite differences by comparing their results with the finite difference of the approximations.

Tsitsiklis and Van Roy (2000) introduced an approximate dynamic programming method that provides theoretical support for the algorithm proposed by Longstaff and Schwartz. This field is new and very topical and investigations are ongoing.

4. CONCLUSION

The main objectives of this paper were: firstly, our goal was to develop the evaluation procedures based on Monte Carlo Method for real and financial energetic contracts and secondly we tried to develop a new technique for the variation decreasing which could be applied to early contracts.

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