Kuznetsov K. S. (Saint-Petersburg, Russia) — **On a price of European options in the model of diagonal processes setting of the Wiener-Ornstein-Uhlenbeck field.**

Let the price of the underlying asset follow the stochastic differential equation (SDE) $dx_t = \mu x_t dt + \sigma x_t dZ_t$, $x_0 > 0$, $\mu \in \mathbb{R}$, $\sigma > 0$. Process Z_t — «diagonal» process (where $s = t$), given on a centered Gaussian field over $\mathbb{R}_+ \times [0, T]$ with covariance $e^{-\lambda|s_2 - s_1|} \min(t_1, t_2)$, $s_1, s_2 \in \mathbb{R}_+$, $t_1, t_2 \in [0, T]$, $\lambda > 0$. For Z_t we can write the following $dZ_t = -\lambda Z_t dt + \sqrt{1 + 2\lambda t}\, dW_t$, $Z_0 = 0$, with standard Brownian motion W_t, $t \in [0, T]$.

Let risk-free bond follow the ordinary differential equation $dB_t = rB_t dt$, where $B_0 = 1$, $r \in \mathbb{R}_+$,— risk-free interest rate.

Теорема. *Under the mentioned above assumptions, the rational value of a european option with an exercise price K, time of expiration T and option payoff function* $\max(x_T - K, 0)$ *at the moment of time $t \in [0, T]$ can be written as follows*

$$f(x, t) = xN(d_+) - Ke^{-r(T-t)}N(d_-),$$

$$d_- = \frac{\ln \frac{x}{K} + (r - \frac{\sigma^2}{2}(1 + \lambda(T + t)))(T - t)}{\sigma\sqrt{(T - t)(1 + \lambda(T + t))}}, \qquad d_+ = d_- + \sigma\sqrt{(T - t)(1 + \lambda(T + t))},$$

where $x = x_t$ — is the price of the underlying asset at time t, $N(\cdot)$ — the cumulative distribution function (CDF) of the standard normal distribution.

To calculate the value of a european option with a payoff function $\max(K - x_T, 0)$ the «put-call> parity formula is used.

REFERENCES

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