G. I. Beliavsky, N. V. Danilova (Southern Federal University, Rostov-on-Don, Russia). About one piecewise constant semimartingale.

In the presented work, a piecewise constant semimartingale W^h is studied. Process is constructed using a two-dimensional random sequence (τ_i, δ_i), the first component $\tau_i = \tau_{i-1} + \nu_i$, $\tau_0 = 0$, ν_i – a sequence of independent and identically distributed random variables - passages of the Wiener process module, the second - a sequence of independent Rademacher random variables. New random process $W_{\tau_i} = W_{\tau_{i-1}} + h\delta_i$, $W^h_t = W_{\tau_{i-1}}$, $\tau_{i-1} \le t < \tau_i$ replaces the Wiener process in the Ito process and in the stochastic differential equation. The use of a new random process instead of the Wiener process in the classical model of Black, Scholes and Samuelson made it possible to obtain a new formula for calculating the fair price of a payment.

The main result concerns the asymptotics of the Ito formula for a given semimartingale. Let
$f(X_t) = f(X_0) + \int_0^t \left(f'(X_s)\mu_s + \frac{1}{2} f''(X_s)\sigma_s^2 \right) ds + \int_0^t f'(X_s)\sigma_s dW_s$, let
$f(X^h_t) = f(X_0) + \int_0^t f'(X^h_{s-})\mu_s ds + \int_0^t f'(X^h_{s-})\sigma_s dW^h_s + \sum_{i=1}^{N^h_t} (f(X^h_{\tau_i -} + h\sigma_{\tau_i}\delta_i) - f(X^h_{\tau_i -}) - f'(X^h_{\tau_i -})h\sigma_{\tau_i}\delta_i)$.

Theorem. If $|f^3(x)| \le M$, if $|\sigma(x) - \sigma(y)| \le L|x-y|$, then in L_2 $\lim_{h\to 0} f(X^h_t) = f(X_t)$.