Замковий О.О. ст..гр.ПК-12-2
Науковий керівник:
к.т.н., доцент кафедри комп'ютерних технологій Золотько К.Є.
(Державний ВНЗ «Дніпропетровський національний університет
ім. О. Гончара, м.Дніпропетровськ, Україна)

Statistical modeling of economic systems in equity markets

Statistical modeling method (or Monte Carlo method) is a way to study the behavior of stochastic systems (economic, technical, etc.) under conditions where the internal interaction is not certain to the full extent. This method consists in reproducing of observable physical process with the help of probabilistic mathematical model and calculating characteristics of the process [1].

The method is based on multiple tests of the constructed model, followed by statistical processing of data to determine the numerical characteristics of the process in the form of statistical appraisals of its parameters.

The majority of calculations by the Monte Carlo method are carried out using a random quasi-number [2, 3]. From the sequence of random numbers uniformly distributed in the interval [0, 1], we can freely switch over to a sequence of random numbers with arbitrary distribution law.

There is a basic relation between the random numbers that have specified distribution law and random numbers with uniform distribution law in the interval [0,1]. The general meaning of relation hereinbefore lies in the fact, that for converting a sequence of random numbers with uniform distribution law in the range [0,1] to the sequence of random numbers with a predetermined distribution function F (x) it is essential to select a random number ξ from the set of random numbers with uniform distribution law in the interval [0,1] , and solve the equation

$$F(x) = \xi \qquad (1)$$

with respect to the variable x.

Solution of the equation represents a random number from a collection of random numbers with a distribution function F (x). [1]

In a case where $f(x)$ density of probability is given instead of F(x) distribution function, relation (1) becomes:

$$\int_{-\infty}^{x} f(x)\,dx = \xi \qquad (2)$$

For series of the most frequently encountered in the real economy distribution laws, was found the analytical solution of the equation (2), the results of which are adduced in table 1.

Table 1

Formulae for simulation of random variables

Variates distribution law	Density of distribution	Formula for simulating a variate
Exponential	$f(x) = \lambda e^{-\lambda x}$	$x_i = -\frac{1}{\lambda}\ln \xi_i$
Weibull	$f(x) = \frac{a}{b}\left(\frac{x}{a}\right)^{a-1} exp\left(-\left(\frac{x}{b}\right)^{a}\right)$	$x_i = -b\left(\ln \xi_i\right)^{\frac{1}{a}}$
Gamma distribution (η-Integer)	$f(x) = \frac{\lambda^n}{\Gamma(\eta)} e^{-\lambda x} x^{\eta-1}$	$x_i = -\frac{1}{\lambda}\sum_{j=1}^{\eta} \ln(1-\xi_i)$
Gaussian	$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\frac{(x-x)^2}{2\sigma^2}}$	$x_i = x + \sigma\left(\sum_{i=1}^{\eta} \xi_i - 6\right)$

Improvement of approaches to the use of hypothesis of random effects influence on market parameters in the course of assessing the fair value of risky assets in stock markets will allow to formulate the most advantageous strategy for investors.

Список літератури:

1 Бережная Е.В., Бережной В.И. Математические методы моделирования экономических систем: Учеб.пособие. - 2-е изд.,перераб.и доп.—М.:Финансы и статистика, 2006.- 432 с :ил..

2.Христиановский В.В. Экономико-математические методы и модели: практика применения в курсовых и дипломных работах: учебное пособие/ В.В. Христиановский, Т.В. Нескородева, Ю.Н. Полшков; под ред. В.В. Христиановского– Донецк: ДонНУ, 2012. – 324 с.

3.Моделі і методи соціально-економічного прогнозування: підручник для студ. вищ. навч. закл. / В.М. Геєць, Т.С. Клебанова, О.І. Черняк та ін.; Харківський нац. экон. ун-т. – 2-ге вид. – Харків: Інжек, 2008. – 394 с.