**Shkolnyi O., Khavruk V. Mathematical methods of analysis and forecasting of the crime on the basic of seasonal indicators**

Seasonality of crimes is not sufficiently studied by scholars of the legal field. The study of seasonal fluctuations of certain types of crimes has an important theoretical and practical significance. The main problem is the allocation of those crimes, which are most typical phenomenon of seasonality. In this article, an attempt is made to find out the seasonality of the most common crime in Ukraine – theft.

The investigation of crimes of theft was carried out on the basis of a statistical method that involves the identification and measurement of seasonal variations - the calculation of the average (arithmetic mean) of this type of crime by months, the comparison of monthly data with the average level for the year. The main indicator that characterizes the seasonality of the crime is the seasonality index. The indices of the seasonality of theft crimes are calculated in three ways and are summarized in the corresponding table. Analysis of theft crimes over the seasonality indexes, using statistical data for 2017, allows to state that the peak is in March, the crime rate falls during June-September (seasonality index is 72.648%), growth is observed in the autumn period - seasonal indexes are respectively: 79.542%, 87.248%. The high level of crimes at the beginning of the year – in January (29,652) is explained by the fact that the number of recorded crimes for the reporting period is chosen as statistics, which is somewhat divergent from the crimes actually committed in January.

The statistical method makes it possible to reveal the seasonality of crimes for the past period, but does not allow the forecasting of seasonal fluctuations for the future period (calendar year). For prediction of crimes of theft, taking into account the seasonality, it is expedient to use formalized methods. For the construction of mathematical models of the seasonality of crime, the Excel software environment was used, as a result four equations were obtained – polynomials of the 6th order for each time of year (winter, spring, summer, autumn). The found boundaries of the prediction of crimes of theft in Ukraine in 2018 The results of calculations give grounds to conclude that if the trend of seasonal variations in the crime rate of theft is formed in 2016-2017, one can expect that in the winter of 2018 the number of such crimes will amount to 76,799, in the spring of 2018 – 98166, in the summer of 2018 – 82104, and in the autumn of 2018 – 54494.

Thus, the study of seasonal crime variability is a methodology that includes the following stages: calculation of seasonality indices; finding the equation for the analytical equalization of the seasonal wave; finding an aligned number of crime rates and projected values of the number of crimes.

Analysis of the latest crime statistics shows that the number of crimes of theft for the period January-February 2018 is 49971, it can be assumed that in December 2018 the number of crimes of theft will be in the range of 5000-8000, and thus, at present end of April 2018), it can be argued that the prediction model obtained on the basis of the polynomial regression equation, taking into account the seasonality, gives somewhat overestimated levels of the crime rate of theft. Given these circumstances, the mathematical model of crime prediction taking into account crime should be improved, namely: it is advisable to expand the statistical base – the time interval from 2016-2017 until 2014-2017; in the mathematical prediction model (polynomial regression equation) to provide and determine a random component; find more accurate ways to determine the average seasonality index for all seasons.

**Key words:** random value, crime, value, seasonality index, probability, quantity, theft, forecast boundary, method, month, parameter, indicator, polynomial regression equation, forecasting, year, row, seasonal wave, arithmetic mean, formula.