

МИНОБРНАУКИ РОССИИ

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Time series models in population prediction

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- The article examines linear and nonlinear time series models for predicting the population of the Russian Federation in the period from 1946 to 2020. The efficiency of population prediction using linear and nonlinear regression models is compared. Tools and time series models for predicting the population of the Russian Federation have been developed. Computational experiments were carried out, which showed the effectiveness of the proposed linear and nonlinear models

Introduction

In modern conditions, the innovative way of development is considered as one of the main directions of economic modernization. It is almost impossible to compete in the traditional field of activity in the world markets, and only fundamentally new technologies, products, and management innovations will create a new competitive environment for industrial enterprises. In turn, the increase in innovation activity will ensure high rates of economic growth, increase the capitalization of the enterprise on the scale of production. In this regard, it is of particular importance to improve the efficiency of management of innovative activities of industrial enterprises. All of the above can not be done without a thorough analysis and forecasting

Introduction

- The article examines the effectiveness of the developed mathematical models for the implementation of a retrospective population forecast for the period 1946-2020. At present, statistical prediction models are widely used in predicting population dynamics, among which regression modeling and the age translation method are particularly distinguished, which have a high area of use and an effective degree of reliability in the implementation of forecasts.

The statistical characteristics of the models

Модель	<i>MSE</i>	<i>RMSE</i>	<i>R</i> ²	F
$Y = e^{4,694 + 0,005 t}$	59,169	7,692	0,774	249,443
$Y = 109,166 + 0,635 t$	48,675	6,977	0,795	283,222
$Y = 78,69 + 16,256 \ln t$	19,879	4,459	0,916	799,163
$Y = 85,005 \cdot t^{0,1317}$	16,512	4,063	0,929	^{SD} 965,407
$Y = 93,605 + 1,8473 t - 0,016 t^2$	3,987	1,997	0,983	4298,257

Conclusion

The developed linear and nonlinear regression models based on time series have demonstrated high efficiency, which allows them to be used for practical applications. Linear and nonlinear time series models showing high predictive power are proposed and investigated. The effectiveness of the developed statistical methods based on linear and nonlinear models was tested. Instrumental software tools for predicting the population of the Russian Federation based on the developed

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