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## ANNOTATIONS OF THE ARTICLES

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### THE AGGREGATION OF INDICATORS OF VOLATILITY WITH NONLINEAR TRENDS

*The article discusses the methods of aggregating volatility in production performance when the nonlinear trend of the individual aggregates with the aim of creating a sustainable population as a whole. The logical essence of the problem lies in the fact that the variation of the trait in different population units is partly due to the General signs, and partly different, independent characteristics, consequently, fluctuations (volatility) may be partially coordinated in magnitude and time, and partly inconsistent. In this case, when aggregating, i.e. the transition to the population as a whole, as a rule, one should expect that fluctuations of the aggregate basis of the aggregate will be less than the fluctuations in average for the population units (the average of the oscillations in units of population). In this course, there are those units together, for which the volatility (variability) is less than the aggregate, as indicators of variability (volatility) within the aggregate range. Aggregation only reduces the average size of the fluctuations, and hence increases the resistance trait. The study of aggregate volatility (variability) allows us to note its decline in the aggregate that has both scientific and practical significance, for example, in the system of state regulation of agrifood market.*

**Keywords:** aggregate volatility, nonlinear trends, agricultural market, the effect of aggregate volatility.

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### STATISTICAL STUDYING OF INVESTMENT PROCESS IN ORENBURG REGION

*The indicators analysis characterizing sustainable development of capital stock investment is: actual volume index of capital stock investment, capital stock investment per capita, supply of apartment houses. The structural changes in investment activities by the types of fixed assets, ownership forms, directions of investment are presented*

*in this article for the last five years. The author analyzed the main financing sources for capital stock investment, types of economic activity for organizations that are not small business entities. Regional clustering of Volga Federal District by the five characters that describe investment and construction activities is carried out using STATISTICA package. As a result of the statistical analysis, the clusters are revealed by the indicators activity rate what has allowed obtaining information about the federal subjects of Volga Federal District with high, medium and low functioning level of real economy sector.*

**Keywords:** investment, investment activity, financing sources, cluster.

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#### STATISTICAL ANALYSIS OF PROFITABILITY AND RISKS REGARDING INVESTMENT IN SHARES OF RUSSIAN COMPANIES

*A share is one of the most common financial instruments at the Russian stock market. Investment in shares over a long time horizon has always given a positive result, and statistical tools developed for its analysis and evaluation can be implemented with other financial instruments, such as bonds or mutual investment funds taking into account characteristics of these assets.*

*The aim of this study is statistical analysis of shares' profitability and risks, both individually, and as a part of the investment portfolio, as well as development procedure of effective investment portfolio considering investor's preferences and specific features of the Russian stock market.*

*The study's results will be useful for a wide range of analysts and researchers dealing with the problems of modeling and forecasting of financial indicators.*

**Keywords:** shares, indicators of shares' profitability and risks, methods of shares' selection for investment purposes.

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## **ECONOMETRIC MODELING OF ECONOMIC GROWTH IN MARI EL REPUBLIC**

*In modern conditions of regions' economic independence, a significant transfer of responsibility center in solving problems of complex social and economic development on the regional and municipal level, the establishing of an appropriate system of monitoring, assessment and forecasting of social and economic development is a requirement for organizing an effective regional management system. The purpose of this article as one of the research stages is development and testing of assessment methods for socio-economic development of Mari El Republic by constructing econometric models for the main indicators of region's economic and social development. The proposed models allow forecasting the main indicators of region's socio-economic development. Moreover the assessment of real level of regional socio-economic development obtained on the basis of this methodology will allow more objective allocating budgetary resources in the region between municipalities of Mari El Republic.*

**Keywords:** economic growth, correlation coefficient, econometric models, forecasting.

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#### STATISTICAL DISTINCTIONS ANALYSIS OF POPULATION INCOME AND SPENDING IN SUBJECTS OF VOLGA FEDERAL DISTRICT

*Studying of territorial distinctions under the conditions of unstable economy has increasingly larger role for purposes of living standards improvement and forming conditions for economic entities development. One of the main conditions for region's effective management at different governance levels is determination and accounting of different disproportions as they lead to strengthening of uncertainty and variability for directions of social and economic development. In this regard the article's purpose is to assess diversity degree of Volga Federal District's regions by income and spending indicators as it is an important component of social and economic monitoring of territorial processes that allows eliminating or reducing negative effects of regional disproportions as well as optimizing decisions that are able to smooth distinctions between territories. The indicators' analysis of asymmetry and variation in population income and spending distribution for subjects of Volga Federal District confirms increasing of territories' asymmetry by the level of average monthly gross payroll of employees and considerable variation of the district territories by the indicators of average incomes per capita and population spending.*

**Keywords:** territorial disproportions, income and consumer spending, distinctions analysis, income differences, funds coefficient, distribution asymmetry, regional asymmetry.

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### STATISTICAL METHODS FOR QUALITY ANALYSIS OF ACCIDENT MANAGERS SERVICES

*Relevance of the issue is regarded to the constant presence of traffic jams on the streets caused by the large number of road traffic accidents (RTA), which consequences the participants often find difficult to eliminate by themselves. This article's purpose is to carry out a statistical analysis of accident manager services in fixation and registration of RTA that allow identifying the main directions for efficiency improving by consequences' management of road accidents. During this study the authors implemented the certain tools of statistical methods for quality management that clearly reveled the following problems in operating process of accident manager services: low dispatch of accident manager arrival to the place of RTA; lack of a standardized procedure for papers registration; lack of proper credibility to accident managers by the road users; defects in working modes of accident managers services. This article can be useful for organization of accident managers' work and development of proper qualification criteria.*

**Keywords:** *statistical methods for quality management, traffic safety, road accident, road traffic incident, accident manager, traffic jam.*

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### STATISTICAL ANALYSIS OF PRICE DYNAMICS FOR FOOD PRODUCTS IN RUSSIAN FEDERATION

*Considering transition to market economy, the price values were changed in during economic processes. There are new approaches to the pricing study; principles of its control were changed. In the current economic situation a price is becoming a major market category and important indicator of population living standards. In this case there is an increased interest to the statistical price analysis for goods and services. Statistical indicators characterizing price changes at the market for consumer goods and services become more important by many economic and social issues. Prices are equally important for enterprises and for population. Speaking from the perspective of a family, prices for goods and services determine purchasing power of its incomes under the market conditions. Most major economic decisions are influenced by the current market prices. In this regard the article's objective is statistical study of price dynamics for food products in Russia.*

**Keywords:** consumer prices, food products, dynamics modeling, variability, forecasting, ARIMA models.

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### RESEARCH OF DYNAMIC MOTIONS IN STRUCTURE OF THE PUBLIC DEBT OF TERRITORIAL SUBJECTS OF THE RUSSIAN FEDERATION

*Regularly arising financial crises exert a negative impact on an economic condition of regions of Russia, as a result many of them can't independently fight against consequences, using only internal resources, and are forced to resort to borrowing, the purpose of writing of article which consists in measurement of changes in structure of a public debt of subjects of the Russian Federation follows from here. For achievement of an effective objective the following methods were used: tabular and graphical, and also descriptive statisticians. As the main results it is possible to call the following: growth of a public debt of territorial subjects of the federation is observed; the greatest share of a national debt is occupied by budget credits and the credits of the commercial organizations; leaders in the level of a public debt are Central and Volga Federal districts; don't cost problems of a non-return of a debt sharply as in all subjects excess of the income over national debt amount is observed. We consider that*

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*the directions of a further research of the developed subject, from a line item of statistical science, is identification and measurement of influence of socio-economic factors on a public debt of territorial subjects of the federation.*

**Keywords:** *public debt, consolidated budget, structure, dynamics, deficit, economic safety.*

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#### **BALANCED SCORECARD DEVELOPMENT FOR STRUCTURE ASSESMENT OF COMMERCIAL BANK**

*In rapidly changing situation at financial market, the banks have to perform the constant monitoring and activity evaluation. However the most applied systems and methods for efficiency assessment of enterprise functioning are not able to reflect the current changes for operational decision-making. In this regard the aim of this research is to develop a balanced scorecard (BSC) using a commercial bank as an example. The paper demonstrates possibilities of BSC implementation by using methods of fuzzy logic to assess enterprise efficiency. Thus the balanced scorecard*

helps to keep track of progress and efficiency of the bank's strategy, as well as it reflects all the processes in details. Dynamics of the developed indicators leads to a conclusion that all aggregated and integrated indicators have opportunities for growth, and the bank is functioning effectively.

**Keywords:** enterprise structure, balanced scorecard, strategy map, prospects, performance indicators.

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#### STATISTICAL ANALYSIS AND FORECASTING OF POPULATION INCOMES IN RUSSIAN FEDERATION

*Objective:* is to conduct analysis and forecasting of population incomes in Russian Federation implementing statistical tools till 2018.

*Methods:* the article presents results on comprehensive research of population income for the period 2010–2015. The analysis of structure and dynamics of population incomes in Russian Federation is conducted; Russian regions classification by the incomes level is carried out using cluster analysis; forecasting till 2018 by the trend model, multi-factor model and within clusters is performed.

*Results:* three groups of Russian regions by the level of income were obtained according to the performed classification by the cluster analysis method; forecasting by the trend equation is carried out, and possible values of income with existing tendencies for 2016–2018 are calculated. Multiple regression analysis and forecasting by fixed factors values is conducted for analyzing the interrelation between income, expenses and key macroeconomic indicators. The article presents results of population incomes forecasting within the obtained clusters according to the multiple regression equations.

*Scientific novelty:* the authors have revealed projected values of incomes level in Russian Federation generally and partly on the basis of statistical models. *Practical relevance:* conceptual issues and paper's outputs can be used in scientific and educational work while considering issues of social statistics.

**Keywords:** population incomes; dynamics; structure; cluster analysis; trend; multiple correlation and regression analysis; factor; forecast.

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### **TERRITORIAL SOCIO-ECONOMIC CONVERGENCE MEASURING OF MUNICIPALITIES AS INDICATOR OF LIVING STANDARDS**

*Quantitative measuring of living standards is one of the topic tasks in statistical science. Significant territorial differences between Russian regions on living standards criteria require improving methodological approaches to this problem solving. The article presents the author's method for living standards study of region's population based on statistical evaluation of the municipalities' convergence by socio-economic and demographic indicators for a certain time period. The study purpose is to validate the methodological approach to living standards measuring at the regional level. For this purpose, the author has studied papers on the researched topic, justified the choice of statistical methods, formed a number of indicators in the context of regional municipalities, given the statistical evaluation of parameters significance, as well as proposed its economic interpretation.*

*The next statistical methods are implemented during the study: method of regression, variations and dynamics analysis.*

*The study is based on the data from Orenburg Statistics Authority for the period 2000-2014. As a result the regressions models have been obtained that reflect dependence of living standards growth rates in Orenburg Region on its original values («convergence models»). Practical relevance of this research concludes in the possibility to adjust socio-economic policy of regional development for living standards improvement.*

**Keywords:** *quality of life, region, municipalities, regression model, convergence, statistical analysis.*

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#### PERIODICITY STUDY OF NATURAL AND MECHANICAL POPULATION MOVEMENT IN ORENBURG REGION

*The paper is devoted to consideration of demographic and migratory cycles of Orenburg region population for 1960-2015. The processes of population movement and changes continue to be one of the main objects of statistical methods application. Firstly it is caused by practical needs of population studying, as well as by mass proportions of the demographic phenomena and relative simplicity of observation. At the same time still there is no integrated practice for cycle definition, no definition for cycle stage; moreover opinions about duration of demographic cycles vary. All this facts have predetermined selection of the research objective – to reveal time series' structure for indicators of natural and mechanical population movement in Orenburg Region using modern statistical tools.*

**Keywords:** *periodicity, time series, natural population movement, mechanical population movement.*

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#### **STATISTICAL EVALUATION OF FACTORIAL CONDITIONS FOR HOUSEHOLDS CREDIT BEHAVIOR**

*The article examines the question of financial behavior of Russian households, in particular its credit behavior. The author presented statistical evaluation and modeling of factors impact on the value of credit confidence index as characteristics of households' credit behavior. A close correlation of selected endogenous variables with the impactful factor is revealed. Multidirectional trends of dollar exchange rates and credit confidence index are reflected. The useful and adequate econometric model of multiple regression for the index of households' credit confidence is obtained. The results of simulation present that dynamics of such factors as dollar average exchange rate and disposable resources of households have a strong impact on the credit confidence of Russians, while influence of the first factor is more significant.*

**Keywords:** credit behavior; credit confidence index, multiple regression modeling.

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#### STATISTICAL ANALYSIS OF MILK MARKET IN TERMS OF PRODUCTION AND CONSUMPTION IN RUSSIA AND ORENBURG REGION

*The article presents a comparative analysis of milk market in terms of production and consumption in Russian Federation and Orenburg Region. The national situation is such that the volume of dairy products consumed per capita is much higher than the volume of production. The deficit is covered by the import of milk and dairy products from abroad - the Republic of Belarus generally. The economic and political conditions at the turn of 2014 lead to accelerated development of negative trends in the dairy industry. The reverse situation can be observed on the regional market: production of milk and dairy products is higher than the volume of per capita consumption. Orenburg Region is one of the market leaders of dairy products for a long time. However, in 2014 the special economic measures influenced the decline of the regional production. The author presented the analytical leveling of trends in the volume of milk production and consumption for Orenburg Region as well as calculated predictive values of these indicators.*

**Keywords:** production, consumption, dairy products, import of milk, modeling trends, production support.

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#### STATISTICAL STUDIES OF SOME ASPECTS OF FOOD SECURITY IN RUSSIA

*The external economic threats, generate need to provide citizens with high-quality food in enough in modern*



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*Russia, closer attention to a problem of food security of the country follows from here. With respect thereto the purpose of writing of article is assessment of level of self-sufficiency by main products of food as one of aspects of food security of Russia. During a research by team of authors such statistical methods of the analysis as have been used: tabular and graphic, coefficient, cluster, correlation and regression. As the main results of the done work it is possible to call: the scheme of carrying out statistical investigation of food security of Russia is developed; availability of threat of loss of food security in connection with devaluation of ruble, fall of level of living of the population and considerable decrease in production is established; essential differentiation of subjects of Russia on the level of security with food is revealed. The received conclusions and results can be used in further researches of a problem of food security, to both independent researchers, and employees of public authorities of management.*

**Keywords:** *food security, agricultural production, food, self-sufficiency, econometric modeling.*

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#### **STATISTICAL STUDY OF CAUSES LED TO DECREASE OF CUSTOMS REVENUES TO FEDERAL BUDGET**

*The purpose of this article is identification of factors causing decrease of customs payments to the federal budget of Russian Federation. Attaining the goal the next statistical tools were used: descriptive statistics, methods of visual information and elements of time-series analysis. The following common factors were determined as a result of statistical methods application: growth in customs payments is observed in 2015 caused by the influence of aggregate factors and first of all by the economic sanctions against Russia, devaluation of the ruble in comparison to other world currencies, fall of the global prices for energy sources and not effective «tax maneuver» as well.*

*The received results will be useful for researchers in the field of foreign economic relations of Russia, and also for employees of Federal Customs Service and Federal Treasury.*

**Keywords:** *customs payments, customs revenue, federal budget, statistics, dynamics, structure, interrelations.*

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#### APPROACH TO ANALYZING AND MODELING OF SPATIAL PATTERNS IN DEVELOPMENT OF REGIONAL LAND MARKET

*Territorial imbalances of market space have significant impact on the structure and efficiency of economy, social policy, strategy and tactics of institutional changes. In this regard, the article proposes an approach to the analysis of irregularity and unbalance of economic space based on the methods and models of spatial econometrics.*

*In terms of this approach the author presents the study results of spatial patterns at the regional market of land resources in Orenburg Region. The analysis of spatial asymmetry by land value for regional administrative areas revealed a non-linear nature of its changes in terms of increasing distance from the regional center. Furthermore the similar pricing process is characterized for the two areas: higher prices are concentrated in the western part of the region, but lower prices - in the eastern part. The outputs can be implemented to develop effective methods for spatial regulation of regional economy.*

**Keywords:** *spatial heterogeneity, spatial clustering, spatial models, land resources market.*

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### **MORBIDITY STATISTICAL ANALYSIS OF PREGNANT WOMEN AND NEWBORN CHILDREN**

*The paper considers the topical issues of statistical evaluation in terms of newborn children health and pregnant women well-being. Health of the nation and each person is formed before birth, during pregnancy of a woman. Timely and relevant statistical information on morbidity of pregnant women and newborn children will be the basis for planning and implementation of health protection measures for young generation of Russian Federation. The purpose of this paper is to conduct statistical analysis of morbidity of pregnant women and newborn children. The article studies the birth rate in Russia as a whole and separately for urban and rural areas. The author analyzes the structure and dynamics of pregnant women morbidity and diseases complicating childbirth as well as prevalence of children in the first year of life. It was revealed that more than 80 % of pregnant women have various diseases, which in turn complicate childbirth process. In 2014, every third child was born sick or fell sick, every second child had respiratory diseases in the first year of life. The incidence of diabetes has the most rapid increase rate among pregnant women; and for children in the first year it's circulatory system diseases and blastomas.*

**Keywords:** morbidity, pregnancy, newborn children, dynamics, structure.

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**MULTIDIMENSIONAL STATISTICAL ANALYSIS OF OIL COMPANY'S CUSTOMER BASE**

*The paper explores heterogeneity of oil company customer base. The authors conducted multidimensional classification of contractors by indicators characterizing the business efficiency based on hierarchical and iterative methods of cluster analysis. The k-means method is chosen on the basis of functional calculation of partitioning quality. It has resulted in the three cluster groups of contractors with high, medium and low degree of business efficiency. The rating evaluation by development of integrated indicator based on multiple choice methods is performed to determine position and importance of customers in the total number of «effective/ineffective» counterparties. The total percentage of correct classification is 81 % for the logit model. The comparison showed that the data obtained with the ranking and classification of integral indicator proves the consistency of analysis results.*

**Keywords:** multidimensional classification, integrated indicator, models of multiple choice, customer base.

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### **ECONOMETRIC MODELLING AND DYNAMICS FORECASTING OF CREDIT PROVISION FOR ORENBURG HOUSEHOLDS**

*The relevance of the issue is caused by the need to study the households' credit provision in order to identify patterns of its development for future decision-making in the field of financial and socio-economic policy in households lending. The paper is focused on statistical study of households crediting in the region, which resulted in opportunity to assess the averaged dynamics of seasonal components data. The author conducted exponential smoothing and ARIMA-modeling of time series for the volume of consumer loans provided to households in the region by using STATISTICA software package. The predicted values of credit provision for households of Orenburg region considering the identified seasonality are obtained on the basis of the constructed model with 95% probability. The paper's outcomes may be useful for professionals engaged in decision-making in the field of financial and socio-economic policy in terms of lending and credit behavior of households.*

**Keywords:** consumer credit, households, time series, modeling, exponential smoothing.

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### **SCIENTIFIC AND INNOVATIVE ACTIVITY OF ORENBURG REGION**

*In modern situation innovations is a necessary condition to ensure competitive advantages of markets and high-technology production, as well as to increase the rating of manufacturing enterprises. Innovations promote: decrease in cost values; improvement of quality and production volumes of goods, works and services; investment attraction; commercial benefit; stable economic growth and expansion of activities. The results of entities' innovative activity in Orenburg Region are reflected in this article. The data about organizations, carrying out research and development, number and structure of personnel including scientific staff is provided. The purpose*

*of the article is assessment of companies' participation in organization of innovative activities. On the basis of these indicators, the cluster analysis on development of the innovative environment is carried out by the types of economic activity. The received results showed that majority of organizations is characterized by low values as innovations require considerable means; its implementation is impossible in the absence of investments and is extremely complicated in the case of adverse entrepreneurial climate. The matters shall become an object of prior attention for authorities of all levels.*

**Keywords:** innovations, scientific research, developments, post-graduate students.

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### MULTI-CRITERIA DETERMINATED TASKS OF DECISION-MAKING IN SUBSYSTEMS OF HIGHER EDUCATIONAL INSTITUTIONS

*Essentially the activities of higher education institutions are productive, but at the same time universities are complex organizational and economic systems, consisting of a large number of subsystems. For convenience of formalizing, the authors identify two integrated groups of subsystems: business and learning. The first subsystem essentially performs the function of production for the benefits of the second. Coordination of subsystems activities can be accomplished by the criteria appointment, reflecting the objectives of functioning as an educational institution and its subsystems. The article deals with the quality criteria for the selection procedure comprising four stages. The multi-criteria deterministic tasks for decision-making in the selected HEI subsystems are formulated. It is advisable to convert these tasks into one-criterion to obtain practical results. This transformation can be accomplished by a procedure consisting of five stages: to determine the type of decision-making tasks, to agree on the area of conflict, to normalize the criteria, to define the compromise scheme and the principle of appropriate optimality, as well as, to carry out the operation of criteria ranking.*

**Keywords:** higher educational institution, management, optimization, model, decision-making.

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### **THE SYSTEM OF SUSTAINABILITY INDICATORS OF THE FOOD MARKET**

*The relevance of the research problem due to the lack of statistical methods use asynchronous fluctuations in production caused by climatic variability in space and time, to create a sustainable food system. The paper focuses on a method of statistical analysis of food security within the framework of expanded reproduction. A leading approach to the study of this problem is the stability of production of main kinds of agricultural products based on both synchronous and asynchronous vibrations in the world, accounting for climatic variability. We develop a system of statistical parameters for estimating stability of production levels and trends of different forms. We show that the parameters of trend stability may serve as characteristics of cycles' presence and stability.*

**Keywords:** food security, production stability, asynchronous of production fluctuations, cycles.

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### DETECTING TIME SERIES TRENDS AND THEIR SYNCHRONIZATION IN CLIMATE DATA

*Analysis of weather and climate dynamics largely depends on reliable assessment of trends and other complex nonlinear interrelationships among atmospheric variables. However, assumptions of many conventional parametric methods for statistical inference, particularly tests for trend detection, are not satisfied by environmental data. The goal of this paper is to provide an insight into utility of modern data-driven procedures that address many limitations of the conventional parametric trend tests. The discussed methods of trend testing employ local regression and local factor methods, hybrid bootstrap, and m-out-of-n subsampling. The results of two climatological case studies demonstrate the utility of the WAVK testing procedure in initial detection of regime shifts in a non-sequential change point analysis and applicability of the new synchronism test to intercomparison of climate trends. One of the possible directions for future research is to employ the discussed testing approaches for intercomparison and scoring of multiple global climate models.*

**Keywords:** bootstrap, resampling, inference, time series, temperature, limnology, CMIP

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#### **PAYMENT FOR ENVIRONMENTAL SERVICES: THE FOREST RESOURCES MANAGEMENT**

*Environmental services from the perspective of the State have as public policy objective the conservation of natural environments as well as the coverage of vegetation that provide environmental services to society. While from the perspective of the forest owner the decisions about forest use, whether through forest extraction activities or change of land use for agricultural or urban activities, depends on the opportunity costs, the conditions of production and access to economic resources. From this perspective, the study will analyze the current institutional framework that regulates environmental services and the system of payment for environmental services giving a contrastive emphasis on the management of forest resources by forest owners and managers. The program for the Payment of Environmental Services is not a determining factor in the owner community's decision to preserve the forest and to continue providing environmental services. So the creation of the conditions for the active forest preservation through the reconstruction of community institutionalism would allow generating the basis for guaranteeing the community reproduction.*

**Keywords:** *environmental services, society, management, forest, agricultural activities, economic resources, system of payment.*

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