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## **ESTIMATION OF DSGE MODELS WITH TERM STRUCTURE OF INTEREST RATES**

The article discusses the main methods of estimation of DSGE models with term structure of interest rates. These models are becoming increasingly popular in empirical analysis of interdependencies between financial markets and real economies.

The most popular approach to estimation of DSGE models without asset pricing equations employs model's loglinearisation and Bayesian estimation of linearised version of the model. As far as asset prices are concerned this method is no longer useful since nonlinearities of asset prices equations make the linear approximation very rough.

Two alternative approaches have been proposed. First uses higher order approximations of the model's solution and employs Bayesian estimation of nonlinear equations. However it is very time-consuming since simulation methods are to be used for a log-likelihood evaluation. In the second approach the model is loglinearised but approximations of asset price equations additionally accounts for higher order terms. Therefore the model remains linear and can easily be estimated using Bayesian approach.

The article also investigates how adding term structure variables to a set of model's observables affects estimates of the model's key parameters. Here a DSGE model of Polish economy will be used with parameters estimated by the second approach.

**Elżbieta Antczak<sup>1</sup>**  
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**AIR DEGRADATION VERSUS ECONOMIC DEVELOPMENT IN EUROPE.  
SPATIAL PANEL DATA MODELS.**

The aim of this paper is to present the research results obtained from the analysis the relation between: economic activity, demographic explosion, social & technological development, SPATIAL AUTOCORRELATION versus the quality of air. The impact of this human activity was examined in European Countries (emphasizing Poland with reference to the other Regions). For the purpose of verifying the hypothesis that realization of sustainable development's assumptions, taking spatial interaction into account, improves the quality of environment and life, there were used some progressive methods. There were applied the ESDA elements, panel data models and SPATIAL PANEL DATA MODELS. The exploration was conducted for 32. Selected European Countries in years 1990-2006/2007. The EUROSTAT, UNdata, EEA were sources of the data. Estimation methods were based on: Instrumental variables - regression, Three Stage Last Squares.

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## **STATISTICAL INFERENCE IN AUDITING**

The control of financial statements is a key issue in the functioning of financial system. Scrutiny of large data sets is usually impossible, mainly because of time limits and costs of research. Another important problem is the substantial number of documents and reports subject to examination. This simply leads to the wide use of mathematical statistics methods in auditing.

In this paper the author presents particular statistical approaches used in verifying financial reports reliability and also in appraising internal control systems. Different sampling methods have been discussed and statistical tests for audit purposes have been presented.

Considering the aims of examining financial data, it is essential for chartered accountants to prevent unsound financial statements from being acknowledged. With respect to this problem, the author presents statistical tests based on fixed type II errors as the most common tests for auditing purposes.

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## **FORECASTING SOME ASPECTS OF REAL ETATE MARKET USING MONTE CARLO SIMULATIONS**

The Monte Carlo Method is one of quantitative methods, which is used to value derivatives. It provides approximate solutions to a variety of mathematical problems by performing statistical sampling experiments on a computer.

The article presents the using of Monte Carlo simulations as a tool of forecasting. Experiments are made for some aspects of real estate market using random numbers generator build in Excel calculating sheet.

**Keywords:**

Forecasting, Monte Carlo simulation, real estates.

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**SOME REFLECTIONS ON THE SUBJECTIVISM IN APPLYING QUANTITATIVE  
METHODS TO THE ANALYSES OF SOCIO-ECONOMIC PHENOMENA**

The encyclopedic definition of the subjectivism has the pejorative meaning. The author of this article expresses the opinion, that firstly - the subjectivism is inevitable due to limited knowledge of complex socio-economic phenomena, secondly - the role of the subjectivism may be positive (creative) when the researcher manages to discover a new unknown economic or social regularity. The negative character of the subjectivism occurs when the researcher wishes to prove the thesis which appears to him obvious and he achieves this goal by manipulation during subsequent phases of applying quantitative methods when conducting the empirical verification of his thesis, i.e. by selecting variables characterizing the subject of the research, by choosing suitable data and by applying such quantitative methods which confirm the given thesis.

## **STRUCTURAL APPROACH TO FORECASTING REGIONAL GROSS DOMESTIC PRODUCT**

When aiming to provide effective and accurate economic forecasts, one faces many constraints. The most important being outliers, missing observations, as well as short time series and structural changes. These limitations prevent economists from an adequate process of forecasting based on traditional time series models. In the paper an attempt will be made to forecast regional Gross Domestic Product according to the structural approach. This approach will be based on the knowledge of the national GDP and regional proportions of this indicator. The results obtained will be verified by means of forecast errors.

It seems that the procedure proposed in the paper could be applied first of all in the case there are some problems with the availability of the current statistical data. Within many applications of accurate forecasts of the regional GDP we can mention in particular the possibility of providing a right estimation of income of municipal units as well as preliminary assessment of the implementation of the regional convergence process. The latter goal can provide for instance a framework for building a regional cohesion policy.

**Iwona Bąk**

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## **APPLICATION OF LOGIT MODELS TO ESTIMATE THE PROBABILITY OF SELECTING TOURIST TRIPS BY PENSIONERS AND RETIRED PERSONS IN POLAND**

Numerous studies and surveys conducted by demographers and statisticians prove that there is a rising tendency regarding the share of elder people in the total population, not only in Poland but in many European countries as well. This is caused, on the one hand, by the longer lifetime expectancy, and on the other hand, by the decrease in the number of births. The aging society is associated with changes in the structure of the demand for goods and services. One of aspects of the phenomena is the need of adjusting the supply of tourist services to this age group. The demographic profile of certain segments of the tourist market would clearly differentiate the offer of tourist agencies. The American and European tourist agencies and governments of certain countries have not only monitored the domination of the 'third age' among tourists but launch actions stimulating the use of tourist facilities off the season.

The Polish elder generation shows quite low interest in the tourist consumption compared to West-European or American ones. It seems to be caused not only by a weak purchasing power of today's Polish 'seniors' but also by the system of values practiced in which tourism and other forms of active leisure do not predominate. The market, however, has been on a constant rise and the free time resources grow, then it could be speculated that the greater and greater number of elderly people would be a significant factor affecting trends on the market of tourist services. It is therefore necessary to do the research on the tourist consumption in order to acquire significant information on motivation and consumer behavior of the elderly tourists and estimated resources to be spent on leisure.

The papers attempts to answer the question about factors of the significant influence on decisions made by pensioners and retired persons regarding the duration and destination of tourist trips. The study covered short term trips (2-4 days), long term trips (5 and more days) and trips abroad (2 and more days). The source of information was statistical data on individual trips of pensioners and retired persons. The data was acquired from the survey called 'Tourism and leisure in households' conducted by the Chief Statistical Office. Conclusions regarding the significance of factors affecting the type of trips and corresponding probability were drawn on the basis estimates of logit models.

**Joanna Bruzda**

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**EFFICIENCY FRONTIERS AND STABILITY OF MINIMUM VARIANCE  
PORTFOLIOS FROM THE WSE ACROSS SCALES: A WAVELET PERSPECTIVE**

In the paper the time-scale (wavelet) analysis is applied to examine the variability of efficiency frontiers of investment portfolios from the Warsaw Stock Exchange across scales. In particular, the stability of minimum variance portfolios is evaluated across varying investment horizons. In portfolio construction 25 stocks from the Warsaw Stock Exchange that were continuously quoted since 1998 are used. Besides, with the help of 8 sectoral sub-indices possibilities of sectoral portfolio diversification are characterized, including their variability across time and scale. We point out those investment horizons (time scales) for which the intra-national diversification is most effective.

In the study the Non-decimated Discrete Wavelet Transform is used together with its tools such as the global and local (short-time) wavelet variance and correlations. Wavelet analysis is a kind of frequency studies that makes it possible simultaneously to examine uni- and multivariate processes in both the time and frequency domains in a very effective way resulting from the optimal time-frequency resolution adopted this approach. Due to this wavelet analysis is thought of being the most effective kind of frequency investigation of nonstationary phenomena. Additionally, the Non-decimated (Continuous-Discrete) Wavelet Transform that is a well known modification of the original Discrete Wavelet Transform provides better estimates of the wavelet variance and enables to compute the wavelet cross-correlations. The wavelet transform based on the Haar wavelet filter is applied directly to stock prices what makes it possible to investigate changing characteristics of investment portfolios across scales. Empirical examination concerning sub-indices is performed on both indices and their returns what provides a deeper insight into the investigated relationships.

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## **SCHUMPETERIAN EVOLUTION STIMULATED BY DEMAND - AN AXIOMATIC SET-UP**

According to Schumpeter's theory, the main causes of economic development are determined by innovations implemented by producers-innovators and realized through credits created by banks from savings. Consumers play a passive role in this process and they can be characterized by routine behaviors, so that only changes in their activities are secondary to respective changes in a production system.

In contrast to this, the paper reflects the research path which interprets economic evolution as a process on the one hand pushed by technological changes, and on the other hand pulled by demand. This idea also extends the research program on modeling Schumpeterian evolution in the axiomatic Arrow-Debreu set-up.

In this context, the aim of the paper is a modification of the standard Arrow-Debreu model in such a way that consumers are seen as equipped with specific production-preference relations which enable them to interfere in producers' activity, and consequently, influence innovative changes in a production sector of an economy by means of proinnovative preferences.

**Tadeusz Czernik**

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### **EXPECTED MAXIMUM LOSS. PORTFOLIO OPTIMIZATION**

The maximum loss (ML), as one of the generalizations of at-risk (VaR) is a relatively new quantile risk measure. Expected maximum loss (EML) is a measure of risk which is closely linked to the maximum loss. This work examines the market dynamics which is a multidimensional geometric Brownian motion. ELM-optimal investment strategy has been proposed. The results were presented on a number of portfolios composed of companies listed on the Warsaw Stock Exchange.

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## **PRINCIPAL AXIS ANALYSIS AND INVARIANT COORDINATE SELECTION**

Principal axis analysis (Critchley et al., 2007) rotates standardised principal components to optimally detect subgroup structure, rotation being based on preferred directions in the spherised data. As such, it is a computationally efficient method of exploratory data analysis, particularly well-suited to detecting mixtures of elliptically contoured distributions. Overall, principal axis analysis exemplifies the Maxim: *two decompositions are better than one*. Technically, as we explain, it provides vivid examples of invariant coordinate selection (Tyler et al., 2009). Worked examples are given throughout.

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## **THE STATES OF FINANCIAL FARKET EQUILIBRIUM IN THE TWO PERIOD INCOME MODEL**

The paper presents the concept of financial market equilibrium under the assumption that all agents correctly anticipates their activities on the real goods markets. Presented is a property equilibria in the income model. In particular, discussed the fundamental properties of financial markets, the prices of securities, the present value vectors and the consumers utility function.

In this context, the basic problem is to determine the relationship between equilibrium, completeness of financial market and absence of arbitrage. These relationships will be used in the designation of equilibrium and study its uniqueness.

## **GENERAL ACTUARIAL ASPECTS CONCERNING A POLICY CONDITIONS FOR MULTISTATE INSURANCE CONTRACTS**

A uniform approach to the analysis of policy conditions of realization of future cash flows arising from multistate insurance contract is presented.

Irrespective of type, each insurance contract gives rise to two payment streams: the stream of premium payments (which flows from the insured to the insurer) and the stream of actuarial payment functions where fixed amounts under the annuity product and fixed insurance benefits are considered as a series of deterministic future cash flows (which go in the opposite direction). Because we focus on discrete-time model, it means that insurance payments are made at the end of time intervals.

Multiple state modeling is a classical stochastic tool for designing and implementing insurance products. The multistate methodology is intensively used in calculation of premiums and reserves of different types of insurances such as life, disability, sickness, marriage or unemployment insurances. One of the ways for numerical calculations of premiums and reserves is to use a matrix notation [1].

Sometimes it happens that benefits may be realized after the end of insurance period and include deferred period or stopping time. The aim of this paper is to comprise these conditions in matrix formulas for premiums and reserves (for multistate insurance contracts), both for deterministic and stochastic interest rate. This approach enables us to give a flexible tool for the analysis of profits of multistate insurance contracts and makes the numerical procedures implementation easier.

For this goal, the set of policy conditions  $\Gamma$  is proposed, which takes pattern on the set of policy conditions for disability annuity proposed by Haberman and Pittacco [2]. The set  $\Gamma$  simplifies pointing out the time horizon for cash flows arising from insurance contract and allows for modification of matrices related to: multistate model and its probabilistic structure, cash flows and discount function. It allows to take into account benefits realized after the end of insurance period (also comprises deferred period and stopping time).

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## **ON THE APPLICATION OF ONE-ARMED BANDIT PROBLEM TO THE REJECTION OF CERTAIN GAMES**

Risk aversion is a concept known in economics, game theory, finance and psychology and relates to the behavior of consumers, players as well as investors under uncertainty. The research shows that the biggest problem of market behavior is loss aversion. Loss aversion is a tendency to feel the pain of a loss more acutely than pleasure of equal-sized gain. Many scientists have analyzed the problem of profitability in the game. Some authors presented certain features, by which “safe” games played once should be characterized. Kahnemann and Tversky (1991) showed that loss-aversion-gain attraction ratio should amount to 1:2. Rabin (2000) showed that if a player is a risk averse expected utility maximizer then he rejects a gamble of equally with some gain  $g$  and loss  $l$ ,  $g > l$ . Palacios-Huerta, Serrano (2006) showed the relationship between risk attitudes over small-stakes and large-stakes gambles. They presented certain features, by which “safe” games played once should be characterized. Aumann and Serrano (2007) defined the riskiness of a gamble and characterized this index by axioms.

The aim of this presentation is to show an asymptotically efficient strategy which enables the risk averse player to establish boundary variables loss and gain at each stage of the repeated game. This strategy was first presented by Lai, Robbins (1995) in order to solve multi-armed bandit problems. The attribute ‘one- or multi-armed’ derives from an imagined slot machine equipped with one or more arms. This gambling game has been known from 1887. In the long run these machines are as effective as human bandits in separating the victim from his money. When an arm is pulled, the player wins a random reward or loss. The player decides at each stage to play or not to play, so as to maximize the long-run total expected reward (or minimizing the regret). The choice depends on the record of previous trials.

*Key words: risk aversion, loss aversion, repeated game, one-armed bandit problem, asymptotically efficient adaptive strategy*

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## **THE GERMAN STATISTICIAN JOHANN PETER SÜßMILCH AND POLAND.**

Johann Peter Süßmilch was born in 1707 and he was the first, who in 1741 wrote a book on statistics in German language. In his time the word statistics was widely unknown and just started to be used worldwide. So this word is not to be found in the first edition of Süßmilchs book. The title of it seems to have nothing to do with statistics, it is “The divine order” and with this publication Süßmilch wanted to make God visible for the people and he used the help of statistics to do this. For him this was not so easy, because in times of enlightenment his king and many others did not believe any more in God. The Prussian king was Friedrich II. (Frederik II.), later called Frederik the Great (Friedrich der Große). He and his friend Voltaire, the famous French philosopher, and many others doubted the existence of God in this time. Süßmilch had the idea, that those who are able to see the divine order behind things, automatically will believe in God again and can tell others that God is existing.

In this time for priests it was usual to be a military preacher first, so Süßmilch, when he wrote his first edition. Later he became a high ranking Berlin parson and a member of the Royal Prussian Academy of Sciences. He himself never was in the Poland, but on the territory of todays Poland his regiment in 1741 took part in the battle of Małujowice (Mollwitz) and his son became a tax collector in Wrocław (Breslau) and finally the major of the town.

It may be interesting to learn a bit about him and about what a priest thought about Poland and what he has wrote about Poland in the middle of the 18<sup>th</sup> century.

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**THE APPLICATION OF THE MICROECONOMIC MODELING IN THE  
FORMATION AND THE PROTECTION OF THE COMPETITIVE ENVIRONMENT  
UNDER THE CONDITIONS THE ANTIMONOPOLY OFFICE OF SLOVAKIA**

The paper is oriented to presentation a microeconomic model apparatus for support of protection of competitive environment on the market structure in the Slovak Economy. In compliance with the transformation of the Slovak economy into a market economy type, a number of urgent and important tasks related to the new principles of operation of the market economy mechanism had to be solved. A natural assumption of the proportional economic development is the protection of economic competition. The existence of a market structure with imperfect competition is linked, as a rule, with direct and hidden effects negatively affecting the implementation of economic competition. Conditions of economic competition in developed countries of the world and the European Union are kept and controlled institutionally and this system element of economic development is of a great importance.

In Slovakia the realization of tasks related to the protection of economic competition is carried out by the Antimonopoly Office. One of the most important attributes of a safe and harmonically developing economic system consists in the safeguard of the state, which guarantees the protection of economic competition. Its break-down can be of course useful and effective for some economic subjects in the short term, but from a long-term view of economic development, it represents a negative trend. In countries with developed economies and historical experience about the existence of market economy risks and pitfalls are generally known. So these countries take measures, which guarantee the legal rules of economic competition.

Keywords: Microeconomic modeling, market structure, competitive environment, Antimonopoly Office of Slovakia.

## **DURATION ANALYSIS IN THE STUDY OF HOUSING MOBILITY OF HOUSEHOLDS**

The difficulty in satisfying housing needs in Poland before 1989 led to poor 'housing mobility' of Polish households and was the result of insufficient housing resources as well as of the shortage of free financial assets. The reason for prolonged habitation in one flat was often intensified by the mechanism of correlating the job appointment with flat allocation and by the legal restrictions concerning the sale or rent of such flat. Consequently, in the situation when an average American household moves house five times, Polish families were stuck in the same, often their first independent one, flat for years. Ownership transformations in the housing sector that took place after 1990 were accompanied by the changes in lifestyle and by migrations for economic reasons and led to greater housing mobility of the Polish households.

In this article the term '*housing mobility*' has been defined as **the frequency with which a household changes its place of residence during its existence**. In order to examine this phenomenon the authors will apply actuarial methods (duration analysis). The study will take into consideration single episodes with one starting point (the purchase of a flat on the resale market) and one final point (selling the flat to another owner). Elementary measures used in the analysis include the distribuant  $F(t)$ , a density function  $f(t)$ , a survival function  $S(t)$ , a hazard function  $h(t)$  of arbitrary non-negative values, a cumulative hazard function  $H(t)$  as well as a likelihood function ( $L$ ). The analysis has covered over 950 transactions concerning the sale and purchase of cooperative flats in 2000-2009, including repeated transactions. For each of the transactions the date, the initial and final prices as well as the basic parameters of a flat have been given.

The study will verify the hypothesis of the low capability of households to change their place of residence, i.e. the high probability of the existing owner to have further '*lasting right*' to the flat.

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## CLASSIFICATION TREES AND THEIR USE IN DISCRIMINANT ANALYSIS

Recursive partitioning is one of the most important methods used to build discriminant and regression models. It divides sequentially the entire feature space  $\mathbf{X}^m$  into homogeneous subspaces (regions)  $R_k$ . Then in each of the regions a local model is built and finally all of them are combined:

$$Y = \sum_{k=1}^K \alpha_k I(\mathbf{x}_i \in R_k),$$

where  $R_k$  ( $k=1, \dots, K$ ) is a subspace (region) of the entire space  $\mathbf{X}^m$ ,  $I$  is the indicator function,  $\alpha_k = \arg \max_s p(P_s | \mathbf{x}_i \in R_k)$ ,  $P_s$  is the class, the observation  $\mathbf{x}_i$  belongs to.

The recursive partitioning method is well known in statistics and has been applied for 50 years, but the most famous application in discrimination and regression was presented by Breiman et al. (1984) in their book on Classification and Regression Trees (CART).

But one single classification tree depends strongly on the learning set, i.e. its prediction ability is poor. In order to improve the accuracy, several models are built and aggregated. The base models  $D_1, \dots, D_V$  (classification trees) are combined into one model  $\hat{D}^*(\mathbf{x}_i) = \Psi(\hat{D}_1(\mathbf{x}_i), \dots, \hat{D}_V(\mathbf{x}_i))$ , where  $\Psi$  is an aggregation function, for example, majority

voting:  $\hat{D}^*(\mathbf{x}_i) = \arg \max_s \sum_{v=1}^V I(\hat{D}_v(\mathbf{x}_i) = P_s)$ .

In the paper the most important problems of the formation, aggregation and the use of classification trees are discussed.

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## **LIQUIDITY RISK, PORTFOLIO CONSTRUCTION**

In classical portfolio analysis it is assumed that the investor decides to invest in a set of shares, with a view to maximize a "utility" of the portfolio. The differences between the criteria for the construction of portfolios of securities are in a different assessment of investment risk. Most often return on investment is assessed on the basis of expected rates of return for individual values included in the portfolio, while the investment risk is assessed on the basis of the variance (standard deviations) of these rates of return. The Sharpe structure of the portfolio redistributed investment risk into two factors: market (systematic risk) and specificity (the risk associated with investment in the value). In the literature you can find other approaches to description of the investment risk, such as Roy's criterion, which minimizes the probability that the rate of return on investment would be lower than a minimum rate of return.

The article presents the modified approach to portfolio construction, which is based on the concept of reducing the liquidity risk, understood as the possibility of being unable to sell instruments at the expected market price. Our model expands the volatility-based investment risk analysis by introducing an extra risk factor. We suppose that proper liquidity risk measures are those which consider the variability of prices, the number of shares traded and the time it may take to sell the instrument. Furthermore, liquidity risk is associated with particular shares and depends on the expectations of other market participants. Therefore, being a part of a specific risk, the liquidity risk may be limited to the entire portfolio (e.g. by selecting the shares in a such way that those with low liquidity have smaller impact on the portfolio performance). The constructed portfolio includes market risk as well as other specific risks.

The idea of understanding the measuring inclusion of liquidity as a parameter value, standing by a random factor (innovation) and as such, having an impact on the price change was presented in the works by (Hasbrouck (1991), Foster, Viswanathan (1993) or Brennan, Subrahmanyam (1996)). During the construction of the liquidity risk of the portfolio the assessment was made on the basis of expected value of measures of liquidity. Measures used in the calculation of liquidity are based on the outstanding purchases and sales, and they are: WRO (Sewastjanow, Karczmarek (2008)) and the spread, calculated on the basis of unrealized bids. Spread for bids is a measure proposed by the author as a measure of liquidity risk describing the difference between the weighted by average number of shares in a unrealized offer for the purchase and sale. This is an equivalent to "relative bid-ask spread" (e.g., Hasbrouck, Seppi (2000)) but it takes into account the number of values as well. The portfolio construction has been done considering the daily returns and the relative bid-ask spread (calculated on the basis of tick-by-tick data) as given, and portfolios are constructed and evaluated for a period of time.

The results obtained from the proposed approach were compared with those from the classical Markowitz and Sharpe's model.

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**AEMS GAINING FACTORS IN POLAND AND OTHER UE COUNTRIES  
WITHIN THE LIMITS OF AGRI-ENVIRONMENTAL POLICY  
(MODELLING APPROACH)**

The Agri-environmental measures (AEMs) implementation intensity is expressed as the ratio between agri-environmental payments and agricultural gross value added. AEMs are policy instruments targeted at development and support for more environmental-friendly agriculture methods and protection of the European landscape. Agri-environmental payment is co-financed by the EU and the member states.

To explain the main economic and political constrains on the implementation measures we used econometric model. The econometric model was built around five different groups of determinants: (1) agricultural political weight, (2) negative externals limitation, (3) positive externals demand for AEMs, (4) budgets constrain, (5) institutional factors.

The econometric model covers sixteen EU countries: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxemburg, Netherlands, Poland (with four regions), Portugal, Spain, Sweden, United Kingdom, observed for the period 2004-2007. The basic data used in this article was taken mainly from the Eurostat.

The main results suggest that AEMs implementation is affected by the strength of the farm lobbies, activity of political institutions and the demand for positive externals.

**Key words:** agri-environmental programmes, agricultural policy, environmental economic, econometric model

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**THE COMPARATIVE ANALYSIS OF NUMBER OF HOURS WORKED  
BY MARRIED WOMEN: OWN-ACCOUNT WORKERS OR PAID EMPLOYEES  
IN FIRST QUARTERS OF 2005 AND 2009 YEARS**

The main aim of the paper is to present the results of the comparative analysis of the impact of the variables describing married women on the number of weekly hours worked by them. There are considered two groups of married women: own-account workers and paid employees. The tobit type V model (a combination of two sample-selection models) applied to the analysis lets to consider the direct and indirect impacts of variables on the dependent variable. The heteroscedasticity of the variance of the residuals is considered. Estimated models let us to indicate characteristics of married women, which predispose them to take more or less hours of work in the week. In particular it is interesting to indicate those characteristics which influence on cutting the working time.

The analysis is based on the data from Labour Force Survey (LFS) conducted by the CSO in Poland. The results for the first quarter of 2009 are presented in the context of the results for the first quarter of 2005.

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## **MEN'S AND WOMEN'S EARNED INCOME COMPARISON**

The article deals with comparing earned income of employed men and women by comparing the proportions of four income areas. They were determined as intervals with bounds defined by average women salary, average men salary and general average salary. The analysis is based on the EU SILC sample survey data.

As it was shown, women's proportions in lower income areas are much bigger than the men's, and men have bigger representation in higher income regions. The wage differentials are related both to men and women with a university degree, even though we assumed, that in this group it shouldn't be relevant.

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**ABSORPTION OF THE EUROPEAN FUNDS BY REGIONS IN 2004 – 2006 AND  
THEIR IMPACT ON ECONOMIC GROWTH IN POLAND**

Analysis of The European Funds absorption by regions of Poland, their impact on regional GDP growth, and also on the synthetic measure of development, are the main topics of the paper.

Similarity measures based on the theory of information - estimated for 5 chosen years - were used as the tool for conclusion if there exist the convergence processes in important area of economy, environment and social sphere.

Additional aspects of analysis are errors of regional GDP predictions and stability of estimated parameters in regional GDP econometric models, due to the time.

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## **ON RANKING COUNTRIES BY ECONOMIC PROGRESS AND DEVELOPMENT**

Report published by the International Commission on Measurement of Economic Performance and Social Progress chaired by J.E. Stiglitz and A. Sen stressed the limitations of the GDP per capita as an indicator of economic performance and social progress. It also renewed the discussion about construction of one commonly acceptable measure of development. Due to the fact that evaluation of progress on the basis of one, even best, measure is not satisfying as it does not include all areas of the development, more than one criterion should be included in international comparisons. Statistical methods allow the limitation of the set of diagnostic variables in order to reduce the computational burden and improve the comprehensibility of the final results.

In the literature and public discussion international comparisons are usually presented in the form of rankings, constructed using the weighted average method or methods originating from multidimensional statistical analysis. We proposed constructing rankings using three different multicriteria methods (MAPPAC, ELECTRE III, AGREPREF), which allow considering simultaneously all diagnostic variables. Moreover, those methods are free of many limitations of the compensatory approach.

Our results are compared with rankings constructed using compensatory approach and multidimensional statistical analysis methods in order to assess the robustness of rankings to the changes of the set of criteria.

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## **SPATIAL SEEMINGLY UNRELATED REGRESSION – THEORY AND APPLICATIONS**

The aim of this paper is to provide a detailed overview of the specifications, estimations and verifications of spatial seemingly unrelated regression (SUR) models. In particular, the author focuses on spatial SUR models commonly used in applied research, such as SUR with spatial error autocorrelation (spatial error of the autoregressive or moving average type) and SUR with spatially lagged dependent variables. This article also presents variety of applications of multi-equation spatial econometric models in socio-economic analysis and it gives examples of practical implementations of the spatial SUR models.

**Keywords:** multi-equation spatial econometric models, spatial seemingly unrelated regression, space-time data.

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## **PROPORTIONATE MEANS OF DISTRIBUTION, OR HOW TO DIVIDE WHAT IS INDIVISIBLE**

In the article we deal with a proportionate division of indivisible goods. Analyze the impact of changes in the structure of the proportional distribution of wealth. More specifically - are trying to determine how large changes in the structure can be made with respect to some initial state to final distribution was in both cases the same. We apply here some well-known methods for the proportional allocation. We only care about the structure of output, which leads to a fixed distribution for all methods.

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## **QUANTITATIVE ANALYSIS OF INCOME DISPARITIES**

The aim of the article is to quantify the income inequality at different levels of selected factors such as region, gender, education, age, ISCO – International Standard Classification of Occupations and NACE – Classification of Economic Activities. The analysis is based mainly on suitable indicators of income disparities, probability models of incomes and correspondence analysis. The base for application of the chosen methods will be data on gross monthly wages of persons older than 16 years of the EU-SILC survey.

**Monika Papież**

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**THE ANALYSIS OF THE IMPACT OF CHANGES IN GDP ON MORTALITY  
IN POLAND IN THE PERIOD 1970-2008**

The paper will present the analysis of the impact of one of the macroeconomic variables, namely GDP, on the changes in mortality in Poland in the period 1970-2008. To analyze the relationship between real GDP growth rates and mortality the mortality index kt from stochastic mortality Lee-Carter model will be used, which describes the overall trend of changes in mortality during the period analyzed. The paper will also present the consequence of economic changes for the three age groups (20-44, 45-64, 65 +). In this case, the variable describing the mortality rate will be the mortality index.

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## **UNBIASED ESTIMATION OF UKRAINIAN BANKS PERFORMANCE**

This paper is devoted to the analysis of productivity changes of Ukrainian banks applying Data Envelopment Analysis. In the paper a data set on the activity of Ukrainian banks in 2005-2008 is used. The bias in estimation that we consider is not connected with a technique of the analysis of productivity changes, but rather with the data available and used to represent balance sheet outputs and inputs. We compare productivity changes for different models of banking with inputs and outputs that cover from 50% to 100% of assets and liabilities of Ukrainian banks. The results of the research allow choosing the most appropriate model for productivity measurement of Ukrainian banks. On the basis of this model we make more profound conclusions of the current state of the Ukrainian banking system, the main sources of inefficiency and productivity change of Ukrainian banks.

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### **THE ANALYSIS OF CHANGES ON THE POLISH INSURANCE MARKET**

In the paper will be presented changes process of the polish insurance market during last 20 years. It will contain researches for development trends, threats and comparison with other markets. The analysis and researches are connected with such areas as:

- Demand for insurance service,
- Supply and structure of insurance products,
- Financial safety for insurance companies,
- Changes in premium inflows and claims outflows,
- Reinsurance cooperation,
- Investment activity in insurance companies.

The last part will include conclusions, development perspectives and new challenges for insurance sector.

**Marcin Salamaga**

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**AN APPLICATION OF CORRESPONDENCE ANALYSIS IN THE RESEARCH OF  
INVESTMENT COMPETITIVENESS IN *POLISH VOIVODSHIPS***

The main purpose of the article is the comparison of investment competitiveness in Polish private sector and public sector. In the study there is proposed the application of Revealed Investment Advantage Index according to the sections of Polish Classification of Activities (PKD). The values of the Revealed Investment Advantage Index calculated for each Polish province are basis for the application of correspondence analysis. The correspondence analysis lets to create *profiles of Polish voivodships* so that observations in the same group have the similar investment competitiveness by PKD sections. The results of analysis will be helpful for finding the *kinds of activities which are most effectively invested or need capital investment*. The data used in the paper is taken from Regional Data Bank of the Central Statistical Office in Poland.

**Victor Shevchuk**

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## **MODELLING TRADE LINKAGES BETWEEN CEE AND “OLD” EU COUNTRIES**

Based on the quarterly 1996-2008 data, it is confirmed with either 2SLS or VAR/VEC estimates that industrial output in the eurozone and exports have a strong positive effect upon output dynamics in the Central and East European countries, while the impact of imports is quite ambiguous. According to VAR/VEC estimates, the share of the eurozone industrial output and exports in domestic industrial output is highest in Poland at 30 and 50 percent respectively, while for the Czech Republic, Slovakia and Hungary respective weights are much smaller. Imports do not play a significant role in the output dynamics in VAR/VEC models, although the 2SLS models signal domestic output ‘crowding out’ in Hungary. For Poland and Hungary, an increase in imports leads to a decrease in unemployment, but against the backdrop of a higher inflation. The use of a dummy for EU accession in 2004 reveals that the most important gains are obtained in Poland, as acceleration of industrial output growth has been combined with a decrease in both imports and unemployment rate. EU accession has led to a decrease in inflation and unemployment rate for the Czech Republic, while in Hungary the unemployment rate has been on the rise. Except Poland, export is stimulated by domestic industrial output in the VAR/VEC models. In contrast to 2SLS models, which suggest import dependency of exports in Poland, Hungary, the Czech Republic and Slovenia, there is no evidence of such a causal link in VAR/VEC estimates. The demand for imports is dominated by domestic industrial output and export, while the impact of industrial output in the eurozone is rather weak. The share of exports in the variance decomposition of imports is as high as 70 percent for Poland, while in other CEE countries it ranges from 30 to 40 percent, being in accordance with the 2SLS estimates.

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## **THE REGRESSION CREDIBILITY MODEL AND ITS APPLICATION**

Credibility ratemaking is a technique for predicting future claims of a risk class, given past claims of that and related risk classes. In this article we review the regression credibility model that is an extension of the Bühlmann-Straub model. The Bühlmann-Straub model belongs to the greatest accuracy credibility theory. Credibility estimators produced by this approach are such linear Bayes estimators that minimize the mean squared error (MSE). Credibility estimators in comparison with Bayes estimators don't require the choice of a prior distribution. Bühlmann showed that credibility estimators depend only on the first and second moments that are easy to estimate from statistical data. In credibility models two sources of information are used in the calculation of the credibility estimators for the individual risk: typically little knowledge about the individual risk (individual data) and quite extensive statistical information about entire portfolio (collective data). In Bühlmann model, Bühlmann-Straub model or hierarchical model, the credibility estimate of claim is given as a linear combination of the individual estimate (based on the individual data) and the collective estimate (based on collective data).

In the Bühlmann-Straub model it is assumed that claims are time homogeneous. This assumption is often not fulfilled in practice in consequence of inflation. In such a situation it is appropriate to apply the regression credibility model. The Bühlmann-Straub model was first time extended to regression case by Hachemeister. In the regression credibility model credibility estimators are being sought for regression coefficients of the regression model. In this model, the credibility factor from one-dimensional credibility models (Bühlmann model, Bühlmann-Straub model or hierarchical model) is replaced by a credibility matrix. By this matrix, individual and collective estimators for the vector of regression coefficients are combined.

This paper describes De Vylder's and Bühlmann-Gisler's adjustments of the credibility matrix from the Hachemeister's regression credibility model. The paper also includes the application of these credibility techniques in non-life insurance.

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## **STATISTICAL EVALUATION OF SOCIO-ECONOMIC CHANGES IN PODKARPACKIE VOIVODSHIP IN 1999-2008**

Socio-economic changes in Polish regions take place with different intensity. Ten-year period of functioning as “new” provinces allows for making preliminary assessment of socio-economic changes in particular regions. This is especially important for economically weaker province, which include the Podkarpackie voivodship.

The aim of the paper is a statistical evaluation of socio-economic changes in the Podkarpackie voivodship in 1999-2008. This objective was tried to be achieved through:

- selection of appropriate statistical features defining the socio-economic development of provinces,
- use of chosen method of multidimensional comparative analysis for the synthetic evaluation of socio-economic development of provinces and rating the Podkarpackie voivodship in the regional structure of the country in 1999 and 2008,
- assessment of socio-economic changes in the Podkarpackie voivodship during the period.

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## **CORRESPONDENCE ANALYSIS AS A METHOD FOR EVALUATION PROFESSIONAL HELP AT MINIMIZING POTENTIAL STROKE RISK FACTORS**

Between the years 2007 and 2008 , as a part of POLKARD programme the Polish Ministry of Health conducted a research referred to as “Organization of the regional reference centres for cardiovascular disease prevention within the high risk strategy. Introduction of quality control and effectiveness assessment of prevention programs”. One of the major aims of the research was to establish how primary cardiovascular disease (CVD) prevention functions in primary care outpatient clinics. Also, the information gathered helped to see how much patients know about potential stroke risk factors and if they are familiar with the help that is available to them in primary care clinics as far as the prevention of coronary heart disease is concerned.

The aim of this paper is to measure the awareness of stroke risk factors as well as to see how active primary care outpatient clinics are in terms of educational programmes aiming at minimizing those factors.

The research was conducted in 2007 in the following provinces: łódzkie, małopolskie, mazowieckie, pomorskie, and śląskie. In all the regions outpatient clinics were selected regardless of the fact if they took part in the programme or not.

The group of patients [N=1555] consisted of people aged 35 to 55 with no CHD, no history of stroke or peripheral artery disease.

At the beginning of the analysis chi-square test of independence was applied in order to determine the influence of the patients' socio-demographic features (i.e. age, sex, education) and NFZ's prevention programmes on the patients' awareness of risk factors as well as professional help available at primary care outpatient clinics aiming at minimizing the factors. Variables with statistically significant relations were further analysed using correspondence analysis method so as to visualise the co-occurrence of particular categories of variables. The analysis proved that what determines the awareness of risk factors and the availability of professional help most is patients' education. Features such as age or the activity of primary care outpatient clinics proved to have a weaker influence on the patients' awareness. At the same time, participation in the ministerial programme is the very factor that determines the scope of professional help provided by primary care outpatient clinics and primary care physicians.

**INCOMES AND EXPENDITURES OF HOUSEHOLDS WITH A DISABLED  
PERSON ON EXAMPLE OF WRZESNIA DISTRICT**

Due to the incidence of disability and the fact that in close proximity to a disabled person are usually some people in the family, disability should be considered as one of the major social problems in Poland. Following the partial or total reduction of capacity to work by people with disabilities, the households budget with such a person undergoes significant changes and usually worse.

The study attempts to identify differences in the level and structure of incomes and expenditures of households with disabled person in comparison to the other socio-economic types of households. It was also made an evaluation of diversity of the studied phenomenon among households with disabled people by describing the characteristics of such person (including the type and degree of disability, its duration, type of disease, etc.).

Source data are the results of a survey conducted in the first quarter of 2005 on a representative sample of 2 105 households with disabled person residing in the district of Wrzesnia. For the description of the remaining households budgets it was used a survey published by the Central Statistical Office. The research method was the analysis of variance and the basic measures of analysis of the structure, including Gini index.

As a result obtained, points out a large incomes' and expenditures' differences of the surveyed households not only against the background of other households types, but also within this subpopulation which is related to demographic and health characteristics of disabled people composing such households.

**Piotr Tarka**

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**STATISTICAL ANALYSIS OF YOUTH'S VALUE SYSTEMS IN POLAND AND NETHERLANDS – AN APPROACH TO TEST LOV AND RVS SCALE**

In this article author describes and measures the composition of youth' systems of values. The research objective was to develop a better understanding in systems of values associated with youth market in two opposite and culturally different countries: Poland and The Netherlands. The sample in conducted survey, included total 232 respondents being interviewed face-to-face. In order to analyze and grasp the full meaning of survey results at higher accuracy level, as well to compare *value-scale* points configuration (that were applied within the questionnaire's measurement scales: LOV and RVS), author exploited *t*- test and Mann Whitney test, experimenting for this purpose on LOV and RVS (Rokeach) scales. Finally, a task of better visual understanding in systems' of values was achieved, when tested values were crossed with variables such as: gender, nationality, socio-economic status and further transferred on graphical dimension with the application of multivariate correspondence analysis.

**Michał Thlon**

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## **USING EXTREME VALUES THEORY (EVT) IN THE MEASUREMENT OF OPERATIONAL RISK**

Thematics of the operational risk is a sphere of the knowledge which started to interest relatively not long ago, the phrase entered to language of finance only just after collapse Barings Bank in the year 1995. Since that time we observe heavy increase of the interest with this kind of risk. Farther back operational risk management was attended for the self-evident act, often synonymous with the usage of the common sense. Huge losses suffered by well-reputed firms (WorldCom, Enron, Societe Generale), as the result of errors in the operational risk management changed this situation. This began intensive research concerning of the methodology of operational risk measurement. In practice economic subjects use many methods both qualitative as and quantitative, however the most of them are statistical techniques aggregative himself on the measurement of the central tendency (e.g. average) inadequate to the appraisal value of large losses from the tail of distribution (fat tail). The main target of my publication is the presentation of the methodology leaning on the Extreme Value Theory (EVT), as the tool letting on the modelling of the operational risk in the area of low frequency and high severity losses (LFHS).

**Agnieszka Tłuczak**  
University of Opole

## **THE USE OF FOURIER ANALYSIS MODELS TO PREDICT PRICES OF MEAT IN POLAND**

The prices and factors influencing them are measurable. Thus it is desirable to make use of time series analysis to predict prices of agricultural products. Main components which constitute the price dispersion are trend, seasonality and circularity. The author of the paper has used Fourier analysis models which take into consideration the trend level change, accidental and seasonal fluctuations. By means of estimated models the author has defined the prices predictions for the first half of 2010. To evaluate the quality of models and predictions the author has used forecast errors.

**Pawel Ulman**

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## **THE DISABILITY COSTS IN EVERYDAY LIFE OF POLISH HOUSEHOLDS**

Households with at least one disabled person consist about 25% of the polish households. The last investigation shows that economic situation of this type of households is – in generally – worse than in households with only able people. The most popular reason of this situation is the low level of the economic activity among polish disabled person. Next, we put a question if presence of disabled person in household generate additional costs of household maintenance, in which group of expenses and how high is the level of this costs.

To answer above questions the structures and levels of expenses between households with and without disabled persons are compared assuming the comparable level of incomes and financial situation. Moreover, the equivalence scale is estimated what allows to calculate how higher or lower are costs everyday life of households with disabled persons assuming the same level of wellbeing.

All of calculations are carried out with using individual data from Households Budget Survey collected in 2007. Theoretical models of income and expenses are used but to estimate cost function and in the next step equivalence scale regression modeling is used.

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**Viera Labudová**

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## **APPLICATION OF DATA MINING MODELS IN PRACTICE**

Every organization accumulates huge volumes of the data from a variety of sources on a daily basis. Data mining is an iterative process of creating predictive and descriptive models, by uncovering previously unknown trends and patterns in vast amounts of the data from across the enterprise, in order to support decision making. Organizations use this information to detect existing fraud and to prevent future occurrences.

This paper illustrates how Credit Scoring for SAS Enterprise Miner software is used to build credit scoring models. In theoretical part we deal with methods and criteria suitable for credit scoring. Practical part concerns with building a suitable model for scoring. Modeling of credit scoring is realized with the SAS Enterprise miner tool.

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## **EXPECTED VOLUME OF INFORMATION ON TRANSFORMATION OF STRUCTURES AS A MEASURE OF DISSIMILARITY OF STRUCTURES**

The notion of entropy was defined on the occasion of the second principle of thermodynamics while application of thermodynamics in the theory of information introduced the notion of entropy to the communication systems. We can talk about entropy everywhere where there is need for illustrating the diversity and randomness that is in the theory of information and statistics in particular. Frequently, diversity is treated as inconvenience, in the theory of information, however, diversity is a source of information. Attempts at determining the degree of that diversity is based on the use of entropy.

Currently, applications of the notion of entropy appear in the analysis of behaviour of various systems, including economic-social systems. Obtaining knowledge on the rules determining the evolution of economic phenomena structures is an important issue for achievement of theoretical and practical goals. Comparison of structures, studying their transformations over time, is the subject of numerous studies on socio-economic issues. The transformations, and at the same time differences of structures are accompanied by diversity for studies on which entropy can be applied.

In socio-economic issues there is need to assess the degree of transformations between the assumed structure (a priori) and the structure actually formed (a posteriori). This can apply to, for instance, the comparison of the assumed expenditures structure of certain economic objects with the structure that was actually implemented. The objective of the paper is to present the possibility of assessment of the degree of those transformations. It was proposed to use the expected volume of information on the transformation of the assumed structure into the actually achieved structure for investigating the degree of dissimilarity between those structures.

**Radosław Wiśniewski**

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### **COST-EFFECTIVENESS OF BILLING BETTERMENT LEVY IN POLAND**

Identification of the factors stimulating profitability of technical infrastructure improvement fee (*betterment levy*) calculation in Poland is the aim of the following paper.

The paper introduces results of simulation of the model of the economic phenomenon - a process of calculating improvement fees.

Simulations will be performed using the author's model of improvement fees calculation process and a computer program using Monte Carlo simulations.

**Ewa Witek**

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## **FINITE MIXTURES FOR INSURANCE DATA**

The simplest finite mixture models are finite mixture of distributions which are used for model-based clustering. More complicated mixtures have been developed by inserting different kind of models for each component. An obvious extension is to estimate a generalized linear model (GLM) for each component. Finite mixtures of GLMs allow to relax the assumption that the regression coefficients and dispersion parameters are the same for all observations and are often used to capture overdispersion in the data which can occur for example if important covariates are omitted in the regression.

Insurance variables are usually non-negative and skewed to the right. Options for modeling these variables are: use a transformation to normality, and then employ the normal linear model on the transformed response or use a response distribution that is concentrated on the non-negative axis (mostly Poisson and gamma distributions are applied).

All computations and graphics will be done with flexmix package of **R**.

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## **THE DYNAMICS OF BUYER-SELLER PAIRING IN ONLINE AUCTION SERVICE MODEL**

Internet auctioning becomes more and more popular among Polish customers who find this style of shopping very attractive and convenient. High popularity of the largest Polish auction site Allegro.pl indicates that customers prefer centralized markets where all offers are available at one place and can be easily compared by price. However if goods offered for sale are to be compared by price, their prices have to be well defined for all the time which is impossible in the case of pure auctions. For this reason an increasing number of sales is utilizing different selling mechanism called "Buy now" which is essentially equivalent to typical online shopping. There may be also another reason for growing popularity of "Buy now" sales: the supply and demand are balanced better than in case of bidding mechanism. This issue becomes important for sellers who are offering constants supply of items and trying to satisfy all of their potential customers. As computer simulations performed on a model of auction system show, there are similar problems with satisfying every customer's expectations as with sharing limited resources in a context of multitasking computer environment. These include such phenomena like starvation preventing some customers from completing a transaction in spite of excess number of goods being available in stock. Conclusions indicate that bidding mechanism is not an efficient way of pairing buyers and sellers and that it does not balance supply and demand even if an equilibrium state is possible.

**THE MANAGEMENT THE FINANCES OF ECONOMIC ORGANIZATION IN  
CONDITIONS OF RISK SERVICE OF THE TONG - TERM FINANCIAL  
OBLIGATIONS**

The management is the economic organization the process folded, as the planning the development of economic organization, realization of plans hugs as well as the process of control of realization plans. The plan of development defines the of development economic aims, these more far - strategic as well as closer - operating. Their realization follows in result of decision processes undertaken by board of economic organization on all rungs the management. Plans found definite conditioning near regard which the defined in plans of development aims should be realized. They conditioning can be independent from manageress with economic organization, particularly these which are external in relation to her. Their changes in track realizing the plans of development can be with reason of not realizing in such dimension in what were definite in plans of development the aims. To reach board undertaking having working planned cells, risk undertakes resulting with necessity of realization of plans near simultaneous lack of influence on quality of conditioning near which it realizes the decision processes.

The realization of plans of development economic organization requires undertaking in all the decision her structural areas. Study this concentrates in area of financial decisions, and it concerns the question of service of tong - term obligations particularly.

The aim of study the state the conception of the system which with foundation has to accumulate and to process for opinion of state of risk the essential information connected with service of the tong - term obligations. The changeability of state of risk is in area of finances the result of changeability of conditioning realization decision - main hypothesis of this study, state the foundation of system of management in conditions of risk. From here the measurement of changeability of results conditioning the state so the essential information about change of state of risk.

The proof of received hypothesis requires the building of model of risk service the tong - term obligations as well as the definition of gathering of measures risk. The measurement of changeability of state risk is in period the powtarzalnym process the staying in risk, it permits to qualify this dynamics and the direction of changes of state undertaken risk. The management the fluency in period of repayment of obligations, leaning on utilization the information about dynamics the and direction of changeability of state risk, the choice of effective instruments of protection process repayments will hug before results of undertaken risk also.

The results of practical utilization of introduced project in study be introduced become. It the implementation of system of management in conditions of risk of service tong - term obligations was executed was in firm the functioning on terrain of Gdańsk and Warsaw Market.