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INTEGRATED MANAGEMENT OF MIGRATION, EMPLOYMENT, FISCAL POLICY AND PUBLIC DEBT

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Abstract. The main idea of the paper states that national migration indicators are closely related with employment opportunities in that country. In addition, the management quality of migration and employment processes is an indicator of the national socio-economic policy competency, while management of these processes is the main purpose of intelligent adjustment of the national fiscal policy and government debt management. The author of the paper selected the formation of the system of quantitative indicators as the main objective of the paper. The system should allow employing government debt possibilities for the selection of proper fiscal policy in order to prevent the transformation of unemployment into the key reason of uncontrolled national inflation. This would be done by revealing the possibilities of fiscal policy to impact on the level and structure of unemployment. Recent globalisation processes and integration possibilities bring a lot of uncertainty to predetermined viability of theoretical assumptions as well as the adequacy of the applied quantitative methods. The paper uses the possibilities of stochastic optimisation and stochastically informed expertise pursuing the possibilities of integrated management of employment, migration processes, fiscal policy and government debt provisions.

Keywords: fiscal policy, employment, migration, public debt, integrated management of employment, fiscal policy and public debt.

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JEL Classification: E24, E27, E62, H63, O15.

1. Introduction

Each concept used in the title of the paper represents a clearly defined process that falls within the remit of government policy. All of these processes should be understood as a significant and hierarchically integrated system operating on a national or regional level with several centres of gravitation, and as a system of different but interacting gravitational forces. The title of the article includes definitions, the complete cognition

of which requires an integrated approach to the diversity and versatility of interaction. It should be underlined that the scientific literature has been long focusing on the analysis of the aforementioned distinctive processes or events as well as the understanding of integration aspects. However, intensive globalisation has revealed the aggregate of new and urgent distinctive processes as well as problems related to their cognition and management of related interaction.

Lack of intelligence in forming management strategies for any of these processes may result in socio-economic consequences for the whole country, while the synergized result of their negative interactions could become disastrous for the economic self-sufficiency and possibilities of sustainable development of a country, especially a small one.

Unfortunately, there is a lack of scientific literature intended for the integrated management of the aforementioned parameters, especially using a quantitative analysis. Thus, the paper presents the results of such experiment.

The performed research is innovative in terms of methodology as it attempted to produce a stochastically adequate evaluation of the interaction between the most complex processes, namely, economic, social and political.

2. Migration as information on socio-economic differences of a country and its surrounding environment

Each of the aforementioned processes or subsystems could possibly become the focus of analysis in the context of the aggregate of processes as well as be separately analysed. However, this article will generally focus on migration (*Lat. migratio* – relocating, moving). First, the attention should be focused on the migration concept, which is used for perception of survival and development problems of inanimate nature and biological processes or protozoa communities, as well as the analysis, cognition and management of social processes.

Apparently, economic and social problems of emigration should be considered in the context of their universal conformity (Bijak *et al.* 2007; Williams 2009; Xiang, Shen 2009).

Naturally, the methodology for cognition of migration within the social medium suggests a wide spectrum of theories: social, macroeconomic, microeconomic, geographical and integrative (Chi, Voss 2005). Every subsystem pertaining to these theories accumulates unique knowledge and experience. Raymer *et al.* 2013; Bijak, Wisniowski 2010; Bijak, Kupieszewska 2008; Bijak 2008; Bijak, Wisniowski 2011 presented an exhaustive logics behind the cognition of an individual subsystem and the essential aspects of migration management possibilities. At the same time, it can be noted that migration is perceived as movement of people with significant relocation. Migration becomes the aggregate of dynamic processes once the search for standard sources of living or conditions ensuring adequate education of social capital as well as other motives become the factors for diversity and dynamics of migration.

Globalisation aims to increase the efficiency of creation and utilization of economic resources. However, globalisation reveals abundant risks related to social migration and the need to find a critical solution. Moreover, for conceptual basics of migration to be understood, complex models must use powers suggested in theory. Otherwise, uncontrolled migration could become a problem similar to the Tower of Babel. All kidding aside, the aggregate of globalisation-caused uncontrolled demographic, economic, social, cultural and other processes, which apparently form without any development logics and are impossible to understand, can became the immeasurable cause for stagnation of progress and sustainability.

Regrettably, the further analysis will only concentrate on integrated management possibilities of emigration, employment, fiscal policy and public debt of small countries, focusing on preparation of an adequate migration management concept and creation of active system of models. Taking into account the existing historical data and expert valuations identical to the reality, one could calibrate the models for quantitative analysis of possibilities of migration management cognition.

3. Preparation and use of hierarchical system for regression dependency to solve the formulated problem

Fig. 1 presents the geometric view of the hierarchical system for regression dependency. The content of the scheme could be explained as follows: the basic level contains the statistical information required for detection of solutions for the system along with additional information, which is received, stored and appears in each of the remaining three levels while performing the required assessments.

First, it is worth mentioning that Fig. 1 presents solutions of the linear polynomial regression for all the three levels of decision. There are pairs of numbers, describing the contents of regression coefficients a_0, a_1, a_2, ..., a_p. On the third level, there are 8 pairs of numbers, on the second – 7 pairs of numbers. The optimisation problem of public debt formation and utilization is solved on the first level. Thus, the structural indicators of debt purchase and distribution are presented as follow:

$$w_1^l, w_2^l, w_3^l, w_1^a, w_2^a, w_3^a. \quad (1)$$

Also, while identifying the linear polynomial regressions, on the second and third levels, the backward procedure of insignificant factors has been applied. For this reason, the mentioned content of the polynomial regression has been formed.

The backward procedure is a sequence of tests to eliminate the independent factors according to their significance. Starting with the maximum number of factors

$$y = a + b_1 x_1 + ... + b_p x_p \quad (2)$$

on the first step, the variable with the highest p-value significance is removed (or eliminated) while testing, which exceeds the predetermined level in the performed calculations – 0.10. This procedure is repeated until the model no longer has a variable that could be eliminated.

Using *RkWard* statistical program, the coefficients of regression and parameters of significance for all set of factors can be found (Eurostat 2013). The content of the factors presented in Fig. 1 is as follows:

- emigration – the number of emigrants per thousand of inhabitants;
- unemployment – the number of unemployed per thousand of inhabitants;
- poverty rate – the number of inhabitants living below the poverty threshold per thousand of inhabitants;
- education – the number of inhabitants having professional or higher education per thousand of inhabitants;
- public debt – debt expressed in thousands of euros per capita;
- foreign investment – in the thousands of euros per capita;
- construction price index – the difference between the average of EU27 states and Lithuanian construction volume index (base 2010 year).

Taxes related to:

- labour relations – the labour-related differences in tax rates in EU27 states and Lithuania;
- consumption – the consumption differences as a percentage of GDP in EU27 states and Lithuania;
- corporate profit – capital and business income differences in tax rates in EU27 states and Lithuania.

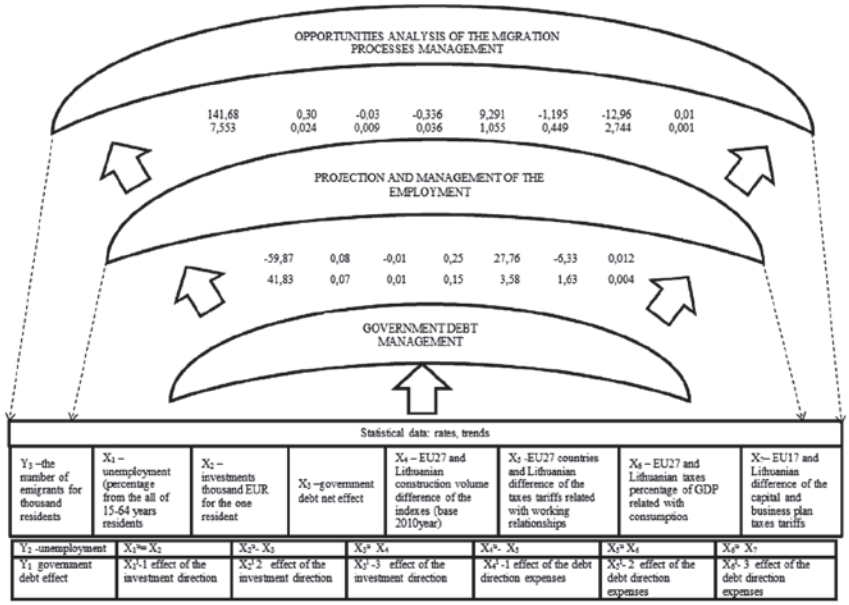


Fig. 1. Integrated evaluation for migration, employment, public debt and fiscal policy (Source: created by the author)

3.1. Evaluation of the public debt effect

The first level is intended for analysis of the situation. It explains ways, in which the use of public debt could be formed in pursuit of the highest net effect generated by the public debt while intelligently searching for the appropriate sources of borrowing and directions for the use of the debt. Currently, there are no officially declared fixed effects, which were created by publicly borrowed resources. Meanwhile, methodical instructions on public debt service designed by the World Bank and International Monetary Fund (Public sector debt statistics 2011; Guidelines… 2003) also require evaluating the net debt, i. e. the amount of gross debt (borrowed volume plus the volume of debt service) and the amount of effects generated by debt.

Analytic dependence becomes the basis:

$$y_1 = f_1(x_1^e, x_2^e, x_3^e; x_1^l, x_2^l, x_3^l) \tag{3}$$

($x_i^e, i = 1,2,3$ – investment tools; x_1^l, x_2^l, x_3^l – debt volume).

Its applicability for prognostic and realistic operational calculations is evaluated as well. Further, we take advantage of the fact that in Fig. 1, the zero level contains identification of all variables. Equation (3) was solved as a stochastic optimisation problem. The net effect volume generated by received debt was used to evaluate emigration volume (3rd level).

Indeed, if there is a need to maximise the volume of the utility formed by debt applying the purchase and utilization of debt, then the indicators of the net utility, obtained by the proposed method, could be placed in the regression equations in the 2nd and 3rd levels. Certainly, this idea requires a deeper reasoning.

Formally, the total debt utilization and management task can be described (Rutkauskas, Lapinskaitė 2012) in the following way. Suppose that the marginal debt unit is obtained from n different lenders and debt service in each case takes t years. Let each debt service require $l_{ij}, i = 1,...,n; j = 1,2,...,t$ funds annually.

Suppose that it is possible to evaluate the present value of all debts in every year – $PV(\sum_{i,j}^{n,t} l_{ij})$. This will be the present value of general debt service costs. In turn, the borrowed unit is invested in n different assets with a return over a period of t years. Suppose that the i-th asset return in the t-th year is denoted

$$a_{ij}, i = 1,2...,n; t = 1,2,...,t\ .$$

It is understood that the same i and j for both borrowing and return generation are only relative. Now, considering the net value of debt-generated effects

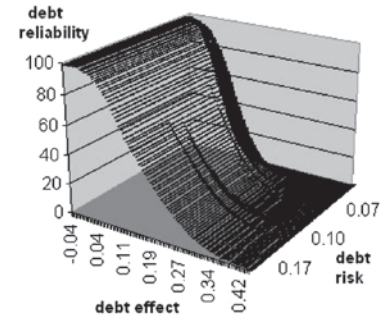
$$PV(\sum a_{ij})$$

we can estimate the net present value of debt or, as defined in this text, the net present value of debt-generated benefit. However, the debt service costs and the incoming effects are prospectively treated as random variables or processes. Therefore, the appro-

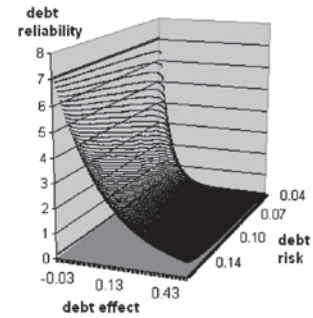
priate information, the sources of which can be data or knowledge bases existing in a borrowing and investment environment or only expert systems, allows treating the debt selection or application problem as a stochastic optimisation problem, when it is necessary to look for such borrowing ratios $\omega_1^d, \omega_2^d, ..., \omega_n^d$, and investment in different assets ratios $\omega_1^I, \omega_2^I, ..., \omega_n^I$, so that the borrowing net effect

$$PV(\sum_{i,j}^{n,t} a_{ij}) - PV(\sum_{i,j}^{n,t} l_{ij}),$$

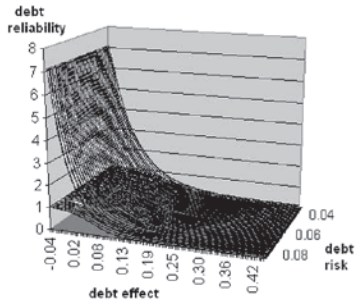
achieved by adequate stochastic size measure utility function would give the greatest benefit for the debtor.



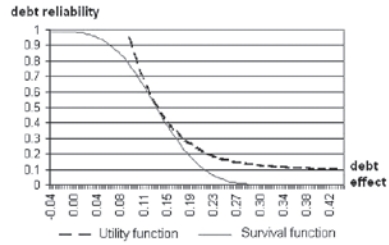
a) Three-dimensional surface



b) Utility function



c) Possibility surface and utility function – three-dimensional view



d) Possibility surface and utility function – the tangency point

The investment (use of debt) structure			Borrowing structure		
$\omega_1^a - 0.685$	$\omega_2^a - 0.305$	$\omega_3^a - 0.01$	$\omega_3^a - 0.05$	$\omega_2^a - 0.685$	$\omega_1^a - 0.265$
Parameters of optimal solution					
The effect of debt use		Effect reliability		Risk level of the effect	
0.127		0.549		0.061	

e) The information of optimal solution

Fig. 2. The anatomy of decision search (Rutkauskas *et al.* 2013)

In some previous papers, the author (Rutkauskas, Kvietkauskienė 2012; Rutkauskas *et al*. 2013) presented a detailed description of this principle together with the problem of choosing the borrowing ratio from among three creditors – $\omega_1^l, \omega_2^l, ..., \omega_n^l$, and the three trends of borrowed money investment – w_1^a, w_2^a, w_3^a, aiming for the expected effect to bring the largest benefit. The effect would be evaluated based on expert evaluation of both the debt costs and investment effect values, while the benefit is measured based on a chosen adequate utility function, the factors of which are both effect volume and its reliability. The mentioned problem could be briefly illustrated in Fig. 2.

The retrieved annual estimate trend was used in evaluating the replacement of borrowing efficiency for the entire analysed period both in the number of the unemployed and emigration dynamics.

3.2. Multifactoring of unemployment rate dynamics

The second level evaluates the functional dependence among unemployment rate in Lithuania and the differences between public-debt-generated net effect and adequate functions of investment volume, the volume of construction works, employment and consumption-related taxes as well as income tax volumes in the EU27 states and Lithuania:

$$y_2 = f_2(x_1^u, x_2^u, x_3^u, x_4^u, x_5^u, x_6^u). \quad (4)$$

Here, we will use the public debt generated net effect as calculated in the first stage. In addition, we can also see the value obtained by linear regression, which makes it possible to compare historical data and proposed system support estimates (Fig. 3). We understand that with linear regression it is difficult to perceive variables interacting in formation of employment level. For this purpose, it is always important to choose adequate, non-linear (as a rule) stochastic dependencies. However, the formation of the entire view and the way in which factors change in the overall result can be obtained with linear regression.

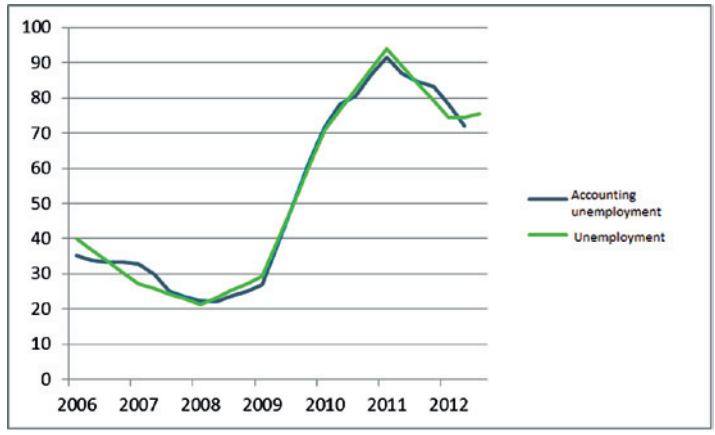


Fig. 3. Real unemployment rates compared with values obtain using LINEST function, when the coefficient value is the average (Source: created by the author)

3.3. Migration – comprehensively considered problem

The third level provides the dependence of emigration index dynamics on the number of the unemployed, the investment volume, the net effect of debt and the difference in taxes related to employment, consumption, capital and business plans, tariffs among EU27 and Lithuania. These specific indicators are detailed in Fig. 1. The general dependence of emigration indicators may be written as:

$$y_3 = f_3(x_1, x_2, x_3, x_4, x_5, x_6, x_7). \quad (5)$$

The specific linear regression solution was obtained using LINEST function and is given in Fig. 4.

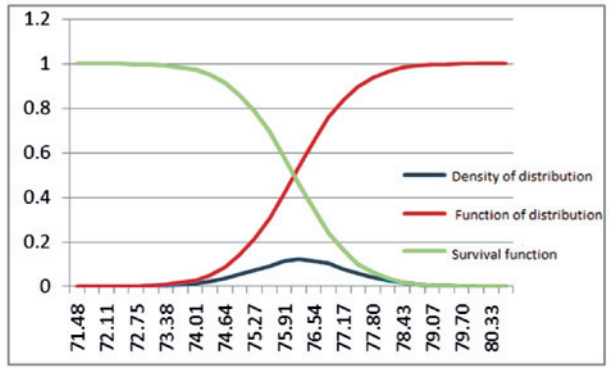


Fig. 4. Unemployment probability distribution of the first possible measures for the analysed period (Source: created by the author)

Fig. 5 provides actually formed emigration data compared with their estimates obtained by linear regression when the linear regression coefficients are derived value averages.

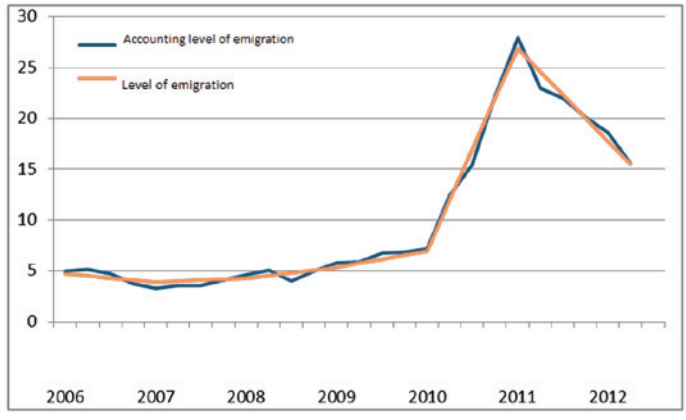


Fig. 5. Actual former emigration rates compared with their values obtained using LINEST function, when the coefficient value is the value average (Source: created by the author)

Individual attention is required for utilization of regression as a forecasting and analysis tool. Multiregression analysis coefficients are not obtained as unambiguous values. Usually, when we want to use them as unambiguous values, we use their averages. Fig. 5 presents the situation where the averages of regression coefficients were taken as coefficients. Consequently, they were in a very good agreement with historical data dynamics.

However, as already mentioned, the regression analysis can be successfully used and evaluated for generation of indicator stochastic forecasting. As shown in Fig. 6, assuming that the regression coefficients are stochastic values, which must be multiplied by values of predicted factors, we get a picture that shows the probability distribution of possible emigration values that fully describe the opportunities of short-term development of the emigration process.

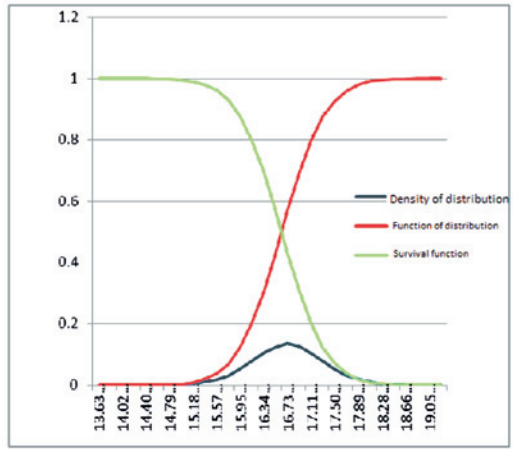


Fig. 6. Emigration potential values of the probability distribution for the individual measures for the analysed period (Source: created by the author)

4. Short overview of methods used for understand of laws that govern migration

The importance of migration and the complexity of the processes as well as factors influencing the extent of migration, the extent of impact made by globalisation and the influence of uncertainty lead to the consistent cycle of cognition, which can be identified in abundant literature aimed at understanding the laws governing migration processes (Nijkamp, Poot 2012):

- theoretical cognition;
- applied methods of cognition;
- models adequate for theoretical assumptions and needs of methods of cognition;
- the evaluation on the general use of results produced from experimental assumptions, methods of cognition and adequate models.

Next, we will shortly review the aforementioned components that are important for understanding of migration. Additionally, the following text will attempt revealing the interrelation of components.

The consistent cycle of cognition can be used to gain understanding about conceptual migration processes (Sato 2007; Bie Lilleor, Van den Broeck 2011; Kancs 2011). In this respect, possibilities of the following theories are underlined and evaluated by the authors:

- sociological theories;
- economic (micro and macro) theories;
- geographical theories;
- unified theories.

Titles of these theories suggest key areas of interest. It is apparent that literature gives less attention to the so-called unified theories, which suggest the departure from strictly unidisciplinary or multidisciplinary cognition to the systemic (Kritz, Nogle 1994) understanding of migration flows, which would allow the use of principles and methods particular to the research of complex systems and provide a more unified possibility for cognition. Some articles of this type, for example (Zlotnick 1998; Massey *et al.* 2002; Massey, Montoya-Weiss 2006), have enjoyed the necessary attention. This paper will draw on the principles of this theoretical point of view.

With regard to applied methods of cognition and models that are adequate for theoretical assumptions or the needs applicable to methods of cognition, the focus should be placed on the following questions:

- How to combine statistical data parameters and their equivalents received by expert evaluation?
- How could we rely on deterministic methods of evaluation and decision-making? How risky is the use of stochastic analysis and forecasting methods?

Attempts to find answers to the aforementioned questions have taken a substantial period of history. Expert evaluations gain more weight not only from the technical point of view, i.e. ensuring the accuracy of assessments, but also in terms of reliability. Many areas of cognition are impossible without expert evaluation. Firstly, this fact is very important for the efficient use of stochastic analysis and stochastic optimisation methods. The information, which is required for the formulation of the above-mentioned problems, is often available only through expert intelligence and powerfully developing global networks of expert evaluation.

This study was based on the so-called stochastic informative expertize (Rutkauskas 2012), when the information was generated to solve problems related to public debt management and evaluated employment and migration possibilities.

In this paper, selection of emigration flows from one EU country to another EU or non-EU country was based on the idea by Massey *et al.* (2002) regarding the possibilities to use hierarchical regression methods with regression factors as variables that comprise the migration push–pull factors. Those were various indicators describing differences of (Fig. 1) economic activity results.

Fig. 6 presents the statistical data of real emigration from Lithuania to other EU countries and the comparison of estimates, which allows considering the hierarchical regression possibilities to use the toughest fiscal policy, public debt, employment and migration processes for integrated analysis (for disclosure of their quantitative mutual dependencies as well as forecasting and management of decision-making).

5. Use of hierarchical regression system for process forecasting

Compared to socioeconomics, it is hardly possible to find such abundance of forecasting methods in other branches of research. This particular science employs almost all possible deterministic and stochastic models if referred to their combination into complex systems. Hence, we have to admit that sometimes, historic data of individually selected social and economic parameters and indicators "submit" to methods that define regularities of their development. Rather frequently, even groups of aforementioned socioeconomic indicators can be sufficiently precisely described using adequately selected models.

However, it is enough to step over the threshold, beyond which everything turns into history, just to see how the seemingly harmonious universe of processes, measured by indicators that adequately represent its essence, becomes unmanageable even to most scientifically developed forecasting systems. This results in such acute questions for researchers as:

- Were essential factors that organise and manage the system as well as dependencies missed in the logic behind the description of the behaviour of associated processes, which were developed during the course of analysis?
- Does reality always contain as much uncertainty, which, if insufficiently familiar through historic data, would ruin hopes for success in forecasting as well as management decisions?

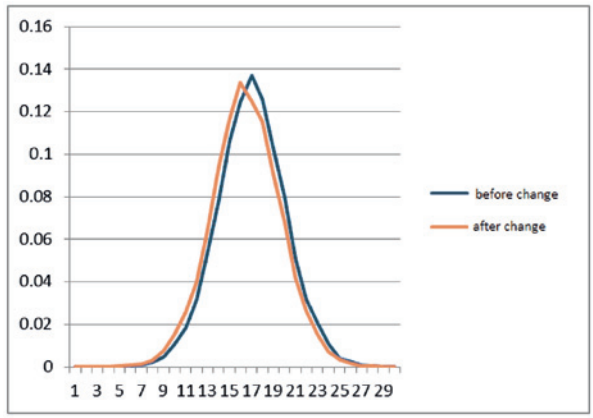
This way, a very important problem of evaluation, which is applicable to most processes, is formed: How much uncertainty was there?

In terms of regression analysis, we often forget that regression analysis treats the selection of past events as cognition of stochastic processes. The estimates of regression coefficients are presented as stochastic values.

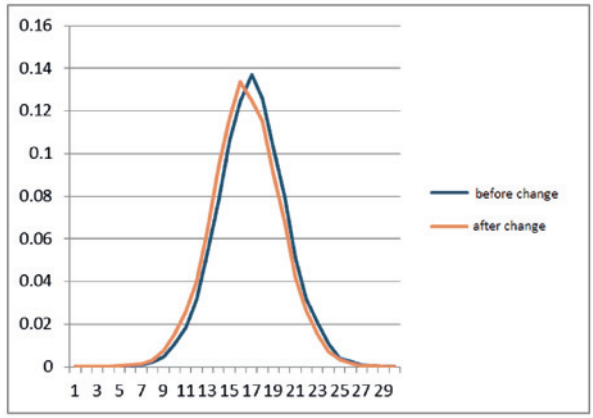
The paper also presents the forecasts of unemployment rates and of the number of emigrants for the first year following the analysed period, which were obtained using the same principle, i.e. with the help of weighted moving averages, when forecasted estimates for all unemployment and emigration factors were obtained on the basis of expert estimates. These values were inserted to the regression equations derived in the hierarchical regression system. Additionally, probability distributions of possible unemployment and emigration values, which were depicted in Figs. 3 and 5, were evaluated. Consequently, the average of unemployment possibilities obtained using the hierarchical regression was close enough to the forecasted value obtained using the weighted average. Average values of emigration rates look similar.

Finally, let's try to undertake a somewhat untraditional sensitivity analysis to evaluate the changes in forecasted value distributions of possible unemployment and emigration indicators, provided the level of risk pertaining to coefficients of regression conditioned by original data would increase by twenty per cent in terms of unemployment and drop by twenty per cent in terms of emigration.

Fig. 7 presents respective changes in the table of unemployed (a being the density of distributions) and the risk of emigrants (compare with b, which shows the density of distributions), measured by standard deviation.



a



b

Fig. 7. Sensitivity analysis for employment and emigration with a changing standard deviation of factors (Source: created by the author)

a – the change in the density of probability distribution applicable to possible unemployment, provided the standard deviation increases by 20%;

b – the change in the density of probability distribution applicable to possible emigration, provided the standard deviation drops by 20%.

6. Final remarks

There is no doubt that evaluation of efficiency pertaining to such individual processes as the public debt, the number of unemployed and emigration dynamics or fiscal policy can open up valuable opportunities for understanding of distinct features of interaction particular to the aforementioned processes, along with their consistent patterns. However, constructive management information is only possible through the analysis of these processes and influencing factors in the general system. The general analysis of these processes is aggravated by the universe of stochastic processes and interactions that exists even in countries of large-scale economy. These processes and interactions vary and become even more complex in the reality of small countries. On the other hand, this allows viewing processes, for which management assumptions and possibilities were created and would pay-off if used for increased efficiency of development.

In turn, evaluation of practical management decisions and especially the consequences pertaining to such decisions requires a certain level of specification. Indeed, as a rule, a growing level of specification results in the increase of the level of relative errors; therefore, it is necessary to ensure an intelligent structure for specification while higher specification would provide more information for decision-making.

Considering that the study presented in the article was based on Eurostat (2013) data on Lithuania, it would be appropriate to find out the level of specification of general indicators analysed in the research that would be most instrumental for Lithuania. Possibly, this can already be seen from detailed information on migration accumulated by the Statistics Lithuania (2013) as well as the level of specification, to which the hierarchical regression system could be transformed in order to maintain the efficiency of the system. Such indicators should and may cover: migration distribution by age, sex, geographic location, type of activity and education in Lithuanian and also the destination country as well as the purpose for emigration and possibilities of emigrants in the country of arrival.

7. Conclusions and suggestions

The processes of globalisation inevitably determine the integration of countries and regions, which empowers a more economic use of natural resources, more efficient creation of new resources and the increase in the effectiveness of human resource and technology utilization. However, in the short-term perspective, the uncontrolled globalisation reveals problems, solution of which demands additional costs.

The increased volume of unemployment and inefficient use of the highly qualified human resources as well as doubtful integration, the lack of understanding how to optimise the effect of labour and capital flows as well as the outbursts of various unanticipated and uncontrolled crises create a special are of concern and comprise threats for sustainability of development and economic self-sufficiency of small countries.

The integrated management of employment and migration processes, along with solution of problems related to fiscal policy and management of foreign debt flows remains one of the relevant topics for scientific research.

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References

Bie Lilleor, H.; Van den Broeck, K. 2011. Economic drivers of migration and climate change in the LDC's, *Global Environmental Change* 21(1): S70–S81. http://dx.doi.org/10.1016/j.gloenvcha.2011.09.002

Bijak, J. 2008. Bayesian methods in international migration forecasting, in Raymer, J. Wiilekens, F. (Eds.). *International Migration in Europe: Data, Models and Estimates.* Chichester, GB, John Wiley, 255–281.

Bijak, J.; Kupiszewska, D. 2008. Methodology for the estimation of annual population stocks by citizenship group, age and sex in the EU and EFTA countries, *Informatica (Ljubljana)* 32(2): 133–145.

Bijak, J.; Wiśniowski, A. 2010. Bayesian forecasting of immigration to selected European countries by using expert knowledge, *Journal of the Royal Statistical Society* 173(4): 775-796. http://dx.doi.org/10.1111/j.1467-985X.2009.00635.x.

Bijak, J.; Wisniowski, A.; the IMEM Team. 2011. Statistical modelling of international migration flows, in *58th World Statistics Congress of the International Statistical Institute* (ISI2011), 21–26 August 2011, Dublin, IE, 21–26 Aug, 2011, 8.

Bijak, J.; Kaczmarczyk, P.; Kicinger, A.; Kloc-Nowak, W.; Kupiszewski, M.; Napierałaf, J. 2007. *Demographic development, labour markets and international migration in Poland-policy challenges.* Available from Internet: http://www.cefmr.pan.pl/docs/cefmr_wp_2007-03.pdf

Chi, G.; Voss, P. 2005. Migration decision-making: a hierarchical regression approach, *Journal of Regional Analysis and Policy* 35(2): 11–22.

Eurostat [Accessed on 2nd of May, 2013]. Available from Internet:
http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/

Guidelines for Public Debt Management 2003. International Monetary Fund and the World Bank, 38 [online], [cited 10 April 2013]. Available from Internet:
http://treasury.worldbank.org/bdm/pdf/PDM_Guidelines_2001_english.pdf

Kancs, A. 2011. The economic geography of labour migration: Competition, competitiveness and development, *Applied Geography* 31(1): 191–200. http://dx.doi.org/10.1016/j.apgeog.2010.04.003

Kritz, M. M.; Nogle, J. M. 1994. Nativity concentration and internal migration among the foreign-born. *Demography* 31(3): 509–524. http://dx.doi.org/10.2307/2061755

Massey, A. P.; Montoya-Weiss, M. M.; O'Driscoll, T. M. 2002. Knowledge management in pursuit of performance: insights from Nortel networks, *MIS Quarterly*: 269–289. http://dx.doi.org/10.2307/4132333

Massey, A. P.; Montoya-Weiss, M. M. 2006. Unravelling the temporal fabric of knowledge conversion: A model of media selection and use, *mis quarterly:* 99–114.

Nijkamp, P.; Poot, H. J. 2012. Migration impact assessment: A state of the art, *Migration Impact Assessment: New Horizons*, 1.

Public sector debt statistics. Guide for compilers and users. 2011[online], [cited 14 May 2013]. Washington: International Monetary Fund. 232 p. Available from Internet: http://www.tffs.org/pdf/method/PSDS11fulltext.pdf

Raymer, J.; Wiśniowski, A.; Forster, J.; Smith, J.; Peter, W. F.; Bijak, J. 2013 Integrated modeling of European migration, *Journal of the American Statistical Association* http://dx.doi.org/10.1080/01621459.2013.789435.

Rutkauskas, A. V. 2012. Stochastically informed expertise as natural step for experts systems network development, in *Conference Proceedings of the 2nd International Scientific Conference "Whither our Economies – 2012",* October 15–16, 2012, Vilnius, Lithuania, 46–53.

Rutkauskas, A. V.; Kvietkauskienė, A. 2012. Successful investment – market behavior and investing intelligence compatibility result, in *Contemporary issues in business, management and education'2012*, 15 November, 2012, Vilnius, Lithuania: selected papers: conference proceedings. Vilnius: Technika., 170–182.

Rutkauskas, A. V.; Lapinskaitė, I. 2012. Marketing as core instrument to implement sustainability strategy for a business world. The case of fast moving consumer, in *The 7th international scientific conference "Business and Management 2012":* selected papers. May 10–11, 2012 Vilnius: Technika, 162–172.

Rutkauskas, A. V.; Stasytytė, V.; Maknickienė, N. 2013. Government debt as the integral portfolio of assets and liabilities generated by debt, *Journal of Business Economics and Management* iFirst: 1-19. http://dx.doi.org/10.3846/16111699.2013.815129

Sato, Y. 2007. Economic geography, fertility and migration, *Journal of Urban Economics* 61(2): 372–387. http://dx.doi.org/10.1016/j.jue.2006.08.002

Statistics Lithuania [Accessed on 10 June 2013]. Available from Internet: http://www.stat.gov.lt/

Williams, N. 2009. Education, gender and migration in the context of social change, *Social Science Research* 38(4): 883–896. http://dx.doi.org/10.1016/j.ssresearch.2009.04.005

Xiang, B.; Shen, W. 2009. International student migration and social stratification in China, *Education and Development in Contemporary China* 29(5): 513–522. http://dx.doi.org/10.1016/j.ijedudev.2009.04.006

Zlotnick, G.; Naheer, E. 1998. *U.S. Patent No. 5,831,936*. Washington, DC: U.S. Patent and Trademark Office.

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