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Sustainabilities Portfolio as System to Envisage and Manage Universal Sustainability

Aleksandras Vytautas Rutkauskas [1], Viktorija Stasytyte [2] and Indre Lapinskaite [2]

[1, 2,] **Faculty of Business Management, Vilnius Gediminas Technical University Vilnius, Sauletekio ave. 11, LT-10223, Lithuania**

E-Mails: ar@vgtu.lt (A.V. R.); viktorija.stasytyte@vgtu.lt (V. S.); indre.lapinskaite@gmail.com (I. L.)

Tel.: +370-5-274-4862; Fax: +370-5-274-4861

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Abstract: The purpose of this paper is not to analyze the sustainability of universe, but try to conceptualize what the universal sustainability is, when it comes to a single country or region, wherein realistically the religious, political, social, economic, environmental and investment subsystems are revealed as the vitality of spiritual and material existence media or maybe wherein the signs of erosion of the subsystems (as the of self-organized entities) correlation or development. The recent events in Africa and Europe unclose the problems, which are accumulated even more than the last decades and the way - not solving them - menace not only to sustainability of development of a single country or regions, but also to imbalance of the global evolution. In the article the possibilities of usage of the sustainability portfolio of subsystems, as means of modern systematic analysis resort is analyzed. Invoking the expert methods and abilities of the portfolio's techniques, the problem of optimal allocation of financial resources among the separate sustainability's subsystems, is trying to be solved, which would let to reach the nourishing standards of universal sustainability. The universal sustainability index for the country was chosen the particular composition of that country's sustainability subsystems indexes. In the dynamics the index is known as random process and its force for a particular moment is measured by the level of index and level's reliability or guarantee. To solve the problem - financial resources allocation in order to reach the maximum power of sustainability index, the idea of Markowitz random field was invoked, and a means for the technical solution the system of simulation models and decisions - "GoldSim" was used.

Keywords: universal sustainability, sustainability index force, sustainability's reliability, Markowitz random field, utility function, stochastical optimization.

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1. Introduction. The Concept of Universal Sustainability

Speaking about the problems of evaluation and management of sustainability usually set of sustainabilities or a structure of universal (from the Lat. universalis) sustainability is chosen, revealing the possibilities to formulate and solve the specific sustainability problems. Mostly the social, economic and ecological sustainability's subsystems are highlighted, often – investment and political sustainability subsystems and rarely – religious sustainability subsystems. And for each of subsystems specific characters and objectives are raised:

- Religious sustainability – is the possibility for humankind to resign to its temporariness existence, to concede spiritual values of each other, to avoid a contraposition of religious gospel, to focus exceptional attention of everybody on weaklings and unfortunates.
- Political sustainability – is the possibilities of citizens to ensure democratic regeneration of country's political institutions, what would guarantee public representation of all citizens' interests and also represent country's interests in international institutions.
- Investment sustainability – is the strategies of choice of development possibilities, allowing to choose the variants of social, technological and economical development, measured with country's disposed material and intellectual resources.
- Social sustainability – is the possibility to combine harmoniously interests of all social groups, ensuring human worth existential conditions which are in the ground level of hierarchy and what is the most important – the ability to develop society evolution under science revealing consistent patterns.
- Economical sustainability – is the ability to satisfy the needs of country maximally with the disposed resources together invoking international connections and support features.
- Ecological sustainability mostly explained as the possibilities to safe the productivity and variety of biosystem.

The main objective of each universal sustainability's subsystems in a more simplified way could be understood as a subsystem's ability to maintain with the high level of guarantee the certain foundation parameter's level above the critical threshold, while dropping below the threshold the subsystem starts to lose its ability to rebuild itself as a system. However, undoubtedly the main question is rising - what kind of ability the universal sustainability should foster, i.e. the resultant of all sustainability subsystems. Searching for an answer to this question deterministically the idea is coming that this feature conceptually should be understood as preservation of the subsystems' ability to interact. Actually the necessity of such feature is seeking by analyzing the environmental sustainability individually also as other sustainability subsystems. However, for individual subsystems the interaction of their elements or their subsystems is conceptually better known and unfolding for management. In a case of universal sustainability there is a need for perfect formation of the concept of interaction indeed as also preparation of interaction of engineering foundations.

The key tasks here are - to understand the content, methods and consequences of the universal sustainability and be able to simulate adequately those processes in order to create the assumptions for the various specialists of subsystems to discuss on the basis of quantitative information.

Considerations about the universal sustainability apprehension and fostering are not abundant and one-directional, and even more - practically constructive. Actually in 1999-2005 was published ESI (Environmental Sustainability Index). However, it was rather measurements of environmental state's parameters or estimates, which are more suitable to compare environmental state of different countries. Later, it was substituted with the EPI (Environmental Performance Index), and as the name asserting it pretends to the instrument of sustainability anatomy.

The authors in the paper despite the concept expressed next to the name of the article also will introduce the pragmatic research - the optimal allocation of resources maintaining the sustainability and interaction fostering the global sustainability (Lithuania as an example). Lithuania in 2008 according to EMI was in the 16 place in the world, but already the next year withdraws from a 30-highest ranked countries list. The authors will present a stochastic model which describes the dependency of the universal sustainability's index of the main - the political, social, economic, environmental, investment and religious sustainability subsystems' states changes.

2. Results and Discussion. Sustainability Assessment Problems: Ought Universal Sustainability's Index to be Adequate Measure for Sustainability Strength Assessment?

Interaction or the ability to interact - is there a difference? Till the late years the content of sustainability's definition was illustrated by sequences which accompanied the results of human activities. Humankind meeting the requirements and continuously growing needs, as the result both the population growth and irrational usage of needs, send a signal about possible catastrophic results in the future. However, mostly it is because the users of sustainability category were not claiming to turn it to science category. As noted in recent years an area that has come to be called sustainability science has emerged. Though sustainability is not yet an autonomous field or discipline of its own, and has tended to be problem driven and orientated towards guiding decision- making. There is a hope and necessity that knowledge about the interaction of sustainability's subsystems will become the first and most important problem of this science.

3. Experimental Section. Fund Allocation According Sustainability Index Strengthening Directions

Suppose that for sustainability of religious, political, social, economical, ecological and investment subsystems as for natural purposes of these system's development, integrating public EU support and business funds, the particular fund is formed, by which State can dispose distributing it among mentioned subsystems. With the help of specific measurements got from lower level of subsystems and based on expert evaluation, we find out how the usage of the marginal financial unit weighty with amount of expenses impact the changes of index. This impact is estimated as stochastical variables in the indexes of subsystems. That existing state of system characterized by index could be changed (multiplied) by the coefficient.

$$C = N(a_{si}, \sigma_{si})^{w_i} \quad (1)$$

Where: N – is stochastic variable with mean value - m_{si}, and standard deviation – σ_{si}, s- state of system, i- name of sustainabilities.

Expert assessed such values of coefficient:

N (0.9; 0.1) – for religious subsystem;

N (0.93; 0.11) - for political subsystem;

N (1.05; 0.5) - for investment subsystem;

N (1.02; 0.04) - for ecological subsystem;

N (0.96; 0.12) - for economical subsystem;

N (0.99; 0.13) - for social subsystem.

The index of universal sustainability is embraced as a production of all subsystems sustainabilities indexes, is a presumption, that universal sustainability accumulate changes of all systems. In the Fig. 1 we see possibilities of universal index, which are characterized together by degree of index changes, reliability of changes and riskiness. It is obviously that we have to know the way how to select the possibility which guarantee maximal force of index. The force of index is calculated with analog of utility function:

$$U = u(e, p, r) = \frac{ep_e}{r_e} \tag{2}$$

Where:

e- The value of index possibility

p- The guarantee of the possibility (p $\{\xi \geq e\} = p_e$)

r- Riskiness of possibilities

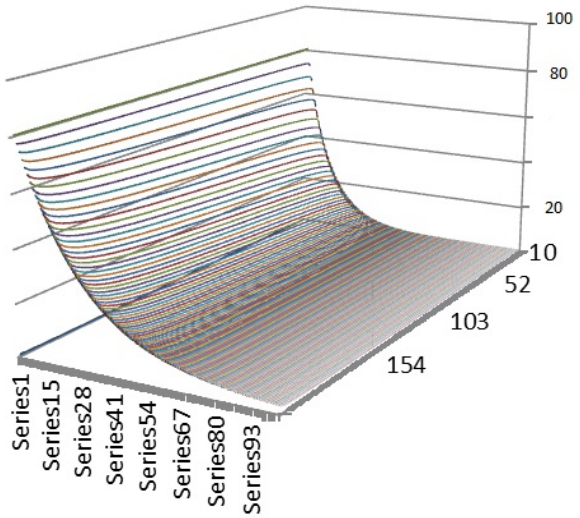

Figure 1. The set of index changes possibilities

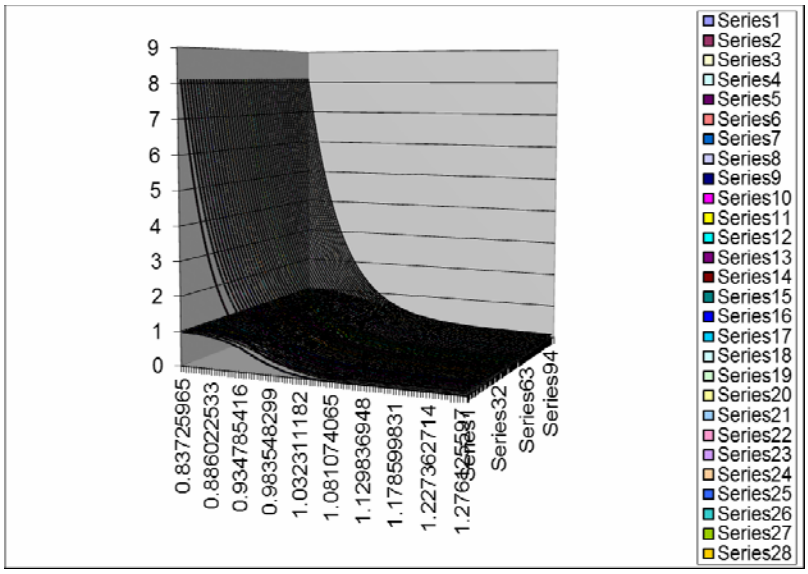

Figure 2. The interaction of index changes possibilities surface with the utility function

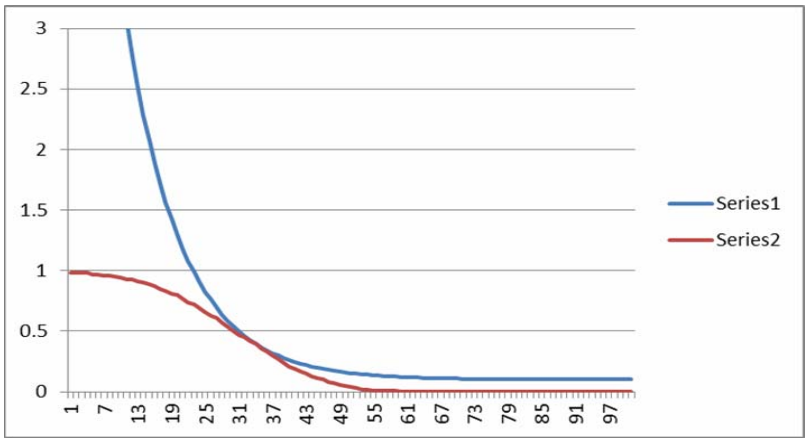

Figure 1. The best possibility choice

4. Conclusions

The definition of universal and general sustainability could become a stand where the indexes of separate subsystems are commensurate.

Expert systems and simulation technologies are capable means for solving the tasks of optimal allocation of resources.

The idea of Markowitz random field is effective means of stochastic optimization.

References and Notes

1. Atkinson, G.; Dietz, S.; Neumayer, E. *Handbook of Sustainable Development*. Edward Elgar, Cheltenham, 2007.
2. Blackburn, W.R. *The Sustainability Handbook*. Earthscan, London, 2007.
3. Clark, W. C.; Dickson, N. M. Sustainability science: The emerging research program, *Proceedings of the National Academy of Sciences*, 2003, Vol. 100, No. 14.

4. Clark, W. C.; Lebel, L.; Gallopin, G.; Jaeger, J.; Mabogunje, A.; Dowdeswell, E.; Hassan, M.; Juma, C.; Kates, R.; Corell, R.; et al. *Science and Technology for Sustainable Development*, 2002, pp. 12-29.
5. Hak, T. *et al*. *Sustainability Indicators*, Scope 67. Island Press, London, 2007.
6. Kates, R. W., Clark, W. C., Corell, R., Hall, J. M., Jaeger, C. C., Lowe, I., McCarthy, J. J., Schellnhuber, H. J., Bolin, B., Dickson, N. M., et al. *Sustainability Science*, Science, 2001, Vol. 292, No. 5517, pp. 641-642.
7. Kates, R. W. Readings in Sustainability Science and Technology. *CID Working Paper* 2010, No. 213. Center for International Development, Harvard University. Cambridge, MA: Harvard University.
8. National Research Council, Panel on Strategies and Methods for Climate-Related Decision Support. Effective decision support: Definitions, principles, and implementation. *Informing Decisions in a Changing Climate*. National Academies Press, Washington, D.C., 2009, pp. 33-69.
9. Parris, T. M.; Kates, R. W. *Characterizing and measuring sustainable development.* Annual Review of Environment and Resources, 2003, Vol. 28, pp. 559-586.
10. Rutkauskas A.V.; Miečinskienė, A.; Stasytytė, V. *Investment decisions modelling along sustainable development concept on financial markets.* Technological and economic development of economy: Baltic journal on sustainability. Technika, Vilnius, Vol. 14. No. 3, 2008, pp. 417-427.
11. Rutkauskas, A. V.; Stasytytė, V. *Optimal Portfolio Search using Efficient Surface and Three-Dimensional Utility Function*. Technological and Economic Development of Economy, 2011, Vol. 17, No. 2, pp. 305-326.
12. Rutkauskas, A.V. *Adequate Investment Portfolio Anatomy and Decisions*, Applying Imitative Technologies, Economics, 2006, Vol.75, pp. 52–76
13. Rutkauskas, A.V.; Stasytyte, V. *Markowitz Random Field as a Stand for Investment Analysis and Decision Making*, in Proceedings of The 15th World Multi-Conference on Systemics, Cybernetics and Informatics: WMSCI, 2011.
14. Soederbaum, P. *Understanding Sustainability Economics*. Earthscan, London, 2008.
15. Wilson, E.O. *The Future of Life*. Knopf, New York, 2002.
16. Wright, R. *A Short History of Progress.* Anansi. Toronto, 2004.