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Analysis of socioeconomic development by intuitionistic linguistic fuzzy numbers

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Abstract

In this paper by using fuzzy intuitionistic linguistic fuzzy operators has been analyzed the influence of external factors to economic state, social consequences and government responses. The analysis is investigated on the basis of Azerbaijan and international information in 2010-2015.

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1. Introduction

The influence of global factors on the state of the national economy is becoming increasingly significant. The world economic system today is a complex mechanism in which each national economy has its own role. And therefore, the analysis of the influence of global factors on the state of the national economy is of great importance. In economic research, for the analysis of socio-economic development various indicators and instruments are used. These approaches depend mainly on the aims of analysis and the levels of development and specialization of countries and their place in the world economy.

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The proposed paper analyzes the degree of influence of external factors on the state of the economy, social indicators and the government's response to these changes. In order to this, we propose to use the concept of "external factor - economic state - social consequences - government response". The socio-economic indicators of Azerbaijan are being analyzed as an object of analysis, and intuitionistic linguistic fuzzy sets are used as a instrument. The choice of analysis instrument is primarily due to the fact that intuitionistic linguistic fuzzy set allows to take into account statistical information errors and to establish a quality level of development.

2. Indicators and sub-indices of the analysis

In the context of globalization, the analysis of the economic development of the oil-producing country should be based on the concept of "External factors - economic condition - social consequences of the economy - government response".
The main external factors - **EFI**, for oil-producing countries, affecting the state of the economy are:
- Oil price on the world market –**WOP**;exchange rates - **USD**;foreign investments - **FIN**.

The economic state- **ESI** is described by the following indicators:
- Oil and gas revenues (mln. US dollars) - **OIN**;   - Volume of investments (mln. az. manats (⌂)) - **INV**;
- Fixed assets (mln. ⌂) - **MPF**; - Financial Stability Index - **AFS**, (calculation of this index is given by G.C.Imanov et. al. (2017).

The social consequences **(SCI)** of the economy are described as :
-Households income (per capita, ⌂) - **INC**;- Employment (thsd. people) - **EMP;**- Average monthly wages - **WAG;**- Unemployment (%) - **UNE;**- Water supply (%) - **WAT;**- Sewerage (%) - **CAN;**- Central heating system (%) -**HES;**- Gas supply (%) - **GAS;**- Hot water supply (%) - **HWA;**- Providing bathroom, shower (%) - **BAT;**
- Ecological Security Index- **ESE**; More details about this index are given by G.C.Imanov et. al. (2016);- Natural increase of population (for every 1000 people) - **GPO;**- Growth + (decrease-) of migration (thsd. people) - **MIG;**- Expenditure on education (mln. ⌂) - **EDU**;- Expenditure on science (mln. ⌂) - **SCI;**- Expenditure on health care (mln. ⌂) - **HEA;**- The average monthly value of pensions (⌂) - **PEN**;- The average monthly allowance and compensation per capita (⌂) - **COM.**

The government's response **(GRI)** is described as:
- New work places (number) - **NWP;**- Social investments (mln. ⌂) - **SIN;**- Wages growth (⌂) - **GWA;**
- Growth in pensions (⌂) - **GPE**;- Personnel retraining (number) - **TRA;**- Improvement in housing conditions (number of families) - **IHO**.

Statistical information on the development of Azerbaijan, corresponding to the problem statement, is presented in Table 1.
For the analysis of economic development of Azerbaijan, an intuitionistic linguistic fuzzy set is used as an instrument.

Table 1. Socio-economic indicators of Azerbaijan during 2010-2015.

Indicators	Sub-indices	Years					
		2010	**2011**	**2012**	**2013**	**2014**	**2015**
EFI	WOP	79.50	111.26	111.67	108.66	98.95	52.39
	USD	0,8026	0,7897	0,7856	0,7845	0,7844	1,0261
	FIN	8247.8	8673.9	10314	10540.9	11697.7	11697.7
ESI	OIN	35097.36	43355,78	43013,83	45342,2	38015,7	22483,45
	INV	17591.4	21588.9	25777.8	27340	27907.5	27907.5
	PRF	83054.5	93942.5	107258.7	121671.3	141098.8	150000
	AFS	0.008	-0,336	-0,214	0,099	0,322	-0,169
SCI	INC	144,2	166,0	190,9	214,7	230,0	240,5
	EMP	4329,1	4375,2	4445,3	4521,2	4602,9	4671,6
	WAG	331.5	364.2	398.4	425.1	444.5	466.9
	UNE	5.6	5.4	5.2	5	5.2	5
	WAT	86,8	87,2	87,3	87,3	87,1	86,8
	CAN	84,3	84,6	84,9	84,9	85,1	85,0
	HES	66,6	64,6	64,6	64,6	64,8	64,6
	GAS	86,1	85,0	85,9	85,9	92,1	91,9
	HWA	7,2	4,7	5,2	5,2	8,8	6,7