Analysis of the Relationship between the Economic Confidence Index and Gross Domestic Product Growth in Azerbaijan

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Abstract: - The paper focuses on the economic policy in Azerbaijan directed to eliminate the results of the Covid-19 pandemic and the return of the country's economy to purposeful structural reforms to ensure productivity and economic growth gradually. Today, the main goal is to direct economic policy to eliminate the results of the Covid-19 pandemic. To analyze short-term economic indicators is important to control economic development in real-time to make operational decisions and to give decision-makers early signals of turning points in economic activity. Monitoring of processes that occurred in the real sector of the economy is carried out through questionnaires. The importance of determining the economic indicators required to assess economic activity in Azerbaijan is considered appropriate. The proposed economic confidence index is considered reliable and important for analysis, forecasting. Special software provides time sequence visualization and integration capabilities. The Economic Confidence Index should assess economic activity as the preventive indicator.

Key-words: - Economic Confidence Index, Gross Domestic Product (GDP), economic shocks, economic indicators, Business Activity Index of Real Sector, Monitoring

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1 Introductıon

The impact of the COVID-19 pandemic, which has lasted for more than a year, remains alarming despite the improvement of economic condition due to vaccination. Development perspectives of the world economy are characterized by high uncertainty, primarily related to the subsequent course of the pandemic. So, the aim of today's economic policy is to eliminate the results of the Covid-19 pandemic. Gradually, the country's economy should return to purposeful structural reforms ensured productivity and economic growth.

Despite the increase in the number of tools stimulating the economic activity of market participants, the problem of confidence has not only lost its actuality but has also begun to have an increasing impact on economic development.

Researches are conducted to evaluate economic activity in the world. The whole activity of most research institutes is to study changes in the economy through various indices.

Azerbaijan's economy has not yet been studied in terms of confidence, and index estimates are still in their infancy.

One of the main tasks of the analysis and forecasting of economic activity is the development of systems for the early detection of changes in the phases of economic periods based on specially developed economic indicators. Leading economic indicators are used to obtain early information about phase changes and to estimate the moments of phase change called crucial points within these systems.

Assumed that the turning points of the forecast indicators are ahead of the turning points of some key economic indicators (for example, real GDP) that characterize the economic situation as a whole.

Currently, there exist two main methodological centers for the development of such indicators:

Fig. 1: Methodological centers
Source: Compiled by the authors

EU countries and a number of other countries (more than 30 countries) are currently using an adapted methodology to build leading indicators based on a survey prepared by the OECD Statistics Department and the European Commission (now OECD-EU methodology).
The OECD methodology currently serves as a generally accepted international standard for constructing economic indicators based on questionnaire data and its usage provides a comparison of the procedures for setting and applying the indicators considered in different countries. In this methodology, small questionnaires are answered. The answers allow you to evaluate the current state of the organization and the expected changes. The selection of questions focuses on obtaining the information necessary for the analysis of changes in the developing economic situation, both in certain types of economic activity and in the country's economy as a whole.

The Economic Confidence Index (ECI) is one of the most important indicators of macroeconomics. This indicator is similar to the business activity index. The difference is that economic confidence is most often associated with business expectations in the near future.

ECI has powerful forecasting properties. These forecasting features can be used in two ways:

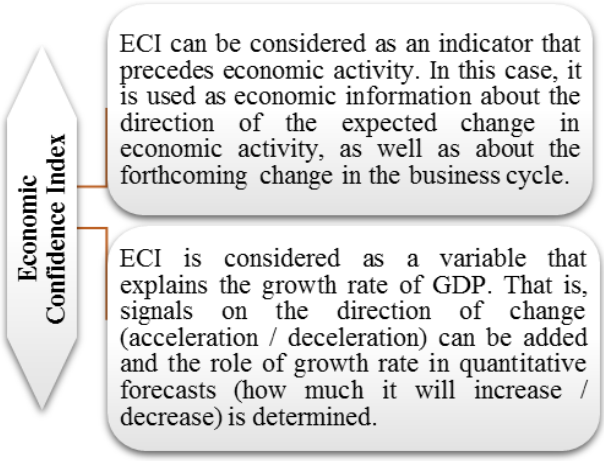

Fig. 2: Economic Confidence Index
Source: Compiled by the authors

Such an extensive list of uses allows the Economic Confidence Index (ECI) to be called a reliable and important tool for analysis and forecasting..

In the presented research we evaluate the turning points of the business period of the country's economy and identify the leading nature of the proposed economic confidence index. Forecasting possibilities of the economic confidence index are determined in the autoregression and error correction models for the monthly and annual growth rates of the country's real GDP.

2 Methodology

The monthly growth rate of GDP(*Gross Domestic Product*) from January 2015 to March 2021 and the business activity statistics of the real sector provided by the Central Bank of the Republic of Azerbaijan (CBA) on monthly surveys [4].

The Economic Confidence Index is calculated based on the following indices:

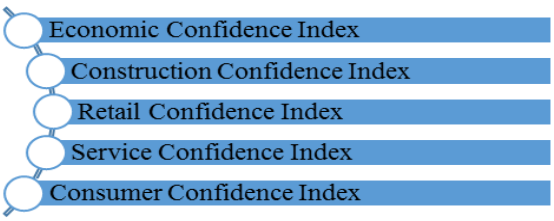

Fig. 3: Economic Confidence Index calculat
Source: Compiled by the authors

The consumer confidence index was not used in the calculations due to a lack of information.
Note that the Institute has been conducting consumer surveys among consumers on the calculation of the consumer confidence index since

May 2021 and it will be used in the calculation of the Economic Confidence Index in the coming months.

Preliminary data processing on the methodology of calculation and application of confidence indices and economic confidence index covers the following main stages:

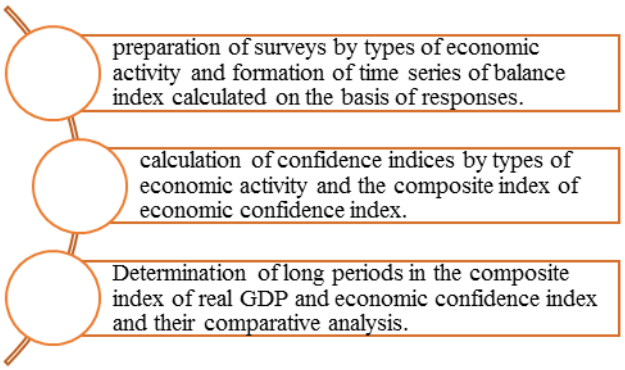

Fig. 4: Stages of calculation economic confidence index

As mentioned above, the preparation and processing of the questionnaires specified in the first stage of the calculation of confidence indices are carried out by the Central Bank of the Republic of Azerbaijan on a monthly basis and published on the official website. Therefore, that information was obtained from there.

Objectives set in the adapting process of this methodology to the data of the Azerbaijani economy:

1. Selection and optimization of application conditions for statistical analysis of time series used, including seasonal smoothing, selection of periods, algorithms for calculating the composite lead index.
2. Study of economic aspects of selection and calculation of key economic indicators, as well as determination of the predictive nature of the calculated economic confidence (table) index and assessment of turning points of business periods of the economy in Azerbaijan.
3. Assessing the potential of econometric as well as predictive indicators of the economic confidence index of the dependence of real GDP growth rates on the economic confidence index (ECI) and establish analysis models for turning points of business cycles

The Azerbaijan Institute for Scientific Research on Economic Reforms has calculated the Entrepreneurial Confidence Index in 2020 through quarterly surveys, considering the OECD methodology and international experience in this field. The index was compared with the quarterly growth rate of GDP.

3 Confidence Index and Calculation Methods of Composite Economic Confidence Index

Direct or indirect calculation methods can be used to calculate the ECI.

The indirect method in the calculation of ECI. Via the indirect method, the confidence indices are calculated for seasonally adjusted time group series of response balances in the form of geometric averages for each economic activity. In this case, the calculation of the ECI index assumes the following:

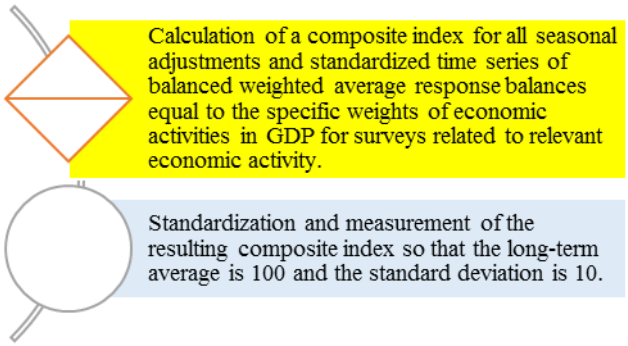

Fig. 5: Calculation of the ECI index

For calculating the ECI, in contrast to the indirect method the **direct method**, provides the use of standardized time series of response balances without seasonal adjustment. In this case, the calculate of seasonal unregulated confidence indices and the composite index of ECI is possible [4].

In the study, a special weight of industry, construction, retail, and services in GDP was adopted for the observed period:

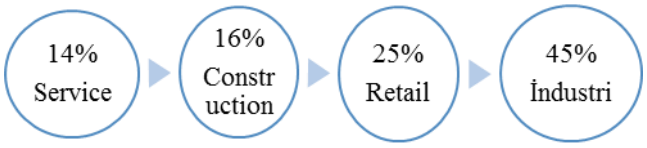

Fig. 6: Services in GDP

Thus, according to the OECD(Organisation for Economic Co-operation and Development) methodology, the calculation of the ECI consists of three stages:

1. Standardization of time series of response balances:

$$\widetilde{B_{it}} = \frac{B_{it} - \widetilde{B_i}}{S_i} \quad (1)$$

where,

$$\bar{B}_i = \frac{1}{T}\sum_{i=1}^{T} B_{it} \quad (1.2)$$

$$S_i = \sqrt{\frac{1}{T-1}\sum_{i=1}^{T}(B_{it} - \bar{B}_i)^2} \quad (1.3)$$

2. Calculation of the average weight of the standard response balances:

$$Z_t = \sum_{i=1}^{n} \omega_i \, \widetilde{B_{it}} \quad (2)$$

where ω_i – is the weighted ratio of the answers to the survey questions. The sum of these ratios is equal to Weight ratios (ω_i) are calculated based on statistics for the considered period. According to the methodology, for the calculation of weight ratios, the usage of the special weight of key economic sectors in GDP is recommended [7].

3. Standardization and scale of the composite confidence index of economic is carried out according to the following equations:

$$ECI = \frac{Z_t - \bar{Z}}{S_Z} \times 10 + 100 \quad (3)$$

where,

$$\bar{Z} = \frac{1}{T}\sum_{t=1}^{T} Z_t \quad (3.1)$$

$$S_Z = \sqrt{\frac{1}{T-1}\sum_{t=1}^{T}(Z_t - \bar{Z})^2} \quad (3.2)$$

In the used measurement versions, the values of ECI vary mainly in the range from 90 to 110.

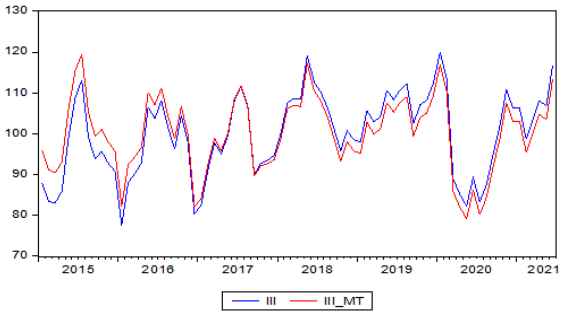

Fig. 7: Dynamics of gross domestic product.
Source: the State Statistics Committee (SSC)

We assume that the significance of the ECI at the level of 100 units is consistent with the long-term trend. Exceeding this level, ie a positive deviation from the long-term trend is interpreted as economic growth, and a value below 100 indicates a negative deviation from the trend and a deterioration of the economic situation. An **indirect method** was used to calculate the composite ECI for Azerbaijan [3].
Before assessment of the Economic Confidence Index, first, we should observe the dynamics of GDP from 2015 to the current period, as well as the dynamics of the industry, construction, retail, service confidence indices provided by the Central Bank of the Republic of Azerbaijan.

As seen from Fig.7, the dynamics of GDP(*Gross Domestic Product*) by months are positive, excluding local increases and decreases.

However, in the period when the COVID-19 pandemic began to spread in the Azerbaijan, business activity decreased due to the restrictive measures applied by the Operational Headquarters under the Cabinet of Ministers in the country, which manifested itself in monthly reductions in GDP.

However, the need to ease social restrictions is already accelerating the recovery process in the economy.

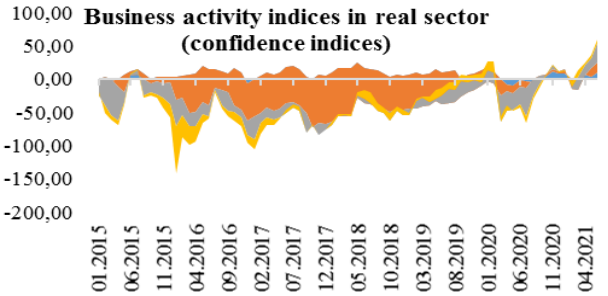

Fig. 8: Business activity indices in real sector.
Source: Central Bank of the Republic of Azerbaijan

Fig.8 shows the confidence indices prepared on the basis of the Central Bank's survey on business activity in the real sector of the economy.

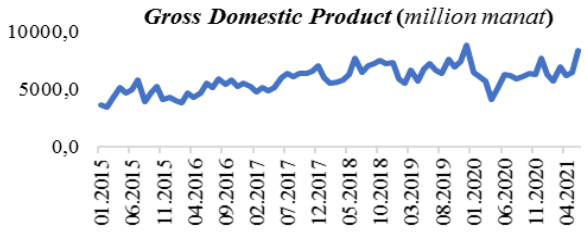

Fig. 9: ECI time series and the seasonal adjusted ECI time series

Fig. 9 shows the diagram of the initial ECI time series and the seasonal adjusted ECI time series for the period from January 2015 to June 2021 for comparison.

The seasonal adjustment was performed using the Hodrick-Prescott (HP) statistical filter.

4 Methods for Obtaining the Cyclic Component if ECI

When using the indirect method to construct the ECI, the use of two methods for the subsequent statistical processing of the time series of the ECI is recommended to obtain its cyclic component:

1. Double use of the Hodrick-Prescott filter with parameter values $\lambda = 42131.155$ for the first stage and $\lambda = 13.93$ for the second stage, analogous to the key economic indicator;
2. Single application of Hodrik-Prescott filter with parameter value $\lambda = 13.93$.

The first method assumes the ECI has a long-term trend over time. The second method is based on the assumption that the ECI series (in economic terms) is stationary.

Therefore, the problem of choosing the processing method can be selected depending on the type of probable model.

If the time sequence of the ECI is determined, there is no need to eliminate the trend, and it is sufficient to eliminate the high-frequency "noise component" using the Hodrick-Prescott filter with the λ parameter value, $\lambda = 13.93$.

This key economic indicator allows a smoother and more convenient cycle component to identify important components that can be used in the analysis cooperatively with a sound business cycle. Otherwise, the use of a two-stage isolation procedure is recommended.

Also, known that structural changes and short time series make it difficult to determine the type of time series model using statistical tests known as “single root” tests. In such a situation, the test results should be analyzed economically to substantiate and interpret the moments of structural change.

The non-stationary timing of the ECI may be due to structural changes due to shocks in the economy, as well as the inability of respondents to distinguish between market fluctuations and structural changes.

Therefore, the structural fluctuations in the economy through the responses of the respondents are reflected in the time series of the ECI [3].

In other words, at certain stages, the ECI may contain a trend component and may not be stationary.

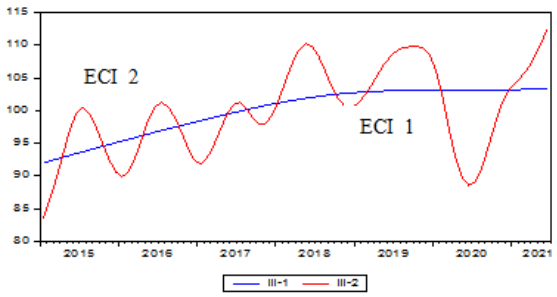

Fig. 10: The effect of a trend reversal on the dynamics of the ECI

Fig.10 shows the comparative results of the time series of the normalized ECI with the above values of the filter parameter. ECI-1 is a cyclic component of the ECI after two staged applications of the Hodrick-Prescott (HP) filter, and ECI-2 is an ECI regulated by a single application of the Hodrick-Prescott filter.

Fig.10 shows that the dynamic characteristics of the time series ECI-1 and ECI-2 are different.

The application of a two-staged HP filter has significantly smoothed the ECI-1 index, bringing it to an almost stable straight line after 2018.

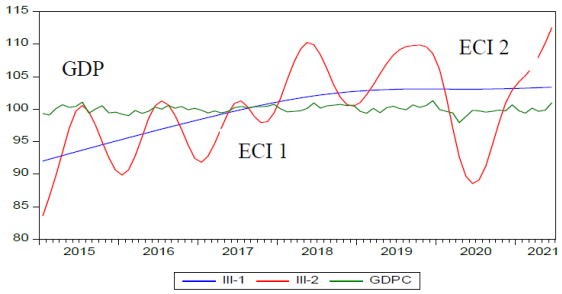

Fig.11 Time series obtained by the two-staged method for GDP and ECI cycles

Fig. 11 shows the two-staged application of the Hodrick-Prescott filter for GDP and ECI-1, and the single ($\lambda = 13.93$) application for ECI-2.

Table 1. Turning points of ECI and GDP

Types of turning points	Year/mon.	ECI	Year/mon.	GDP
botton	*03.2015*	*90,4495*	*01.2015*	*99,6852*
peak	*07.2015*	*119,413*	*04.2015*	*101,58*
botton	*01.2016*	*82,1907*	*08.2015*	*98,4275*
peak	*07.2016*	*111,124*	*08.2016*	*101,032*
botton	*12.2016*	*82,0086*	*12.2016*	*99,5126*
peak	*07.2017*	*111,575*	*01.2017*	*100,364*
botton	*09.2017*	*89,5044*	*06.2017*	*99,5656*
peak	*05.2018*	*117,221*	*06.2018*	*101,426*
botton	*10.2018*	*93,2355*	*01.2019*	*99,8738*
peak	*01.2020*	*117,182*	*12.2019*	*101,402*
botton	*05.2020*	*79,7208*	*04.2020*	*97,741*
peak	*11.2020*	*108,507*	*04.2021*	*100,863*

VAR Model:

GDP_ = 0,37×ECI_(-1) - 0,91×ECI_(-2) + 0,91×ECI_ (-3) - 0,37×ECI_ (-4) + 2,79×GDP_(-1) - 2,95×GDP_(-2) + 1,30×GDP_ (-3) - 0,14×GDP_(-4) + 0,87

ECI_ = 3,07×ECI_ (-1) - 3,76×ECI_ (-2) + 2,13×ECI_ (-3) - 0,46×ECI_ (-4) + 0,15×GDP_ (-1)

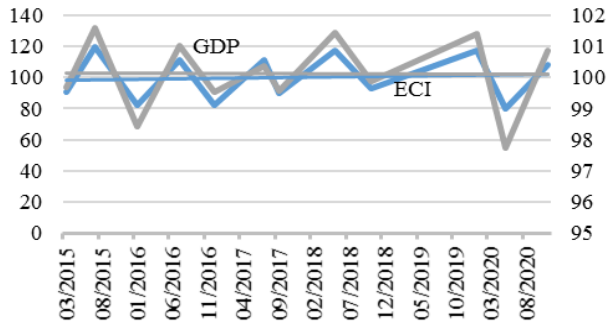

Fig. 12: ECI and GDP turning points

This year the physical volume index of GDP has increased compared to February-March. The increase of confidence indices in these sectors during this period led to an increase in the Economic Confidence Index by 3.5%. In general, the significant easing of the special quarantine regime connected with the pandemic, the growing popularity of the vaccination process in the country has led to the revival of economic life.

Although the volume of industrial productions increased by 12.2% in nominal terms in March compared to February of the current year, in January-March it decreased by 4.6% in real terms compared to the same period of the previous year.

In the first quarter of 2021, the volume of work and services in the construction sector increased by 4.8% compared to the same period in 2020. In the same period, retail trade turnover decreased by 1.1%.

Due to the short duration of surveys conducted by the Institute for Scientific Research on Economic Reforms (surveys started in the first quarter of 2020) and the small number of respondents, the Economic Confidence Index was calculated based on the European Union methodology based on monthly confidence indices calculated by the Central Bank of Azerbaijan since 2015.

Periods were determined by conducting seasonal leveling on GDP and Economic Confidence Index. ECI peak points ahead of GDP growth about 2-4 months, bottom points 1-4 months ahead.

Periods are determined by applying seasonal smoothing to the Industrial Production Index and the Industrial Confidence Index.

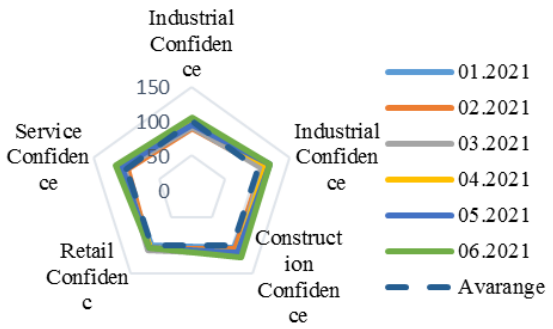

Fig. 13: Shows the radar diagram of business activity indices for 2021.

The diagram shows an improvement in the decentralization rate. From a sectoral perspective, confidence in construction and industry increased in January 2021. Overall, economic confidence was above average in all sectors during this period. In February, confidence levels were low in all sectors except the service sector. In March, confidence remained below average in the industry, although confidence increased in construction, services, and retail trade.

5 Economic Confidence İndex And GDP Forecasting

The following diagrams show the ECI and GDP forecasts for June 2022 based on the vector autoregression (VAR) model.

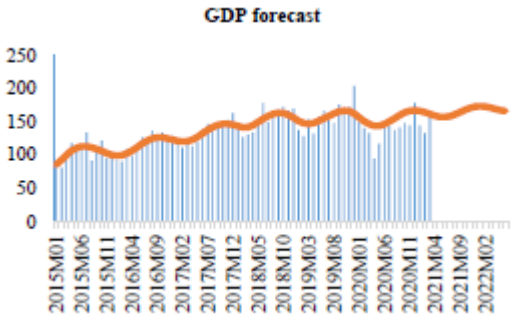

Fig. 14: Gross Domestic Product forecast

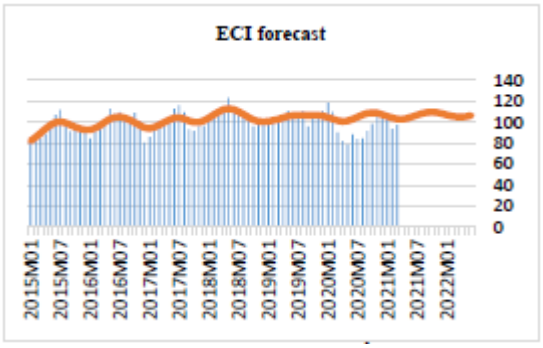

Fig. 15: Economic Confidence Index Forecast

Table 2. Turning points of ECI and GDP forecast

ECI		GDP	
peak	bottom	**peak**	bottom
	2015M01		2015M01
2015M07	2016M01	**2015M07**	2016M02
2016M07	2017M01	**2016M09**	2017M02
2017M07	2017M11	**2017M11**	2018M01
2018M05	2018M12	**2018M09**	2019M03
2019M07	2020M06	**2019M10**	2020M05
2021M01		**2021M03**	

Comment**:** *The table understands 2015M01 - 2015Month January*.

6 Conclusıon

The presented work has great importance in studying the effects of the COVID-19 pandemic on the business activities of production and service enterprises. The Economic Reforms Research Institute of the Ministry of Economy of the Republic of Azerbaijan initially developed survey forms characterizing the development of the real sector. During the preparation of the surveys, the experience of different countries in this area was studied, as well as methodological tools developed by the Organization for Economic Cooperation and Development (OECD) in this area were used. The developed surveys were further improved considering the opinions and suggestions of the relevant structural units and agencies of the Ministry of Economy and Industry of Azerbaijan.

The composite index of economic confidence index was calculated based on the economic sector according to the "Business Activity Indices in the Real Sector" database formed on the basis of surveys conducted by use of the Conjuncture Surveys of the Central Bank of the Republic of Azerbaijan for the observation period from January 2015 to March 2021, as the initial statistical base of the study;

Seasonal smoothing on confidence indices, economic confidence index, and real GDP by economic sectors was conducted.

The predictive nature of the calculated economic confidence index has been identified and the turning points of the business cycle of the Azerbaijani economy have been evaluated;

The dependence of real GDP growth rates on the Economic Confidence Index (ECI) has been econometrically assessed and business cycle turning point analysis models have been developed, and forecasts for the period up to March 2022 have been prepared based on the VAR (vector autoregression) model.

We observed that the turning points of the ECI and real GDP cycles coincide. So, the economic confidence index can be used to prepare short-term forecasts of economic growth rates.

ECI is predictive. Moreover, these predictive features can be used in two ways:

1.ECI can be considered as a leading indicator in terms of economic activity. In this context, information is provided on the expected changes in economic activity and the forthcoming phase of business cycles.

2.ECI can be used as an explanatory variable for GDP growth rate in relevant forecasting models.

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Contribution of Individual Authors to the Creation of a Scientific Article (Ghostwriting Policy)

Arzu Hueynova, Ophelya Mazanova carried out the simulation and the optimization.
Simuzar Mammadova, Saadat Majidova has organized Section 1
Afaq Aslanova, has organized Section 4
Samira Rustamova. was responsible for the Statistics.

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