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# Financial System Sustainability Assessment Model Creation

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**Abstract**

**Purpose of the article:** The article is devoted to analyse the sustainability in the financial system. Sustainability in financial systems leads to the financial institution's positive economic performance during the financial crisis. The sustainable financial system must keep the country's economy healthy, effective, and profitable, and this is one of the tasks the answer to which still is looked for.
**Methodology/methods:** The article includes the observation of financial system sustainability approach, the analysis of the financial system structure, architecture, and soundness. In addition, positive and negative impacts of sustainability on financial systems are discussed. The literature analysis, comparison methods, quantitative analysis, the multiple objective optimization MULTIMOORA method, and the graphical representation were used in the article. Based on the MULTIMOORA method and the indicators of sustainability, the model to measure sustainability is implemented.
**Scientific aim:** The main goal of this article is to create and adopt a model of sustainability in the financial system measurement.
**Findings:** The results show that sustainability in financial systems helps the financial institution to maintain positive economic performance even in the crisis time.
**Conclusions:** Sustainability of the financial system is measured according to the sustainability approach; the interaction of economic, social and environmental aspects should be considered. The multiple objective optimization was used to obtain sustainability in the financial system and the MULTIMOORA method was selected for the analysis of the financial system sustainability. For the analysis, 10 countries were selected, which joined the European Union in 2004, in other words, named as "A10" countries. MULTIMOORA proved that the financial system is a complex system, with interrelations between objectives and alternatives that are taken into account at the same time and ,different values of the indicators, representing a particular group of indicators.

**Keywords:** sustainability, financial system, structure of the financial system, MULTIMOORA method, financial ratios, financial market

**JEL Classification:** C69, G20, G32

## Introduction

Today, the economy faces rapid global changes. Economic crisis striking from time to time attempts to downturn the economy of the country, even when it has problems in particular sectors. The financial system with its components must be under the analysis over the time, not only measured by the GDP and import/export intensity, but also analysed according to the structure of the financial system, on micro- and macro-levels, in order to observe the country's economy under the different angles, avoiding the uncertain downturns. Nowadays the term of sustainability has become the trend in the banking sector, and it comes to the business, slowly being introduced into the whole financial system. Sustainable development, as one of the most desired aims of the financial sector, has received more and more social and political support. The financial sector also follows the sustainability by the sustainable investment, investment in renewable resources or green energy. The financial system is one of the core aspects of the welfare of the countries, since the profitability of the business and soundness of the country's economy depend on it. The financial system is as a major "vehicle" that makes work the whole economy of the country. That is why sustainability in the financial system is one of the most important and discussed topics nowadays. The financial system with its components must be under the analysis over the time, not only measured by the GDP and import/export intensity, but also analysed according to the structure of the financial system, on micro- and macro-levels, in order to observe the country's economy under the different angles in order to avoid the uncertain downturns.

To reach this goal, the sustainability of the financial system approach is observed, analysing its structure, architecture, and soundness. In addition, positive and negative impacts of sustainability on financial systems are discussed. Moreover, the model of measurement of sustainability in the financial system is created based on financial system sustainability indicators. Based on the MULTIMOORA method and sustainability indicators, the model to measure sustainability is implemented to 10 EU countries, which joined the EU in 2004. The results show that sustainability in financial systems helps the financial institution to maintain positive economic performance even in the crisis time. The research could be used for the analysis of the financial system, for the investigation of sustainability in the financial system, or for further research of the sustainability approach in financial systems.

## 1. Literature Review

### 1.1 Sustainable Development approach in Financial Systems

The meaning of sustainability is multifaceted, as it is described differently in many academic contexts. But the main idea of all the sustainability definitions (Hutton, Cox, 2005) is that there is an interaction between three main systems, i.e. environmental, social and economic. The idea of sustainability gives new thinking to the banking sector, which recognizes the interdependencies of the economic, social, and environmental systems, and the connections between social and environmental challenges, on the one hand, and firm's or nation level growth and innovation, on the other.

This appears in the bank's strategies designed to create value for the future. The best way to achieve the sustainable value growth is to create such a strategy (Klemkosky, 2013), according to which it would be possible to meet the intersection of economic, social and economic sectors. The "interdependent systems" indicate the influence which different sectors of society may have on the firm or national level capacity to operate sustainably.

The conceptual model of Sustainability provides the essence how on the corporate or national level sustainable development could be embraced with the overall strategy. There are the interactions of the economic, social, and environmental systems and there are also measurable business variables that reflect the natural interdependencies between the systems. The main idea is that strategic environmental and social actions can enhance the profitability through environmental stewardship and through promoting social equity in ways that serve both shareholders and the larger public good.

### 1.2 Sustainability in Financial Markets

The sustainability in financial markets has still emerged on the economic policy, but stability in financial markets has been an aspired goal for decades. According to Younsi, Nafla (2017), the global financial crisis made a negative impact on financial systems worldwide; that is why one of the major global challenges is to establish financial market stability. Stability and sustainability – two terms still are used synonymously, but sustainability encompasses more than stability. Conversely, a stable financial system may not necessarily be sustainable. In the financial industry (Schäfer, 2013), the stability of the system can only be assured through consistent government intervention.

There are set several requirements for sustainability in financial markets: internalizing, ability to self-regenerate, diversity, long-term orientation and credibility.

If it is considered that the concept of sustainability is a development, which fulfils the present needs without risking that future generations cannot fulfil their own needs, it can be more precise with regard to the financial system. What does sustainability mean from a monetary perspective?

Sustainability from a monetary perspective (Brunnhuber *et al.,* 2004) includes at least five aspects:

1. Achieving a long term-perspective in contrast to the shareholder-value, which is short-term sited.
2. Closing the income gap, which otherwise favours further military conflicts and a reduction of the average life expectancies.
3. Covering the debt load of each economy by one generation, as it is not just to burden further generations.
4. Tackling social issues, especially social care and unemployment.
5. Coping with the energy carrier (non-renewable vs. renewable) in order to offer a long-lasting un-depending resource.

In order to meet these demands, there is a need to look closer to the financial architecture itself, as it affects all decision making within the real economic sector.

### 1.3 Towards the Sustainable Financial System

In order to reach sustainability in the financial system, there is a need to make changes. Today the world is concerned about short--term financial crises, crisis management being unable to look at some steps further. The sustainable and effective financial system requires scenario development. In order to develop a scenario for sustainability in financial systems, the key factors or characteristics for the sustainable development might be identified. Foresight and alternative projections might be the core of the scenario towards the sustainable financial system. The aim is to observe the whole financial system, its structure, politics, social life development, environmental factors, and technology development in order to identify the field of sustainable development in the financial system (Karyotis, Onochie, 2016).

There are three main fields according to the key factors for the scenario towards sustainable development of financial systems that could be introduced: money system/financial markets, economy and global environment that includes both social and environmental factors. On the basis of those three fields and factors, the possible alternative scenarios for

the sustainable development of the financial system could be developed. In fact, it does not matter that only one scenario is the right decision. In real life, one may expect the combination of single scenarios into one comprehensive system.

Each scenario shows a distinctive picture of the future in terms of the financial framework and therefore each scenario makes visible different development trends, risks and possible solutions. On the one hand, the financial sector itself possesses elements for it is own lasting development. On the other hand, it can become, besides technological innovations, political measures regarding demography and education as well as a general change of values, a fourth important category for the benefit of a sustainable path for the society in it is entirety.

All the scenarios of sustainable development of financial system are represented and classified according to main sustainable development requirements: political system, economic system, social system, production system, technological system, international system, and administrative system.

More complex scenarios for sustainable development according to Brunnhuber *et al.* (2004) are: sustainable growth and de-globalization. These scenarios include more requirements for sustainable development. However, complex financial systems require complex decision and scenarios to achieve sustainability. In this case, the fact of scenarios combination and the mix cannot be avoided.

The sustainable development combines ecological, social, and economic concerns (Grundey, 2008), and offers opportunities to improve the lives of people. Market attributes that can serve the purpose of sustainability – such as freedom of choice, competition, and innovation – should be more fully engaged in such concerns (Sakalauskas, 2010), because markets also provide the poor with more opportunities and can better reflect the values of environmental goods and services crucial to our quality of life.

Sustainability brings to the financial system long-term growth and efficiency, which plays a significant role in country's economy and development, so that is why it has become one of the major aspects, that every financial system might follow towards.

## 2. Methodology

### 2.1 Multiple Objectives Optimization in Financial System Sustainability assessing model

Sustainability is a complex issue, a measure which takes a lot of analysis and data selection, as it consists of three main parts: economic, social and environment. Each group consists of a particular number of indicators, which is needed to measure. What is more, all indicators are different, have their own value and measure units, which brings difficulties for the analysis. The Multiple Objective Optimization is a great solution for complex data that need to be analysed, grouped and measured. The Multiple Objective Optimization includes many different methods, such as TOPSIS (Hwang, Yoon, 1981), AHP (Saaty, 1988), Promethee (Brans *et al.*, 1984), MOORA (Brauers, 2004a, 2004b, 2004c), and more. The analysis of the Multiple Objective Optimization methods according the most important criteria, such as time, simplicity, calculations, stability, and information type shows that the MOORA method is one of the methods that satisfy the necessary condition for the analysis of sustainability of the financial system, is quite simple to implement, but has a good evaluation of stability, and provides quantitative information with the minimum requirement of financial calculations.

The MOORA method can analyse all the objectives without the matter of correlation, takes into account interrelations, the recently available data could be used for the research, and allows using objectives without subjective estimation.

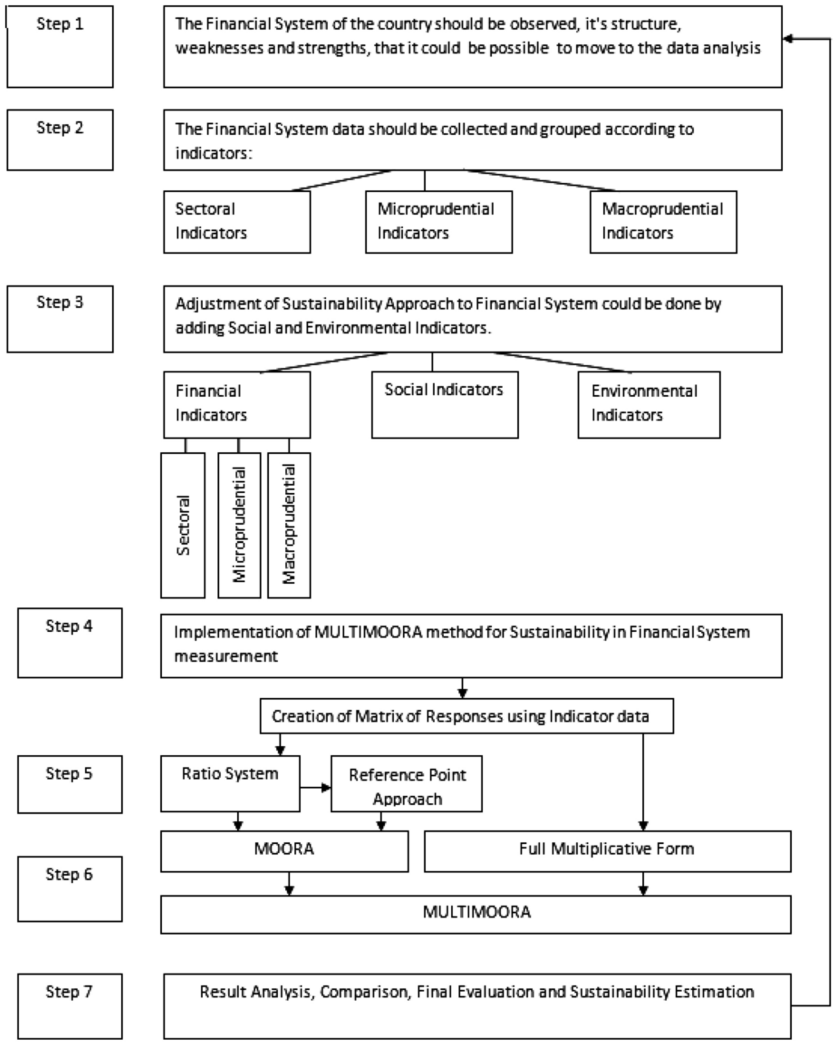


*Figure 1. The assessment model of financial system sustainability. Source: the authors.*

MULTIMOORA is the further sequence of the MOORA method and of the full multiplicative form of multiple-objectives. MULTIMOORA was introduced by Brauers and Zavadskas (Brauers, Zavadskas, 2010) for the first time at the beginning of 2010. For further research, the MULTIMOORA method would be implemented to measure the sustainability in the financial system.

Several authors used the MULTIMOORA method in various research projects. For example, Baležentis *et al.* (2011a) offered to evaluate structural indicators of the country targeting the Europe strategy for 2020, in 2010 (Baležentis *et al.,* 2010) the evaluation of Lithuania in the European Union was represented. The MULTIMORA method was used by Brauers (2012) in the evaluation of the preparation for the economic aim for 2020 of the countries of the European Union. Kildienė (2013) offers the MULTIMOORA method in the evaluation of construction enterprises. Also, MULTIMOORA was used in the evaluation of risk assessment tools for various industries (Liu *et al.,* 2014), robot selection evaluation by MULTIMOORA

introduced by Datta *et al.,* (2011). Brauers *et al.,* (2012b) adopted MULTIMOORA for the evaluation of the performance of Lithuanian commercial banks, also, Brauers *et al.,* (2012c) introduced economic ranking of European Union countries using MULTIMOORA, while Stankevičienė (2012) adopted MULTIMOORA in the assessment of country risk, Dapkus, Streimikienė (2012) used MULTIMOORA for the analysis of energy policy.

The MULTIMOORA method is widely used in different studies. Farzamina, Babolghani (2014) applied MULTIMOORA for the analysis of the supply chain in production, especially for the selection of the supplier in the production process.

To find out sustainability in the financial system, it is necessary to implement a model according to which the sustainability could be measured. The Financial System Sustainability model (Figure 1) could consist of the systematically grouped sustainability indicators which would be used in the MULTIMOORA method to find the measure of the sustainability of the financial systems.

The assessment model of financial system sustainability includes 3 types of indicators: financial, social and environmental. Financial indicators are divided into 3 groups: sectoral, macroprudential and macroprudential indicators. In the fourth step of the model, it is possible to start implementing the MULTIMOORA method by creating the matrix of responses that would consist of financial system sustainability indicators. Then, the fifth step shows the calculation of the ratio system and reference point approach according to the MOORA method. After that, in the sixth step, the full multiplicative form is added to MOORA and the result of MULTIMOORA is obtained.

*Table 1. Aggregated microprudential indicators.*

| Aggregated Microprudential Indicators |
|---|
| Economic growth |
| Aggregate growth rates |
| Sectoral slumps |
| Balance of payments |
| Current account deficit |
| Foreign exchange reserve adequacy |
| External debt (including maturity structure) |
| Terms of trade |
| Composition and maturity of capital flows |
| Inflation |
| Volatility in inflation |
| Interest and exchange rates |
| Interest rate spread |
| Risk Premium on lending |
| Volatility in interest and exchange rates |
| Level of domestic real interest rates |
| Exchange rate sustainability |
| Exchange rate guarantees |
| Lending and asset price booms |
| Lending booms |
| Asset price booms |
| Contagion effects |
| Trade spillovers |
| Financial market correlation |
| Other factors |
| Directed lending and investment |
| Government recourse to the banking system |
| Arrears in the economy |

*Source: Evans et al., 2000.*

## 2.2 Indicators of Financial System Sustainability

The evaluation of financial structure should cover the roles of the key institutional players, including the central bank, commercial and merchant banks, savings institutions, development finance institutions, insurance companies, mortgage entities, pension funds, and financial market institutions.

The functioning of financial markets, including money, foreign exchange, and capital markets (including bonds, equities, and derivative and structured finance products) should also be covered (IMF, 2005).

To measure growth and development of

*Table 2. Aggregated Microprudential Indicators.*

| **Aggregated Microprudential Indicators** |
|---|
| **Capital adequacy** |
| Aggregate capital ratios |
| Frequency distribution of capital ratios |
| **Asset quality** |
| ***Lending institution*** |
| Sectoral credit concentration |
| Foreign currency-denominated lending |
| Nonperforming loans and provisions |
| Loans to loss-making public sector entities |
| Risk profile of assets |
| Connected lending |
| Leverage ratios |
| ***Borrowing entity*** |
| Debt-equity ratios |
| Corporate profitability |
| Other indicators of corporate conditions |
| Household indebtedness |
| **Management soundness** |
| Expense ratios |
| Earnings per employee |
| Growth in the number of financial institutions |
| **Earnings and profitability** |
| Return on assets |
| Return on equity |
| Income and expense ratios |
| Structural profitability indicators |
| **Liquidity** |
| Central bank credit to financial institutions |
| Segmentation of interbank rates |
| Deposits in relation to monetary aggregates |
| Loans-to-deposits ratios |
| Maturity structure of assets and liabilities (liquid asset ratios) |
| Measures of secondary market liquidity |
| **Sensitivity to market risk** |
| Foreign exchange risk |
| Interest rate risk |
| Equity price risk |
| Commodity price risk |
| **Market-based indicators** |
| Market prices of financial instruments, including equity |
| Indicators of excess yields |
| Credit ratings |
| Sovereign yield spreads |

*Source: Evans et al., 2000.*

the financial system, the sectoral indicators could be used, but to analyse the efficiency, "health" of the financial system, its soundness, how strong the financial system is in the case of the stress and crisis, may help the indicators, that shows the financial system as a "whole" mechanism, which operating could be measured (Evans *et al.*, 2000). Macro- and micro- indicators could help to analyse the financial system as "whole". These microprudential indicators (Crockett, 2000) comprise both aggregated microprudential indicators of the health of individual financial institutions, and macroeconomic variables associated with financial system soundness (Table 1).

The aggregated microprudential indicators (Table 2) are primarily contemporaneous or lagging indicators of soundness. Macroeconomic variables can signal imbalances that affect financial systems (Dombret, Lucius, 2013) and are, therefore, leading indicators. Financial crises usually occur when both types of indicators point to vulnerabilities, that is when financial institutions are weak and face macroeconomic shocks.

The indicators of the current health of the financial system are primarily derived by aggregating indicators of the health of individual financial institutions (Lombardy, Siklos, 2016). One commonly used framework for analysing the health of individual institutions (Ginevičius, Podviezko, 2011) is the so-called CAMELS framework.

The financial side of the financial sector sustainability plays a significant role, of course. But, still, a lot of advantages (Omann, Spangenberg, 2002) and benefits is provided by social and environmental indicators to the sustainability of financial systems (Ruiviejo, Morales, 2016). For example, by taking into account social and environmental aspects, investors minimise risk and create long-term value (Aras *et al.,* 2018). The social and environmental indicators help to analyse social satisfaction, social involvement in the financial system, the distribution of income, the

use of finances and overall welfare. The environmental aspects help to integrate technological spread, investment and the gain from the resources used, saving the environment, and allocation of the resources. According to the McKenzie (2004), social issue of sustainability could be expressed by the following indicators:

- Health of the population.
- Unemployment rate.
- Poverty risk.
- Distribution of income.
- Education.

Typically, environmental indicators of sustainability could be as follows (Meltzer, 2016):

- Environmental performance and sustainability index.
- Emission intensity.
- Energy intensity.
- Access to electricity.
- CO2 emissions.

The sustainability of the financial system does not exclude the social and environmental impact. Maybe, these aspects are not core factors in the measurement of sustainability, but still, are the part of it, bringing its own impact on the financial system.

## 3. Results and Discussion

### 3.1 Financial System Sustainability Assessment Model Implementation in the selected 10 EU Countries

10 European countries were selected to measure financial system sustainability, joining the European Union in 2004: Estonia, Latvia, Lithuania, Poland, Hungary, Slovakia, Slovenia, Czech Republic, Cyprus, and Malta. Once the countries for the financial system sustainability analysis have been determined, the second step is the financial data collection. The data was collected from the following sources: the Eurostat database, European Central Bank, World Bank, Environmental Performance Index, and World Energy index. According to the financial system sustainability assessment model (Figure 6), all indicators were collected and the calculation was done according to the MULTIMOORA scheme.

According to the received ranks of the MULTIMOORA method, the countries could be divided into groups as follows:

- 1–3 Rank – the highest level of sustainability.
- 4–5 Rank – the medium level of sustainability.

*Table 3. Sustainability of Financial System of 10 EU countries.*

| Total | Financial | | | | | | | | | Social | | | Environmental | | | Sum | MULTI MOORA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Microprudencial | | | Macroprudential | | | Sectoral | | | | | | | | | | |
| Poland | 2 | 2 | 8 | 7 | 7 | 3 | 1 | 1 | 1 | 7 | 5 | 7 | 4 | 2 | 4 | 61 | 1 |
| Czech Republic | 5 | 1 | 7 | 4 | 4 | 1 | 4 | 9 | 2 | 3 | 1 | 3 | 8 | 4 | 7 | 63 | 2 |
| Malta | 6 | 8 | 10 | 6 | 5 | 6 | 2 | 8 | 5 | 1 | 2 | 2 | 1 | 3 | 1 | 66 | 3 |
| Hungary | 1 | 3 | 9 | 2 | 2 | 5 | 3 | 5 | 3 | 9 | 7 | 10 | 3 | 6 | 2 | 70 | 4 |
| Cyprus | 9 | 5 | 3 | 1 | 1 | 2 | 7 | 2 | 7 | 10 | 10 | 9 | 2 | 1 | 3 | 72 | 5 |
| Slovakia | 8 | 7 | 6 | 9 | 10 | 8 | 6 | 3 | 6 | 6 | 4 | 6 | 6 | 5 | 5 | 95 | 6 |
| Latvia | 3 | 4 | 2 | 5 | 6 | 10 | 9 | 7 | 9 | 5 | 9 | 4 | 5 | 10 | 8 | 96 | 7 |
| Estonia | 7 | 9 | 5 | 3 | 3 | 9 | 8 | 10 | 8 | 2 | 6 | 1 | 10 | 8 | 10 | 99 | 8–9 |
| Lithuania | 4 | 6 | 4 | 8 | 8 | 4 | 10 | 6 | 10 | 4 | 8 | 5 | 7 | 9 | 6 | 99 | 8–9 |
| Slovenia | 10 | 10 | 1 | 10 | 9 | 7 | 5 | 4 | 4 | 8 | 3 | 8 | 9 | 7 | 9 | 104 | 10 |

*Source: the authors.*

- 6–10 Rank – the lowest level of sustainability.

According to the result (Table 3), the best Sustainability in Financial System is in Poland, in the second place is the Czech Republic, the third position is taken by Malta. Hungary and Cyprus take the medium level. Slovakia, the Baltic States and Slovenia have the lowest sustainability evaluation using the MULTIMOORA method.

The MULTIMOORA method is very useful in the analysis of the financial system sustainability. It can analyse sustainability by each group of indicators, and in additzion, using MULTIMOORA, it is possible to find out the total sustainability of the financial system of the countries to make a comparison. MULTIMOORA helps to identify strengths and weaknesses of countries' financial system. The analysis of the financial system would help to make the development strategy of the particular country, to improve its economic position, to predict the possible economic stresses and downturns, as well as to keep the soundness of financial system, and its stability and sustainability, taking into account not only the financial side but social and environmental issues, as well.

## 4. Discussion

The sustainability of the financial system includes the sustainable growth of the central bank of the country and financial markets. Sustainable development ensures the shift from the investment in greenhouse gas, fossil fuel and resource intensive industries towards resource efficient technologies and green production business models (Voltz *et al.*, 2015). The important aspect leading to the financial system sustainability is environmentally-based investment decisions – when investment decisions are being made according to sustainability approach and risk assessment. This investment approach requires a new decision-making strategy with the integrated sustainability ideology, which would be one of the initial steps towards green economy. "Green" investment decisions lead to the development of renewable energy, sustainable production, "green" financial instruments and "green" banking. Sustainability-based investment would align with climate changes, energy and water supply.

## 5. Conclusion

The sustainability of the financial system is measured according to the sustainability approach; the interaction of economic, social and environmental aspects should be taken into account. The indicators, which represent sustainability in financial systems, could be divided into three groups: financial, social and environmental. The core group is financial indicators, but social and environmental aspects also play a significant role. The financial group of indicators could be divided into sectoral indicators, microprudential and macroprudential indicators. By dividing the financial group of indicators, it is possible to observe the country's level by each segment of the financial system. The microprudential indicators analyse the financial system of the country on the level of microeconomics, while macroprudential indicators analyse the sustainability of the financial system of a particular level on the level of macroeconomics. According to the results found after the use of MULTIMOORA, it is hard to adopt one particular scenario of the financial system Sustainability for the countries. MULTIMOORA proved that the financial system is a comprehensive system, with interrelations between objectives and alternatives that are taken into account at the same time and different values of the indicators, representing the particular group of indicators.

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