33rd RSEP International Conference on Economics, Finance and Business
23-24 November 2024, UNIVERSITY OF WASHINGTON ROME CENTER, Rome, Italy

# Economic discomfort in European Union – Insights from several crisis episodes and impact on meeting sustainable development goals

**Iustina Alina Boitan**
*Prof. PhD. Hab. Bucharest University of Economic Studies, Faculty of Finance and Banking, Romania*
*E-mail:* iustina.boitan@fin.ase.ro

**Abstract**

The regional economic discomfort felt by people before and after a crisis period has become a matter of concern for decision makers at the national and European levels, as the European Commission Joint Research Centre acknowledges. Against this background, the aim of the paper is twofold: a) to investigate the degree of economic burden felt by the inhabitants of the EU member countries, during various periods of crisis that occurred in the last two decades, by building an alternative measure of economic performance called misery index; b) to evaluate its influence on several major outcomes envisaged at the national and international level related to the achievement of the Sustainable Development Goals (SDG). In particular, the research approach relies on the computation of a misery index for each member state of the EU, which is intended to serve as a barometer for civil society and policy makers, signaling the status of the economic well-being of residents and their further impact on sustainable goals. The research approach is comprehensive and multifaceted, consisting of: i) computation of a country-level Misery Index over the years 2009-2022 to analyze its historical pattern; ii) ranking of countries at selected time points to identify those countries that recorded peaks in the degree of economic dissatisfaction; iii) correlation analysis; iv) quartile analysis; v) causality tests for the interplay between the economic misery level and relevant SDGs. The findings emphasized that the highest level of economic discomfort during the last 13 years belongs to the contemporaneous period (2022 year-end data) and is mainly due to the adverse developments of the inflation rate. Some EU countries tend to position themselves toward the lower bound, while others toward the upper bound of economic misery. During 2011-2019, Greece has persistently recorded the highest index values, while in 2020 and 2022 Lithuania became the worst country in terms of economic dissatisfaction. Furthermore, the level of economic discomfort appears to influence the achievement of some SDGs.

## 1. Introduction

The choice for building a Misery index as a proxy for the economic wellbeing substantiates in the generally agreed reasoning that the construction of indices can help to reduce data complexity and shed light on unknown, hidden or unperceived features, to compare and rank results, and to communicate scientific outputs in a friendly and easy-to-understand manner (Reckien, 2018). As Pontarollo et al. (2018) claim, despite its rather simple calculation, this type of index acts as a sound proxy for determining living conditions of an average citizen in a given country, since persistently high inflation or unemployment rates are more likely to damage the real economy and to have deep social consequences.

By calculating the index with a yearly frequency, one can assess the time persistence of the economic discomfort perceived by individuals due to a specific exogenous shock or crisis. By comparing the dynamics of the index in the sample countries, changes (improvement or worsening) in resident dissatisfaction, which is partly due to public policies and strategies implemented by national authorities. Therefore, the index can indirectly serve as a barometer for evaluating the rapid response of the authorities to contain the crisis episode and alleviate the economic, financial, or social burden felt by individuals. The index is useful for signaling the degree of economic dissatisfaction felt by residents in a given country due to an adverse, severe event (financial crisis, pandemic crisis, economic recession, geopolitical tensions, etc.).

The research objectives consist of: i) computation of a Misery Index for each country in the sample, for a timeframe covering the years 2009-2022 to reveal its historical pattern and to build a visual radar; ii) performing a ranking of countries at selected time points (2009 to account for the effects of the global financial crisis outbreak; 2020 to account for the onset of the COVID-19 pandemic crisis) to identify those countries that recorded peaks in the degree of economic dissatisfaction; iii) conducting a correlation analysis to uncover whether the economic discomfort in some countries is synchronized; iv) performing a quartile analysis to understand the spread of data and identify outliers; v) conducting Granger causality tests to uncover whether there is a bilateral or unilateral relationship between the economic misery level and relevant SDGs. The findings shed light on the geographical distribution of the most economically miserable countries in the EU. Cross-country research is carried out, considering the EU member states in a comparative manner.

The paper is structured as follows: the second section synthesizes previous studies that investigate the degree of economic distress felt by inhabitants through various types of misery indices. The third section presents the methodological stages of the analysis and discusses the findings. The last section concludes.

## 2. Literature review

Measurement of economic discomfort among people has been a topic of concern and debate among practitioners and researchers in the last decades. The development of misery indexes, by aggregating various economic and financial variables, has been a first attempt to include in a single metric the economic malaise of people (Cohen et al. 2014). The stated aim of this index was to objectively measure the loss of economic welfare (Lechman et al. 2009).

Pontarollo et al. (2018) compute a regional discomfort index, as the algebraic sum of the interest rate, inflation, and unemployment rates, minus the year-over-year percent change in per capita gross domestic product growth, in order to assess how "miserable" a region is in the aftermath of the global financial crisis. The findings highlight broad changes in the geographical distribution of the miserable regions in EU, in the post-financial crisis years. Specifically, the EU countries with the lowest economic discomfort are Germany, Austria, the UK, and Denmark, while Spain and Portugal worsened their condition.

Grabia (2011) used the original formula of the Okun Misery Index as an alternative measure of efficiency of an economy, to complement the information provided by the GDP per capita indicator or the Human Poverty Index developed by the United Nations. The comparative rankings of EU countries for the period 2000 – 2009, based on the economic misery index and the GDP per capita, show similar results. In both cases, the best performing countries include Luxembourg, Denmark, the Netherlands, Austria, the United Kingdom, and Sweden, while the lowest in the ranking (exhibiting the highest economic poverty) are Hungary, Slovakia, Estonia, Poland, Lithuania, Latvia, Romania, and Bulgaria.

A recent and singular approach belongs to Eloi (2022) that adapts the original formula of the macroeconomic misery index to the current European social context, by focusing on two factors which largely explain the dynamics of current consumer prices: food and energy. The author attempts to develop a social-ecological misery index by referring to two social-ecological indicators, such as energy poverty and food insecurity. The findings reveal that Eastern and Southern European countries (Bulgaria, Greece, Lithuania, Portugal, and Romania) are in a particularly vulnerable situation.

Another singular study (Vlandas, 2020) combines economic and health performance indicators into a single metric called the Pandemic Misery Index to assess the performance of selected countries during the onset of the pandemic crisis. In the top worst performers are included Canada, the UK and the US, as well as Spain, Italy and Portugal, followed by Belgium and the Netherlands. On the contrary, there are good performers, represented by several European countries: Latvia, Hungary, Slovakia, Norway, Denmark, and Iceland.

## 3. Methodological insights and analytical stages

By definition, the Misery Index measures the discomfort felt by individuals given the change in macroeconomic fundamentals. In this paper the Misery Index is computed by following the generally accepted computational methodology related to Misery Indices, through the summation and deduction of several equally weighted macroeconomic variables. Specifically, the variables included in the formula are meant to show the presence of potential imbalances and weaknesses in the national economy in terms of price stability and employment. Therefore, the formula used is: the annual inflation rate + the annual unemployment rate.

They were selected having as a starting point the original formula developed by Okun and a review of the literature of the most influential macroeconomic fundamentals from a people's point of view. All variables whose higher levels exert a negative impact on people's economic well-being enter this formula with a positive sign. Consequently, a high level of the Misery Index indicates a high degree of economic discomfort or dissatisfaction. As a proxy for the inflation rate, the harmonised index of consumer prices (HICP) that represents the official measure of consumer price inflation in the euro area countries is employed. This indicator measures the change over time in the prices of consumer goods and services purchased by households. The unemployment rate is calculated as the number of unemployed persons aged 20 to 64 as a percentage of the labour force (the total number of people employed and unemployed). The source of data for both indicators is the Eurostat database, data collected with an annual frequency.

### 3.1. The historical pattern of the Misery index in the EU member countries

The computed values of the Misery Index (see Table 1 and Figure 1) show that the highest level of economic discomfort felt by individuals across all EU countries during the last 13 years belongs to the contemporaneous period (2022 year-end data). This suggests that the level of economic misery tends to be more pronounced in times of multicrises (energy crisis, inflationary pressures, geopolitical crisis, government-ineffective fiscal positions due to high public debt-to-GDP ratios caused by national measures adopted to contain adverse economic effects triggered by the pandemic, etc.), rather than in periods characterised by a single but major crisis episode (the financial crisis, the pandemic).
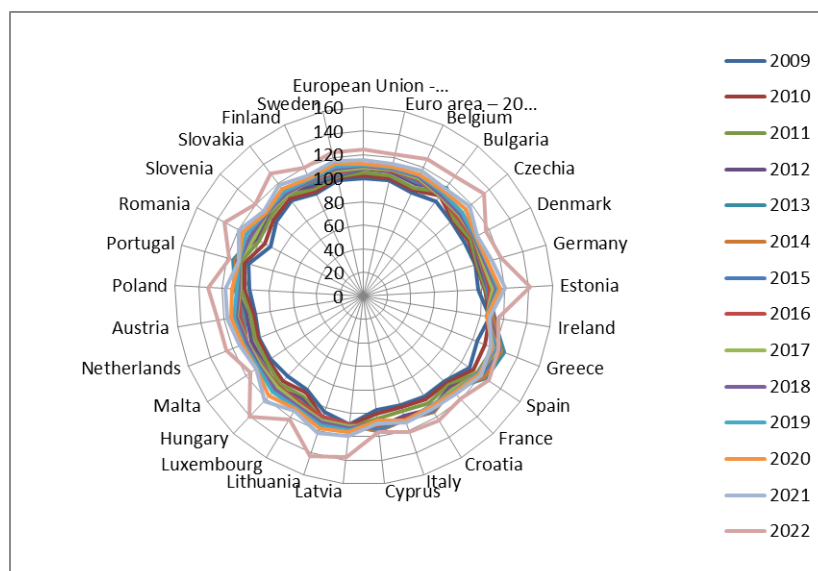


**Figure 1.** The time pattern of the Misery index

Source: the author

The slow but time persistent increase in the level of the Misery Index, recorded by each country in the sample, is due to a gradual increase in the index of consumer prices (a metric used to assess the inflation rate), overlapped on a decreasing trend registered by the unemployment rate. Consequently, it seems that the historical dynamics of the index is mainly driven by shifts in the inflation rate rather than in the unemployment rate. The figure

indicates successive layers of economic discomfort one year from another, culminating with a larger jump in 2022.

**Table 1.** Misery index annual values and main descriptive statistics

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Belgium** | 96,59 | 99,09 | 101,28 | 104,18 | 106,1 | 106,78 | 107,5 | 108,67 | 110,23 | 111,64 | 112,47 | 113,23 | 117,01 | 127,86 |
| **Bulgaria** | 100,71 | 106,76 | 110,94 | 114,23 | 115,42 | 112,58 | 109,3 | 106,68 | 106,55 | 108,28 | 109,89 | 111,87 | 114,2 | 127,52 |
| **Czechia** | 97,3 | 99 | 100,5 | 104 | 105,4 | 105,2 | 104,5 | 104,2 | 105,7 | 107,1 | 109,6 | 113,7 | 117,6 | 134,2 |
| **Denmark** | 97,2 | 100,5 | 102,8 | 105,3 | 105,5 | 105,5 | 105,3 | 104,9 | 105,8 | 106 | 106,7 | 107,6 | 109 | 117,3 |
| **Germany** | 98,3 | 98,8 | 100,1 | 101,7 | 103,2 | 103,6 | 104 | 103,9 | 105,3 | 106,8 | 108,1 | 109 | 112,4 | 121,4 |
| **Estonia** | 97,52 | 102,76 | 103,63 | 105,13 | 107,06 | 106,53 | 105,7 | 107 | 109,68 | 112,85 | 114,4 | 115,8 | 120,12 | 141,53 |
| **Ireland** | 108,1 | 108,5 | 110,6 | 112,4 | 111,6 | 110,3 | 108,5 | 107 | 105,8 | 105,5 | 105,7 | 105,8 | 108,6 | 115,7 |
| **Greece** | 103,21 | 110,57 | 118,46 | 125,92 | 128,14 | 125,91 | 123,3 | 122,42 | 121,65 | 120,44 | 119,26 | 117,77 | 115,45 | 122,61 |
| **Spain** | 107,89 | 111,88 | 116,14 | 121,81 | 124,63 | 122,93 | 120,2 | 117,56 | 117,39 | 117,36 | 117,06 | 117,91 | 120,44 | 127,65 |
| **France** | 99,64 | 101,55 | 103,8 | 106,43 | 107,91 | 108,61 | 108,7 | 108,71 | 109,37 | 111,2 | 112,05 | 112,1 | 114,28 | 120,14 |
| **Croatia** | 99,06 | 102,05 | 106,19 | 111,46 | 114,44 | 114,86 | 113,8 | 110,57 | 110,27 | 109,23 | 108,74 | 109,46 | 112,22 | 123,11 |
| **Italy** | 97,6 | 99,7 | 102,4 | 107,5 | 110,2 | 110,7 | 110,2 | 110 | 111,1 | 111,7 | 111,9 | 111,1 | 113,3 | 121,3 |
| **Cyprus** | 97,11 | 100,19 | 104,8 | 111,65 | 115,44 | 115,57 | 113,2 | 110,28 | 109,35 | 107,53 | 107,08 | 106,37 | 108,52 | 115,87 |
| **Latvia** | 109,61 | 110,56 | 111,58 | 112,79 | 109,91 | 109,79 | 109,3 | 109,2 | 111,1 | 112,73 | 114,43 | 116,32 | 119,24 | 137,67 |
| **Lithuania** | 103,54 | 108,53 | 110,14 | 111,48 | 111,34 | 110,58 | 108,5 | 107,98 | 111,02 | 112,87 | 115,27 | 118,33 | 122,35 | 143,17 |
| **Luxembourg** | 93,05 | 95,14 | 98,95 | 101,79 | 104,45 | 104,74 | 105,7 | 105,34 | 106,85 | 109,11 | 110,53 | 111,43 | 113,91 | 122,15 |
| **Hungary** | 93,93 | 99,17 | 102,58 | 107,64 | 108,52 | 106,44 | 105,8 | 104,75 | 106,34 | 108,94 | 112,16 | 116,65 | 122,44 | 140,42 |
| **Malta** | 95,25 | 97,39 | 99,1 | 101,93 | 102,98 | 103,54 | 104,4 | 104,7 | 105,28 | 106,85 | 108,44 | 109,97 | 109,82 | 116,09 |
| **Netherlands** | 95,3 | 96,75 | 99,22 | 102,59 | 106,47 | 107,09 | 106,9 | 106,01 | 106,3 | 107,02 | 109,38 | 110,66 | 113,18 | 125,48 |
| **Austria** | 93,34 | 94,54 | 97,55 | 100,25 | 102,77 | 104,5 | 105,4 | 106,67 | 108,52 | 110,01 | 111,28 | 113,77 | 117,06 | 125,27 |
| **Poland** | 97,3 | 101,1 | 104,5 | 108,5 | 109,6 | 108,5 | 106,5 | 105,1 | 105,5 | 105,8 | 107,6 | 111,3 | 117,1 | 131,8 |
| **Portugal** | 101,65 | 104,32 | 108,44 | 113,92 | 115,05 | 112,4 | 111,5 | 110,84 | 110,2 | 109,6 | 109,51 | 109,48 | 110,05 | 118,13 |
| **Romania** | 89,5 | 95,03 | 100,14 | 102,98 | 106,34 | 107,31 | 106,9 | 104,83 | 104,9 | 108,28 | 111,95 | 115,67 | 119,71 | 133,56 |
| **Slovenia** | 96,97 | 100,36 | 103,31 | 106,4 | 109,6 | 109,67 | 108,4 | 107,35 | 107,6 | 108,16 | 109,31 | 109,22 | 111,17 | 120,54 |
| **Slovakia** | 101,35 | 103,99 | 107,03 | 111 | 112,75 | 111,95 | 110,1 | 108,02 | 108,1 | 109,26 | 111,33 | 114,27 | 117,63 | 130,45 |
| **Finland** | 95,82 | 97,53 | 100,15 | 103,01 | 105,56 | 107,26 | 107,6 | 107,69 | 108,43 | 108,52 | 108,88 | 109,98 | 112,62 | 119,54 |
| **Sweden** | 100,83 | 102,93 | 103,55 | 104,56 | 105,1 | 105,3 | 105,8 | 106,74 | 108,52 | 110,32 | 112,23 | 114,33 | 117,29 | 124,99 |
| **Main descriptive statistics** | | | | | | | | | | | | | | |
| *Minimum* | 89,50 | 94,54 | 97,55 | 100,25 | 102,77 | 103,54 | 104,00 | 103,90 | 104,90 | 105,50 | 105,70 | 105,80 | 108,52 | 115,70 |

| *Maximum* | 109,61 | 111,88 | 118,46 | 125,92 | 128,14 | 125,91 | 123,30 | 122,42 | 121,65 | 120,44 | 119,26 | 118,33 | 122,44 | 143,17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Average* | 98,80 | 101,80 | 104,74 | 108,17 | 109,83 | 109,56 | 108,78 | 108,04 | 108,77 | 109,74 | 110,94 | 112,34 | 115,06 | 126,13 |
| *Standard deviation* | 4,63 | 4,84 | 5,27 | 6,06 | 6,02 | 5,29 | 4,45 | 3,97 | 3,67 | 3,36 | 3,12 | 3,45 | 4,09 | 7,93 |

Source: author

In addition to the raw values of the index, the primary descriptive statistics provide additional information about the characteristics of the data. The annual average indicates that 2009 had been the year with the lowest degree of economic dissatisfaction, while 2012 and 2016, and respectively 2013, 2014, 2015, 2017 and 2018 are time periods that witnessed a similar level of discomfort. The standard deviation statistic emphasises how scattered the data are around a central tendency; in other words, it is a measure of the data heterogeneity. The highest values are recorded for the year 2022, followed by 2012 and 2013, suggesting an increased presence of outlier, extreme values across EU countries. The smallest variability in the data sample belongs to 2019, with a deviation of 3.12.

Regarding the minimum values of the index, signalling the best living standards in terms of the two macroeconomic variables considered, in 2009 and 2017 Romania holds the first place; during 2010 – 2013 Austria had the lowest degree of economic dissatisfaction, in 2015-2016 Germany held this position, while Ireland occupied this position during 2018-2020 and 2022.

In contrast, the maximum values of the Misery index highlight the highest degree of economic discomfort felt by residents. During 2011-2019 Greece has persistently occupied this position; in 2020 and 2022 Lithuania became the worst country, while in 2021 this place was held by Hungary. Thus, some EU countries tend to position themselves toward the lower bound, while others toward the upper bound of the economic misery.

*3.2. EU countries' ranking in terms of economic discomfort, at selected time points*

By performing a ranking of the Misery index scores for selected time periods, it can be identified those EU countries that recorded peaks in the degree of economic dissatisfaction. The insights from this comparative analysis are meant to indicate whether euro-area countries performed similarly, or if a given country occupied the same place in this ranking during various crisis events. The specific years considered are 2009, to account for the effects of the global financial crisis outbreak, 2020 to account for the onset of the COVID-19 pandemic crisis, and 2022 for a recent period characterised by the overlapping of simultaneous crisis episodes.

**Table 2.** EU countries' ranking

| Country | 2009 | | Country | 2020 | | Country | 2022 |
|---|---|---|---|---|---|---|---|
| **Latvia** | 109,61 | | **Lithuania** | 118,33 | | **Lithuania** | 143,17 |
| **Ireland** | 108,1 | | **Spain** | 117,91 | | **Estonia** | 141,53 |
| **Spain** | 107,89 | | **Greece** | 117,77 | | **Hungary** | 140,42 |
| **Lithuania** | 103,54 | | **Hungary** | 116,65 | | **Latvia** | 137,67 |
| **Greece** | 103,21 | | **Latvia** | 116,32 | | **Czechia** | 134,2 |
| **Portugal** | 101,65 | | **Estonia** | 115,8 | | **Romania** | 133,56 |
| **Slovakia** | 101,35 | | **Romania** | 115,67 | | **Poland** | 131,8 |
| **Sweden** | 100,83 | | **Sweden** | 114,33 | | **Slovakia** | 130,45 |
| **Bulgaria** | 100,71 | | **Slovakia** | 114,27 | | **Belgium** | 127,86 |
| **France** | 99,64 | | **Austria** | 113,77 | | **Spain** | 127,65 |
| **Croatia** | 99,06 | | **Czechia** | 113,7 | | **Bulgaria** | 127,52 |
| **Germany** | 98,3 | | **Belgium** | 113,23 | | **Netherlands** | 125,48 |
| **Italy** | 97,6 | | **France** | 112,1 | | **Austria** | 125,27 |
| **Estonia** | 97,52 | | **Bulgaria** | 111,87 | | **Sweden** | 124,99 |
| **Czechia** | 97,3 | | **Luxembourg** | 111,43 | | **Croatia** | 123,11 |
| **Poland** | 97,3 | | **Poland** | 111,3 | | **Greece** | 122,61 |
| **Denmark** | 97,2 | | **Italy** | 111,1 | | **Luxembourg** | 122,15 |
| **Cyprus** | 97,11 | | **Netherlands** | 110,66 | | **Germany** | 121,4 |
| **Slovenia** | 96,97 | | **Finland** | 109,98 | | **Italy** | 121,3 |
| **Belgium** | 96,59 | | **Malta** | 109,97 | | **Slovenia** | 120,54 |
| **Finland** | 95,82 | | **Portugal** | 109,48 | | **France** | 120,14 |
| **Netherlands** | 95,3 | | **Croatia** | 109,46 | | **Finland** | 119,54 |
| **Malta** | 95,25 | | **Slovenia** | 109,22 | | **Portugal** | 118,13 |
| **Hungary** | 93,93 | | **Germany** | 109 | | **Denmark** | 117,3 |
| **Austria** | 93,34 | | **Denmark** | 107,6 | | **Malta** | 116,09 |
| **Luxembourg** | 93,05 | | **Cyprus** | 106,37 | | **Cyprus** | 115,87 |
| **Romania** | 89,5 | | **Ireland** | 105,8 | | **Ireland** | 115,7 |

Source: author

The ranking in Table 2 shows that the top five positions in terms of the most miserable countries irrespective the benchmark year considered are represented by Lithuania, Spain, Greece, Hungary, and Latvia. In 2009 and 2020 several countries have maintained the same place in the hierarchy of the economic discomfort, namely Sweden and Poland, while in 2009 and 2022 Lithuania, Cyprus, and Ireland kept their positions unchanged (the latter two countries recorded the smallest values of the index).

*3.3. Correlation analysis*

In addition to the historical patterns uncovered above, a correlation analysis is conducted to reveal whether the economic discomfort in some particular years tends to be synchronised among countries. The Pearson correlation matrix is illustrated in table 3.

**Table 3**. Misery index correlation matrix

| | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **2009** | 1 | .933** | .834** | .721** | .583** | .550** | .516** | .519** | .510** | .425* | 0,310 | 0,163 | 0,052 | 0,042 |
| **2010** | .933** | 1 | .958** | .868** | .752** | .703** | .648** | .634** | .628** | .571** | .479* | 0,339 | 0,193 | 0,184 |
| **2011** | .834** | .958** | 1 | .966** | .894** | .852** | .803** | .763** | .717** | .629** | .511** | 0,340 | 0,153 | 0,110 |
| **2012** | .721** | .868** | .966** | 1 | .971** | .938** | .897** | .840** | .764** | .634** | .486* | 0,292 | 0,089 | 0,029 |
| **2013** | .583** | .752** | .894** | .971** | 1 | .986** | .954** | .883** | .789** | .643** | .479* | 0,259 | 0,052 | -0,035 |
| **2014** | .550** | .703** | .852** | .938** | .986** | 1 | .985** | .921** | .828** | .671** | .491** | 0,245 | 0,027 | -0,084 |
| **2015** | .516** | .648** | .803** | .897** | .954** | .985** | 1 | .963** | .880** | .725** | .530** | 0,251 | 0,007 | -0,146 |
| **2016** | .519** | .634** | .763** | .840** | .883** | .921** | .963** | 1 | .964** | .841** | .644** | 0,331 | 0,052 | -0,133 |
| **2017** | .510** | .628** | .717** | .764** | .789** | .828** | .880** | .964** | 1 | .939** | .783** | .493** | 0,224 | 0,035 |
| **2018** | .425* | .571** | .629** | .634** | .643** | .671** | .725** | .841** | .939** | 1 | .940** | .717** | .471* | 0,265 |
| **2019** | 0,310 | .479* | .511** | .486* | .479* | .491** | .530** | .644** | .783** | .940** | 1 | .898** | .705** | .517** |
| **2020** | 0,163 | 0,339 | 0,340 | 0,292 | 0,259 | 0,245 | 0,251 | 0,331 | .493** | .717** | .898** | 1 | .922** | .778** |
| **2021** | 0,052 | 0,193 | 0,153 | 0,089 | 0,052 | 0,027 | 0,007 | 0,052 | 0,224 | .471* | .705** | .922** | 1 | .911** |
| **2022** | 0,042 | 0,184 | 0,110 | 0,029 | -0,035 | -0,084 | -0,146 | -0,133 | 0,035 | 0,265 | .517** | .778** | .911** | 1 |
| **\*\*. Correlation is significant at the 0.01 level (2-tailed).** | | | | | | | | | | | | | | |
| **\*. Correlation is significant at the 0.05 level (2-tailed).** | | | | | | | | | | | | | | |

Source: author

The raw values of the Misery index for the years 2011-2014 are highly (over 0.7) and statistically significant correlated with the values recorded for the time period 2010-2017. The years 2015-2017 are highly correlated with the period 2011-2018, the year 2018 shows a high correlation with the period 2015-2020, the year 2019 is highly correlated with 2019-2021, the year 2020 exhibits a high correlation with the period 2018 – 2022, while the year 2022 is highly correlated with 2020 and 2021 but shows no statistically significant and negligible correlation with the 2009-2018 period. Thus, it seems that the economic discomfort felt in one particular year tends to spread over the next 3-4 years window.

*3.4. Quartile analysis*

Complementary to the previous findings, a quartile analysis is performed to understand the spread (variability) of data in the sample by breaking it into meaningful quarters and identify outlier countries.

**Table 4.** Statistics for the percentiles 25, 50 and 75

|  | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **25q** | 95,82 | 98,80 | 100,15 | 103,01 | 105,50 | 105,50 | 105,70 | 105,10 | 105,80 | 107,10 | 108,74 | 109,48 | 112,22 | 120,14 |
| **50q** | 97,52 | 100,50 | 103,55 | 106,43 | 108,52 | 108,50 | 107,60 | 107,00 | 108,43 | 109,11 | 110,53 | 111,87 | 114,28 | 124,99 |
| **75q** | 101,35 | 104,32 | 108,44 | 111,65 | 112,75 | 111,95 | 110,10 | 109,20 | 110,23 | 111,64 | 112,23 | 115,67 | 117,63 | 131,80 |

Source: author

The 1st quartile (lower quartile) corresponds to the 25 percentile and gathers the smallest values of the index, for each year considered. It can be seen from Table 4 that these values are slowly but persistently increasing one year from another. Interestingly, the period 2013-2017 witnessed a stagnation of the degree of dissatisfaction felt by residents. These particular countries are represented by Czechia, Denmark, Germany, Luxembourg and Malta. In other words, 25% of the index values are below the annual threshold indicated in the table. The second group of values comprises data between the lower quartile and the median (the 50th percentile). The third group of values reconciles data between the median and the upper quartile (the 75th percentile). Consequently, 75% of the index values are below the annual thresholds. The fourth group comprises data between the upper quartile and the maximum value of the data set. For the 2022 year, the countries included in this fourth group are represented by Lithuania, Estonia and Hungary, followed by Latvia, Czechia, Romania, and Poland. By comparison, in 2020 the most miserable countries in the sample are Lithuania, Spain, Greece, Hungary, Latvia, Estonia, and Romania.

*3.5. Causality tests of the interplay between the economic misery and relevant SDGs*

We recall that the paper has a two-fold objective. Apart from computing the index and revealing its historical pattern of evolution and cross-country characteristics, its potential impact on several major outcomes envisaged at national and international levels, such as complying with sustainable development goals, is examined. In the following, the relationship between the misery index and selected SDGs indicators is assessed by means of a correlation and causality approach. First, the correlation matrix is generated to reveal the strength and direction of the linear relationship between pairs of variables.

**Table 5.** Pearson correlation coefficients

|  |  | Misery index | SDG 2 - gov. support agriculture | SDG 3 - unmet need for medical examination and care | SDG 4 - Early leavers from education and training | SDG 8 - gov. investment in GDP | SDG 9 - gov. sector expenditure on R&D | SDG 12 - value added in environmental goods and services sector | SDG 13 - Expenditure on environment protection | SDG 16 - confidence in EU institutions |
|---|---|---|---|---|---|---|---|---|---|---|
| **Misery index** | | 1 | 0,012 | 0,105[*] | -0,071 | -0,069 | -0,025 | -0,036 | 0,115[*] | -0,176[**] |
| | | - | 0,819 | 0,042 | 0,168 | 0,198 | 0,647 | 0,597 | 0,031 | 0,001 |
| | | 378 | 348 | 376 | 378 | 353 | 351 | 221 | 351 | 378 |

Note: 2-tailed significance is presented on the 2nd row, while the last row represents the number of observations available for each indicator. * Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

Table 5 indicates that there is a strong, highly statistically significant relationship between the misery index and SGD no. 16. Additionally, the negative coefficient suggests that these variables tend to evolve in opposite directions, namely, when the state of economic discomfort rises, the confidence in EU institutions starts to erode.

A significant and positive relationship is identified between the misery index and SDG no. 3 as well as the SDG no. 13, signaling that both variables tend to evolve simultaneously (they are witnessing both high or low values). To sum up, the correlation analysis reveals that the degree of economic misery is statistically linked with the SDGs targeting good health and well-being, the climate action undertaken by decision makers, and the environment characterised by strong institutions.

Second, the Granger causality test complements the picture by signaling whether prior change in one variable is followed by changes in other variables. The presence of causality between pairs of variables should be interpreted as 'chronological ordering of movements in the series' (Brooks, 2008). More to the point, Diebold (2001) emphasises that when using a causality test, the findings expressed through the short statement 'a causes b' should be understood as 'variable a contains useful information to predict variable b (in the linear least squares sense)". Table 6 synthesises the results of the Granger causality tests.

**Table 6**. Pairwise Granger causality test

| Null Hypothesis: | Obs. | F-Statistic | Prob. |
|---|---|---|---|
| DS2 does not Granger Cause MI | 267 | 2,65324 | 0,0723* |
| MI does not Granger Cause DS2 | | 1,04504 | 0,3531 |
| S3 does not Granger Cause MI | 370 | 1,76185 | 0,1732 |
| MI does not Granger Cause S3 | | 0,08088 | 0,9223 |
| S4 does not Granger Cause MI | 376 | 3,34862 | 0,0362** |
| MI does not Granger Cause S4 | | 7,48957 | 0,0006*** |
| S8 does not Granger Cause MI | 311 | 1,06428 | 0,3463 |
| MI does not Granger Cause S8 | | 1,15271 | 0,3171 |
| DS9 does not Granger Cause MI | 270 | 0,2409 | 0,7861 |
| MI does not Granger Cause DS9 | | 2,73727 | 0,0666* |
| DS12 does not Granger Cause MI | 137 | 1,19858 | 0,3049 |
| MI does not Granger Cause DS12 | | 4,90484 | 0,0088*** |
| S13 does not Granger Cause MI | 297 | 0,34689 | 0,7072 |
| MI does not Granger Cause S13 | | 4,38638 | 0,0133** |
| S16 does not Granger Cause MI | 376 | 7,41998 | 0,0007*** |
| MI does not Granger Cause S16 | | 2,1951 | 0,1128 |

* Correlation is significant at the 0.10 level

** Correlation is significant at the 0.05 level

*** Correlation is significant at the 0.01 level.

The unilateral causality relationship is established between the SDGs no. 2 (zero hunger) and no. 16 (strong institutions) and the misery index. The interpretation is straightforward: An initial change in the level of the above-mentioned SDGs may trigger effects on the level of economic distress felt by the population. Another set of unilateral causality relationships appears between the misery index and the SDGs no. 9 (industry, innovation, and infrastructure), 12 (responsible consumption and production) and 13 (climate action). Consequently, changes

in the degree of economic distress (either as improvements or impairments) precede subsequent changes in SDG values.

Bilateral causality is only present between the misery index and the SDG no. 4 (quality education), both variables seem to influence each other.

## 4. Conclusions

In general, the findings retrieved from the previous analytical stages shed light on the geographical distribution of the most economically miserable countries in the EU. In the three benchmark years considered (2009, 2020 and 2022), the spatial distribution of the economic discomfort has deeply changed. The countries bearing the highest discomfort, arising mainly from the persistent and high inflation rate, are represented by Lithuania, Spain, Greece, Hungary, and Latvia. Residents in Cyprus, Denmark, Malta, and Ireland, who seem to be witnessing a more stable economic environment, face little discomfort.

Historically, Greece held for nine consecutive years the highest degree of economic discomfort, being replaced contemporaneously by Lithuania. At the opposite lie Austria and Ireland, with a good record of low economic misery levels. The analysis of the country grouping according to the main percentiles gives further insight.

Another major finding relates to the temporal distribution of the discomfort: the year 2022 is most correlated with 2020 and 2021 while showing negligible correlation with the 2009-2018 periods. Therefore, it can be concluded that the economic distress triggered by the COVID-19 pandemic beginning with 2020 is likely to persist in the subsequent years. A similar trend can also be observed for the economic discomfort in 2009, which proves to be highly synchronised with the one recorded in 2010 and 2011.

Regarding the interaction with the SDGs, it seems that 3 of 8 SDG indicators (namely SDG no. 2, no. 4 and no. 16) have the potential to further influence the level of the misery index; meanwhile, changes in the misery index level are susceptible to be followed by changes in four SDGs (SDG no. 4, no. 9, no. 12, no. 13). This preliminary analysis reinforces the idea that people's economic well-being, modelled on the misery index, deserves further investigation against the main social, environmental, and economic challenges, as expressed by the various dimensions of sustainable development dimensions.

## References

Brooks, C. (2008) *Introductory econometrics for finance*, Cambridge: Cambridge University Press, 2nd edition.

Cohen, I.K., Ferretti, F., McIntosh, B. (2014). Decomposing the misery index: A dynamic approach. *Cogent Economics & Finance* 2: 991089.

Diebold, F.X. (2001). *Elements of Forecasting*. Cincinnati: South Western Publishing, 2nd edition.

Eloi, L. (2022). *Assessing the inflation crisis: a social-ecological misery index for Europe*, October 3, 2022. https://progressivepost.eu/assessing-the-inflation-crisis-a-social-ecological-misery-index-for-europe/

Grabia, T. (2011). The Okun Misery Index in the European Union Countries from 2000 to 2009, *Comparative Economic Research. Central and Eastern Europe*, Łódź University Press, Vol. 14, Iss. 4, pp. 97-115, 2011. https://doi.org/10.2478/v10103-011-0029-8

Lechman, E. (2009). *Okun's and Barro's Misery Index as an Alternative Poverty Assessment Tool. Recent Estimations for European Countries*. MPRA No. 37493, 2009.

Pontarollo, N., Ronchi, S., Serpieri, C. (2018). European Union regional discomfort before and after the crisis, *Environment and Planning*, ISSN 0308-518X, 50 (7), 2018.

Reckien, D. (2018). What is in an index? Construction method, data metric, and weighting scheme determine the outcome of composite social vulnerability indices in New York City, *Regional Environmental Change*, 18:1439–1451, 2018.

Vlandas, T. (2020). *A pandemic 'misery index': Ranking countries' economic and health performance during Covid-19*. https://blogs.lse.ac.uk/europpblog/2020/12/04/a-pandemic-misery-index-ranking-countries-economic-and-health-performance-during-covid-19/