

**Testing the Economic Resilience of Economic Cooperation  
Organization (ECO) Member States Using AHP-TOPSIS  
Approach in 2017**

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**ABSTRACT**

Economic resilience is a new phenomenon in the global economic discourse. Its significance and relevance has been widely discussed by leading economists, especially following the global financial meltdown in 2007-08. Different theories have been pitched and several determinants used by economists to measure resistance performance of an economy against external shocks. However, determinants used by Briguglio et al. (2008) have been widely accepted as most credible. Pertinently, this research paper is based on the determinants used by Briguglio to determine the economic resilience of ECO member states in 2017 using AHP and TOPSIS approach. This paper finds robust evidence that misery index, external debt and human development index increase resilience to external shocks and ultimately reduce the incident of crisis. Nations with low economic resilience, in order to strengthen their economies should pursue policies to reduce unemployment and inflation, adopt financial discipline, sustainable debt policies and develop education and public health sector to reduce economic crisis significantly. Moreover, this research is based on questionnaires filled by the economists, weighted through AHP approach and then ranked by TOPSIS. We conclude that Azerbaijan ranked first and was the most resilient country while Kyrgyz Republic was the least economic resilient country in 2017 against adverse shocks.

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## ملخص

تعتبر المرونة الاقتصادية ظاهرة جديدة في الخطاب الاقتصادي العالمي اليوم. فقد تم نقاش أهميتها وملامتها على نطاق واسع من قبل كبار الاقتصاديين، خاصة بعد الانهيار المالي العالمي في فترة 2007-2008. وتم طرح نظريات مختلفة واستخدم العديد من المحددات من قبل الاقتصاديين لقياس أداء مقاومة الاقتصاد ضد الصدمات الخارجية. ومع ذلك، فإن المحددات التي استخدمها بريغوليو وآخرون (Briguglio et al.) 2008 تم قبولها على نطاق واسع باعتبارها الأكثر مصداقية. وعلى نحو وثيق الصلة، تستند هذه الورقة البحثية إلى المحددات التي استخدمها بريغوليو لتحديد المرونة الاقتصادية للدول الأعضاء في منظمة التعاون الاقتصادي عام 2017 باستخدام نهج عملية التحليل الهرمي (AHP) وترتيب الأولويات عن طريق التشابه مع الحل المثالي (TOPSIS). فهذا المقال يكشف عن وجود أدلة قوية على أن مؤشر البؤس والدين الخارجي ومؤشر التنمية البشرية يزيد من القدرة على الصمود أمام الصدمات الخارجية ويقلل في نهاية المطاف من وقوع الأزمات. وعليه، يجب على الدول ذات المرونة الاقتصادية المنخفضة، من أجل تعزيز اقتصاداتها، اتباع سياسات للحد من البطالة والتضخم، واعتماد الانضباط المالي، وسياسات الديون المستدامة، وتطوير قطاع التعليم والصحة العامة للحد من الأزمة الاقتصادية بشكل كبير. وعلاوة على ذلك، يستند هذا البحث إلى استبيانات استكملها الاقتصاديون، مرجحة من خلال نهج عملية التحليل الهرمي ثم مصنفة حسب ترتيب الأولويات عن طريق التشابه مع الحل المثالي. ونستنتج أن أذربيجان احتلت المرتبة الأولى وكانت الدولة الأكثر مرونة بينما كانت جمهورية قيرغيزستان الدولة الأقل مرونة اقتصاديا عام 2017 ضد الصدمات السلبية.

## ABSTRAITE

La résilience économique est un phénomène nouveau dans le discours économique mondial actuel. Son importance et sa pertinence ont été largement débattues par d'éminents économistes, en particulier après l'effondrement financier mondial de 2007-2008. Différentes théories ont été élaborées et plusieurs déterminants utilisés par les économistes pour mesurer la performance de résistance d'une économie face aux chocs externes. Cependant, les déterminants utilisés par Briguglio et al. (2008) ont été largement acceptés comme les plus crédibles. De manière pertinente, ce document de recherche est basé sur les déterminants utilisés par Briguglio pour déterminer la résilience économique des États membres de l'ECO en 2017 en utilisant l'approche AHP et TOPSIS. Ce document trouve des preuves solides que l'indice de misère, la dette extérieure et l'indice de développement humain augmentent la résilience aux chocs extérieurs et réduisent finalement l'incidence de la crise. Les pays dont la résilience économique est faible devraient, pour renforcer leur économie, mener des politiques visant à réduire le chômage et l'inflation, adopter une discipline financière, des politiques d'endettement durable et développer les

secteurs de l'éducation et de la santé publique afin de réduire considérablement la crise économique. De plus, cette recherche est basée sur des questionnaires remplis par les économistes, pondérés par l'approche AHP et ensuite classés par TOPSIS. Nous concluons que l'Azerbaïdjan s'est classé premier et a été le pays le plus résilient tandis que la République kirghize a été le pays le moins résilient économiquement en 2017 face aux chocs défavorables.

**Keywords:** Economic resilience, resistance, AHP, TOPSIS, ECO Countries.

## 1. Introduction

Over the past decade, the term 'economic resilience' has emerged as a buzzword in popular discourse with far-reaching practical implications. It has prompted researchers and policy-makers to intensify their efforts in understanding the degree of resilience of economic systems. Economic resilience refers to ability of countries to withstand shocks and recover quickly to their potential (European Commission, 2017). It is the policy-induced ability of an economy to withstand or recover from the effects of such shocks (Briguglio et al., 2008). Resistance economy is basically to promote domestic production, particularly in strategic products and services and the consequent reduction of dependence on imports. It is the most substantial tool to reduce external vulnerabilities and diversifying national assets to cope with risk.

Resistance economy prepares the ground for the comprehensive growth and development even in the economic pressures and sanctions (Afkandeh, 2016). The notion of resistance economy has gained popularity among both academics (see, Fingleton et al., 2015) and policy makers (Alessi et al., 2019). This notion enables any country to convert crisis into opportunity and provides avenues to cope with uncertainties.

Keshavarzi and Fathi (2014) quoted that "resistance economy is the economy that determines prosperity of the country under pressure, sanction and serious enmities". Furthermore, Manca et al. (2017), documented: "a resilient system (or society) can face shocks and persistent structural changes in such a way that it does not lose its ability to deliver societal well-being in a sustainable way (i.e., deliver current societal well-being, without compromising well-being of future generations)". Resilience is not only about the ability to absorb and recover from shocks, but is also emphasized as an ability to create new paths (Boschma, 2015).

Similarly, the U.S. Economic Development Administration's (EDA) Comprehensive Economic Development Strategy (CEDS) Content Guidelines<sup>3</sup> documented that resilience has three primary attributes:

- The ability to recover quickly from a shock.
- The ability to withstand a shock.
- The ability to avoid the shock altogether.

In order to lay foundation of a local or regional resilient economy, the ability to anticipate risk, evaluate how that risk can impact key economic assets and/or indicators and build a responsive capacity is of primary importance. The Content Guideline further explains that shocks may include:

- Downturn in national or global economy, impacting demand for local goods and spending.
- Downturn of particular industries critical to local economic activities.
- Other external shocks such as natural or man-made disasters, military base closures or a major employment crunch, changing climate, etc.

Iran's Supreme Leader defines resistance economy as thus:

*When it comes to economy what counts is the domestic production, job creation, and elimination of unemployment, keeping inflation under control, and most important is the economic prosperity and tackling recession all these falls under the purview of resistance economy.*<sup>4</sup>

Since sanctions have been imposed on a number of countries in North Africa and the Middle East, Iran is singled out for being the subject of the largest, longest and most stringent sanctions in history (Farahani & Shabani, 2013; Takeyh & Maloney, 2011). Iran's economy is the weakest point of its government—vulnerable to external shocks—where, the West can hit them hard and has been under constant attack since the Islamic

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<sup>3</sup> Available at, see <https://www.eda.gov/files/ceds/CEDS-Content-Guidelines-full.pdf>

<sup>4</sup> Speech available at, see <https://www.youtube.com/watch?v=sp0pYNJUjmM>

Revolution of 1979. Iran has been trying to make the economy resilient. And, ultimately, the notion of Iranian resistance economy is based on the concept of total independence from foreign influence, including economic independence (Gerocs & Szanyi, 2019).

In order to measure resistance level of an economy, resilience index is put into use. The Resilience Index appears to have the power both to identify economies that are heading towards trouble and to identify the specific policy areas of weakness that lie behind their increasing vulnerability (Boorman et. al., 2013). The availability of reliable data clearly plays a crucial role in detecting vulnerabilities (Roberto & Stefano, 2016) in assessing the effectiveness of policy measures (Garda and Zieman, 2014; Caldera et al., 2015). Pertinently, high-quality micro-data is needed that widen and deepen statistical information on economic resilience.

Different studies have been carried out and different concepts been introduced so far discussing economic resilience. Hallegatte (2014) pitched ideas regarding measurement and definition of economic resilience while others aimed at defining country-level economic resistance (see, Rose, 2013). Briguglio (1995) argues that small states are prone to exogenous shocks although they may have high GDP per capita as they are highly dependent on trade due to lack of economic resources. However, many small states perform well in the context of economic resilience and this phenomenon is termed as ‘Singapore paradox’; although Singapore is vulnerable to external shocks still it has managed to attain high economic growth and has built its resilience in the face of exogenous shocks (for details, see Briguglio, 2003). This article is based on Briguglio et.al (2008) economic resistance framework that measures the capability of policy in four broad areas, namely: macroeconomic stability, microeconomic market efficiency, good governance and social development.

Resilience is not only in the interest of national economies, it also has possible spill-over effects for neighboring countries. Also, inadequate resilience has the potential to negatively affect the smooth functioning of any neighboring country. So for this purpose, Economic Corporation Organization (ECO) member states have been selected to gauge the economic resilience of these neighboring countries for the year 2017, as data for this year was easily accessible to introduce the economic

resilience ranking concept and can be further updated with new methods and techniques. This paper addresses the following two main question:

- Which ECO member state is relatively more economic resilient?
- What are the main economic indicators in strengthening the economy against adverse shocks?

Furthermore, we used an Analytical Hierarch Approach (AHP) which is a multi-criteria decision (MCDM) making approach in which factors are arranged in a hierarchical structure (Saaty, 1990). This approach was developed by Thomas L. Saaty in 1970, and it is the most popular MCDM model to solve complex problems (Chian, 2002). Having simple theory, basic calculation process, allowing sensitivity analysis, flexibility, both qualitative and quantitative methods are some beneficial aspects of AHP (Fahmy and Hagag, 2013).

The Expert Choice software tool runs the mathematical calculation based on the data inserted, and ultimately assigns relative weightage to the criteria. After assigning relative weightage to the criteria we used the weightage to find ideal solution using TOPSIS approach—a multi criteria decision analysis initially introduced by Ching-Lai Hwang and Yoon (1981) and it was further developed afterwards.

## **2. Literature Review**

The concept of resilience has grown apace in the literature since the 70's. The first idea of resilience was pitched in physics to study the deformability of materials caused by compressive stress and it has been adopted also in ecology (Holling, 1973; Pimm, 1984), psychology (Garmezy, 1973) and economics (Hill et al., 2008; Martin, 2015; Sensier et al., 2016). To allow for an approach that is not field-specific, we build on our previous work (Manca et al., 2017), and operationalize the notion of resilience as the ability to face shocks and persistent structural changes in such a way that current societal well-being is preserved, without compromising that of future generations. Hence, resilience is key for staying on or returning to the sustainable development path of our society (Alessi et al., 2019).

Despite the many disparate definitions of resilience—ecological, economic, organizational behavior, engineering—they each identify a

similar general conceptualization of rebounding after a disaster or shock event (Rose, 2009; 2017).

Adaptive resilience brings the idea of a dynamic process of learning, which involves structural/ operational adjustment as a response to shocks, and also allows the system to evolve into a new development path (Folke et al. 2010; Simmie and Martin 2010; Davoudi 2012; Martin and Sunley 2015). The concept of economic resilience is a cross-cutting phenomenon, so it needs to be tackled from the economic and the social perspective. Therefore, our analysis takes into account a large set of variables to capture relevant aspects of economic performance and societal well-being production. We move away from the most used parsimonious approach in measuring economic resilience (Sensier et al. 2016; Lagravinese 2015; Martin et al., 2016; Faggian et al. 2018), and combine the joint dynamic response of many selected variables to the crisis, at different time horizons.

Martin and Sunley (2020) explain that resilience have a discernible impact on policy thinking: a new imperative of constructing or building regional and urban economic resilience is gaining momentum. Nevertheless, despite its popularity and influence, our understanding of the concept in economic geography still requires development.

The literature linking economic structures to economic resilience is relatively scarce. The role of high-quality basic political institutions (such as the rule of law or the political stability) for a better shock absorption has, for example, been studied by Acemoglu et al. (2003) and Rodrik (1999). Acemoglu et al. (2013) find that countries with weak institutions suffer substantially more volatility as measured by the standard deviation of per capital output. Rodrik (1999), in turn, notes that external shocks on growth are larger the greater the latent social conflicts in an economy and the weaker its institutions of conflict management.

In recent times, number of resilience indicators proposed and used both by researchers (Martin 2012; Sensier et al. 2016; Faggian et al. 2018) and policymakers (IPPR North 2014; Figueiredo et al. 2018). Still, operationalizing the concept of resilience is not a straightforward task for many reasons.

Canova (2012) relies on common GDP shocks, filtered by time series methods to examines the characteristics of sectoral cycles in EU countries and investigates the reasons which might explain differences in the

adjustment capacity of sectors and countries to economic shocks; broadly defined as unforeseen changes to business conditions. They showed that different capacity to absorb adverse shocks within industrial sub-sectors seems to be mainly explained by how far product market reforms have advanced.

Duval and Vogel (2008) conducted a similar analysis, but focused on the persistence of shocks in the output gap. Their simulations suggest that rigid labor and product markets extend the time it takes for output to recover to potential following an adverse shock, and it also increase the cumulative output loss incurred over the period.

Biroli et al. (2010) also look at economic resilience through the lenses of the competitiveness channel across euro area countries. They showed that real effective exchange rate (REER) adjusts and recovers in such a way to redress cyclical divergences and that after monetary unification REER dynamics have become less reactive to country-specific shocks but also less persistent.

In addition to the empirical literature regarding economic resilience, the crisis has impelled an increased policy focus on the need to determine factors improving economic resilience. The OECD has initiated a work stream to better understand economic resilience and to strengthen economies against adverse shocks<sup>5</sup>. Moreover, surveillance across OECD countries is meant to be fortified by identifying vulnerabilities to external shocks early on so as to reduce their likelihood and economic cost. For this purpose, the OECD team has pitched a large set of mainly macro and financial vulnerability indicators (see Röhn et al 2015) which could be used as an early warning tool (Hermansen and Röhn 2015).

Caldera-Sanchez et al. (2016) and Sutherland & Hoeller (2014) has explained the relationship between economic growth, macroeconomic stability and vulnerability as well as the creation of a new set of vulnerability indicators. The European Central Bank has also analyzed and proposed factors driving economic resilience in a similar vein (European Central Bank 2016; Sondermann 2018).

To synthesize the various academic and policy discussions, the Joint Research Centre (JRC) of the European Commission, in co-operation with the European Political Strategy Centre, started a common reflection

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<sup>5</sup> <http://www.oecd.org/economy/growth/economic-resilience.htm>



on resilience in the policy context (Joint Research Centre 2015) and set up a dedicated commission-wide research and policy network. The first result of these efforts was the development of a conceptual framework devoted to the assessment and measurement of resilience (Manca et al., 2017). It was also incorporated into the second Stieglitz Report on well-being metrics (De Smedt et al., 2018).

The nexus between resilience, sustainability, and well-being are increasingly being discussed in European policy (Folke et al. 2002; Stiglitz et al. 2009; Andor et al. 2011; Raworth 2017) and slowly are being considered as a basis for new policy frameworks (European Commission 2018b).

This paper adds to the existing literature by employing new mathematical technique (AHP-TOPSIS) to rank the economic resilience of Economic Corporation Organization (ECO) member states using a broad range of indicators to identify the relatively well-functioning economic structure (covering the macroeconomic stability, microeconomic efficiency, good governance and social development) for the year 2017.

Section 3 elaborates on the components of the resilience index and establishes a link of these indicators to economic resilience. Section 4 explains the collection of data selected for the resilience index. Section 5 explains the methodology and technique used in the current research.

### **3. Components of the Resilience Index**

The framework to measure economic resistance was developed by Briguglio et al. (2008). The framework and indicators have been further updated and revised since then. Likewise, this research paper is based on the same Briguglio et al. (2008) framework, however, with different indicators and different approach. The economic resistance index measures the capability of policy in four broad areas, related to absorbing and neutralizing shocks, namely:

1. Macroeconomic Stability.
2. Microeconomic Market Efficiency.
3. Good Governance.
4. Social Development.

**Table 1:** Components of Resilience Index

Indicator	Sub-Component/s	Data Source
Macroeconomic Stability	Fiscal Deficit to GDP Ratio	Trading Economics and Central Banks
	Misery Index	World Bank
	External Debt to GDP Ratio	Central Banks
Microeconomic Market Efficiency	Business Freedom	The Heritage Foundation
	Financial Freedom	The Heritage Foundation
	Labor Freedom	The Heritage Foundation
	Trade Freedom	The Heritage Foundation
Good Governance	Property Rights	The Heritage Foundation
	Judicial Effectiveness	The Heritage Foundation
	Government Integrity	The Heritage Foundation
Social Development	Human Development Index	UNDP

### 3.1 Macroeconomic Stability

A stable macroeconomic system describes a national economy that has minimum vulnerability to external shocks and it is therefore prerequisite for sustained and inclusive development (see, Piece, 2012). Macroeconomic stability acts as a shield against external forces like currency and interest fluctuations in the global market. A stable macroeconomic system helps to keep inflation low and stable, besides maintaining low national debt to GDP and minimum government deficit. It is one of the most important indicators to measure health of any economy.

Different indicators can be used to find macroeconomic stability. In this paper, the macroeconomic stability of a country is constructed on the basis of three main indicators:

### 3.1.1 Fiscal deficit to GDP ratio

Fiscal deficit means the country is spending beyond its means—spending more than it collects in taxes and other revenues. It may not always have negative implications, however, it is an important indicator to measure government's performance. Uzbekistan is the only country running government surplus amongst the selected countries whereas other countries are running in deficit. Pakistan has performed miserably and was running the highest government budget deficit in 2017 as shown in table I in the Appendix.

### 3.1.2 Misery Index

It is the sum of unemployment and inflation rate. It is believed that both higher rate of unemployment and worsening inflation creates economic and social adversity for a country. The rise in inflation means increase in cost of living whereas higher rate of unemployment suggests more people plunging into poverty. Misery index is an important indicator to measure resilience index. Hence it received the highest weightage from respondents of survey in the selected indicators as shown in table II in the appendix. Turkey performed poorly due to high inflation and unemployment rate whereas Iran performed relatively well—due to ease in economic sanctions in year 2017 as shown in table I in the appendix.

### 3.1.3 External Debt to GDP Ratio

It is a debt a country owes to non-resident creditors. External debt to GDP ratio receives second highest weightage after misery index and it is considered the most important indicator in the context of resilience. Briguglio et.al (2008) considers this indicator a key measure of resilience index, because a country with a high level of external debt may not be able to mobilize resources. Iran has the minimum external debt to GDP whereas Kyrgyz Republic is burdened with external debt and performed low in this context as shown in table I in the appendix.

## 3.2 Microeconomic Market Efficiency

The efficient market is the one that adjusts promptly to achieve equilibrium. Efficient market absorbs the effects of shocks in the

economy without resulting in any further disturbance in economy. Different indicators can be used to evaluate market efficiency. In this research paper, we used components of the Index of Economic Freedom 2017, entitled “market efficiency” released by the Heritage Foundation. These particular components are aimed at estimating the extent to which markets operate freely, competitively and efficiently across countries. For this purpose, to assess microeconomic market efficiency for selected countries are constructed on the basis of following four indicators, namely:

### 3.2.1 Business Freedom

The business freedom component provides clear idea regarding business framework. It measures the extent to which the regulatory and infrastructure environment limits the effective operation of businesses.

### 3.2.2 Financial Freedom:

Financial freedom measures the extent of liberty people have over savings, investment and cash holding, and the level to which the financial sector is dominated by private firms. This index pertains to banking sector efficiency and the extent of government meddling in the financial sector.

### 3.2.3 Labor Freedom

This indicator measures various facets of legal and regulatory framework of a country’s labor market including minimum wages, laws inhibiting layoffs, severance requirements, and measurable regulatory restraints on hiring and hours worked. It also tells us about employment opportunities across the country.

### 3.2.4 Trade Freedom

Trade freedom index is applied to international trade. This index is used to appraise country’s trade mechanism—regulations and duties on imports and exports. Trade freedom is basically a composite measure of the extent of tariff and nontariff barriers that affect import and export of goods and services<sup>6</sup>.

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<sup>6</sup> For more details, see

<https://www.heritage.org/index/pdf/2019/book/methodology.pdf>

### 3.3 Good Governance

As the former UN Secretary-General Kofi Annan noted that “good governance is perhaps the single most important factor in eradicating poverty and promoting development”.<sup>7</sup> So, basically, it is the exercise of political, economic and executive power to handle countries’ affairs. Good governance is an essential indicator for an economic system. It gives boost to economic resilience.

A state with weak legal and judicial effectiveness undermines respect for rule of law and further weakens progress towards sustainable development (for more details, see Rahmani et al., 2013). The present study uses below indicators to assess good governance extracted from The Heritage Foundation.<sup>8</sup>

#### 3.3.1 Property Rights

This component assesses the legal framework of a country that allows individuals to acquire, hold, and utilize private property, and security provided by the law enforcement agencies. Turkey and Kazakhstan have better property rights legal framework, while Iran lacks this infrastructure as their performance is shown in table I in the Appendix.

#### 3.3.2 Judicial effectiveness

An independent and efficient judicial system protects the rights of individuals against violation of laws by others, including elites and governments. Judicial effectiveness is a key indicator to assess justice in any country; it ensures that laws are respected and appropriate legal actions are taken against violators.

#### 3.3.3 Government Integrity

It is a fundamental indicator of a citizens’ trust on the government. Corruption is a grave concern; it creates insecurity and erodes economic freedom. Turkey performed well and was the most trusted government among selected countries whereas Uzbekistan performed badly in the context of government integrity as shown in table I in the appendix.

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<sup>7</sup> Kofi Annan, Partnerships for Global Community: Annual Report on the Work of the Organisation (UN, 1998).

<sup>8</sup> For more information, visit <https://www.heritage.org/index/book/methodology>

### **3.4 Social Development**

Social development promotes well-being of each and every individual in a society and focuses on the need to “put people first” in the context of development processes. It seeks to help society reach its full potential. Social development is one of the most significant components of the economic resilience as it promotes social inclusion. Social development shows the investment in people and their well-being which requires removal of barriers and giving opportunity to every citizen to grow, develop their skills and contribute in a meaningful way.

Social Development is considered a key indicator in terms of economic resilience. In this paper, social development indicator of the resilience index entails education, life expectancy and per-capita income as measured by the UNDP human development index (HDI). A higher HDI index means that the citizens have higher lifespan, enjoy quality education and a high GNI per-capita. Among ECO member states, Kazakhstan has the highest HDI index with 0.80 and is followed by the Iran at 0.798 while Pakistan scores the lowest at 0.562.<sup>9</sup>

### **4. Data Collection**

The data has been mainly collected from the World Bank indicators for the year 2017. Good governance and microeconomic efficiency data have been extracted from The Heritage Foundation. For some other specific information and collection of data tradingeconomics.com and respective central banks data were assessed. It is pertinent to mention here that Economic Corporation Organization (ECO) is a Eurasian political and economic intergovernmental organization established in 1984 in Tehran. There are 10 members of the organization. However, Afghanistan has been excluded from this research due to insufficient data.

### **5. Methodology**

This research article is based on the indicators described by Briguglio et.al (2008) which measures the capability of policy in four broad areas,

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<sup>9</sup> HUMAN DEVELOPMENT INDICES AND INDICATORS: 2018 STATISTICAL UPDATE, available at: [http://hdr.undp.org/sites/default/files/hdi\\_table.pdf](http://hdr.undp.org/sites/default/files/hdi_table.pdf)

namely: macroeconomic stability, microeconomic market efficiency, good governance and social development.

For the construction of resilience index and evaluating ranking of selected countries Analytical Hierarchy Process (AHP) and TOPSIS approaches have been used. This approach is used in wide range of circumstances in fields such as government, business, industry, healthcare, shipbuilding, and in education (see, Saracoglu, 2013).

Furthermore, to give suitable weightage to selected determinants, proper questionnaires were distributed among renowned academics in Tehran and top economists. Subsequently, after filling the questionnaires, we weighted the indicators through AHP approach—weightage for selected indicators is shown in table IV in the Appendix—and then ranked through the TOPSIS approach. The ranking is given in table VI in the Appendix.

## 6. Analytic Hierarchy Approach: (AHP)

**Step 1:** In this first step, the qualitative and quantitative criteria and sub-criteria are defined—developing a hierarchical structure with goal at the top level—criteria at the second level and alternatives at the lower most level.

**Step 2:** Relative importance of different attributes/criteria were assigned by the distinguished economists with respect to the goal through questionnaire. The Saaty (1990) comparison scale was used, as shown in Table 2. Equations from 1 to 9 are derived from Saaty (1980) AHP calculation.

$$C_{ij} = \begin{bmatrix} C_{11} & C_{12} & \dots & \dots & \dots & C_{1n} \\ C_{21} & C_{22} & \dots & \dots & \dots & C_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ C_{n1} & C_{n2} & \dots & \dots & \dots & C_{nn} \end{bmatrix}$$

Where  $n$  is the criteria count, and  $C_{ji} = 1/C_{ij}$ , where  $i$  and  $j$  is 1 to  $n$ .

**Table 2:** Comparison Value Scale

Scale	Degree of Preference
1	Equal Importance
3	Moderate Importance
5	Strong Importance
7	Very, very Strong Importance
9	Extreme Importance
2,4,6,8	Intermediate Importance
1/3,1/7,1/9	Values of Inverse Comparison

**Step 3:** Third step is to generate the normalized pair-wise matrix ‘X’ by dividing each element in the matrix by its column total:

$$X_{ij} = \frac{c_{ij}}{\sum_{j=1}^n c_{ij}}$$

Where,  $i$  and  $j$  is 1 to  $n$ .

$$X_{ij} = \begin{bmatrix} X_{11} & X_{11} & \dots & \dots & \dots & X_{1n} \\ X_{21} & X_{22} & \dots & \dots & \dots & X_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ X_{n1} & X_{n2} & \dots & \dots & \dots & X_{nn} \end{bmatrix}$$

Now, using the above X matrix to get vector weights matrix W. It can be calculated as:

$$W_i = \frac{\sum_{j=1}^n X_{ij}}{n}, \text{ we get vector weight matrix } W = \begin{bmatrix} W_1 \\ W_1 \\ \vdots \\ \vdots \\ W_n \end{bmatrix}$$

Where,  $i$  and  $j$  is 1 to  $n$ .



**Step 4:** Multiply each column pair-wise comparison matrix by the corresponding weight will give us another matrix:

$$D_{ij} = \begin{bmatrix} C_{11} & C_{11} & \dots & \dots & \dots & C_{1n} \\ C_{21} & C_{22} & \dots & \dots & \dots & C_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ C_{n1} & C_{n2} & \dots & \dots & \dots & C_{nn} \end{bmatrix} \times \begin{bmatrix} W_1 \\ W_2 \\ \vdots \\ \vdots \\ \vdots \\ W_n \end{bmatrix} = \begin{bmatrix} D_1 \\ D_2 \\ \vdots \\ \vdots \\ \vdots \\ D_n \end{bmatrix}$$

Where,  $i$  and  $j$  is 1 to  $n$ .

**Step 5:** In this particular step, divide the sum of row entries by the corresponding weight:

$$E_i = \frac{D_i}{w_i}$$

Where,  $i$  is 1 to  $n$ . Now, calculate average value ' $\lambda'$ ' as given below:

$$\lambda_{max} = \frac{\sum_{i=1}^n E_i}{n}$$

Where  $i$  is 1 to  $n$

**Step 6:** The consistency index is calculated by the following given formula:

$$\text{Consistency Index} = \frac{\lambda_{max} - n}{n - 1}$$

**Step 7:** The final step in AHP approach is to calculate a Consistency Ratio (CR). In this stage we find out how consistent the judgments have been relative to large samples of purely random judgments. If CR is lower than 0.1 or equal to 0.1, the calculations of the criteria are consistent otherwise the judgments are not credible. The consistency ratio calculated as  $CR = CI/RI$ , where  $RI$  is random index and  $n$  is order of matrix given in table 3 below.

**Table 3:** Random Index Value Scale

n	1	2	3	4	5	6	7	8	9	10
RI	0	0	0.58	0.9	1.12	1.24	1.32	1.41	1.46	1.49

Source: Golden and Wang (1990)

In our case, the inconsistency ratio is automatically generated by using Expert Choice software which comes out 0.06. This value is less than 0.1 or 10%. Thus, the weights presented in Table II in the appendix can be used for TOPSIS calculation. Besides, the best option using AHP approach is the one which achieves the most suitable trade-off among the different criteria as shown in the table II in the appendix.

### Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS)

**Step 8:** Decision-making matrix is given below:

$$A_{ij} = \begin{bmatrix} A_{11} & A_{12} & \dots & \dots & \dots & A_{1n} \\ A_{21} & A_{22} & \dots & \dots & \dots & A_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ A_{m1} & A_{m2} & \dots & \dots & \dots & A_{mn} \end{bmatrix}$$

**Step 9:** This step transforms various attribute dimensions into non-dimensional attributes which allows comparisons across criteria (Ewa, 2011). This is the most important step where the scores in the evaluation matrix  $A_{ij}$  are being transformed to a normalized scale.

$$N_{ij} = \frac{A_{ij}}{\sqrt{\sum_{j=1}^m A_{ij}^2}}$$

The normalized matrix or a dimensionless matrix in our present study is presented in table I in the appendix.

**Step 10:** In this step, multiplying each entry with corresponding weight—the weights we extracted in AHP process—in order to get new

matrix which is a weighted normalized matrix  $K_{ij}$ , as shown in table III in the appendix.

$$K_{ij} = \begin{bmatrix} N_{11} & N_{11} & \dots & \dots & \dots & N_{1n} \\ N_{21} & N_{22} & \dots & \dots & \dots & N_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots \\ N_{m1} & N_{m2} & \dots & \dots & \dots & N_{mn} \end{bmatrix} \times \begin{bmatrix} W_1 \\ W_2 \\ \vdots \\ \vdots \\ \vdots \\ W_n \end{bmatrix}$$

**Step 11:**

The positive ideal solution can be calculated as:

$$A_j^+ = \text{Max}(K_{ij})$$

While negative ideal solution can be found as:

$$A_j^- = \text{Min}(K_{ij})$$

In this step, we find ideal best and ideal worst solution. It is pertinent to note here that the minimum value of misery index and external debt to GDP represent the best ideal solution because, normally lower value of external debt and misery index favor country's macroeconomic stability.

Meanwhile, the government deficit to GDP is a negative number—deficit—in all 8 selected countries except Uzbekistan, which is running a government surplus. To normalize this column we added a same number to the whole column that makes even the lowest digit a positive number. So, in this Uzbekistan performed better than others and Pakistan scored the lowest and ultimately positive value of government deficit to GDP represents the best ideal solution as shown in table IV in the appendix.

**Step 12:** Calculate the Euclidean distance from the ideal best and the ideal worst value. It can be calculated as:

$$S_i^+ = \sqrt{\sum_{j=1}^n (K_{ij} - A_j^+)^2}$$

$$S_i^- = \sqrt{\sum_{j=1}^n (K_{ij} - A_j^-)^2}$$

In this step values of positive and negative ideal solution distances is calculated. The Euclidean distance is presented in table V in the appendix.

**Step 13:** The final step would ultimately give us the performance score. It can be found as:

$$P_i = \frac{S_i^-}{S_i^- + S_i^+}$$

In addition, country with higher performance score would be ranked higher. In our model, Azerbaijan ranked first with higher performance score followed by Iran and then Pakistan as shown in Table VI below in the appendix.

## 7. Analysis

This section presents and argues the main results of our empirical analysis based on the indicators namely: macroeconomic stability, microeconomic market efficiency, good governance and social development. This précis the large number of economic variables into a single number for each country and thus serve as handy and informative summary statistics for the resilience capacities.

Once the economic resilience ranking of the ECO member states have been determined, the most immediate policy objective concerns the identification of certain deep-rooted features that are robust and meaningful predictors of resilient outcome at the country level.

In our results, Azerbaijan, a country at the crossroads of Eastern Europe and Western Asia with around 9.8 million population, topped the chart among ECO member countries despite being a small state as shown in fig 1 below. It has managed to cope with vulnerabilities through cautious economic development policies and has nurtured resilience.

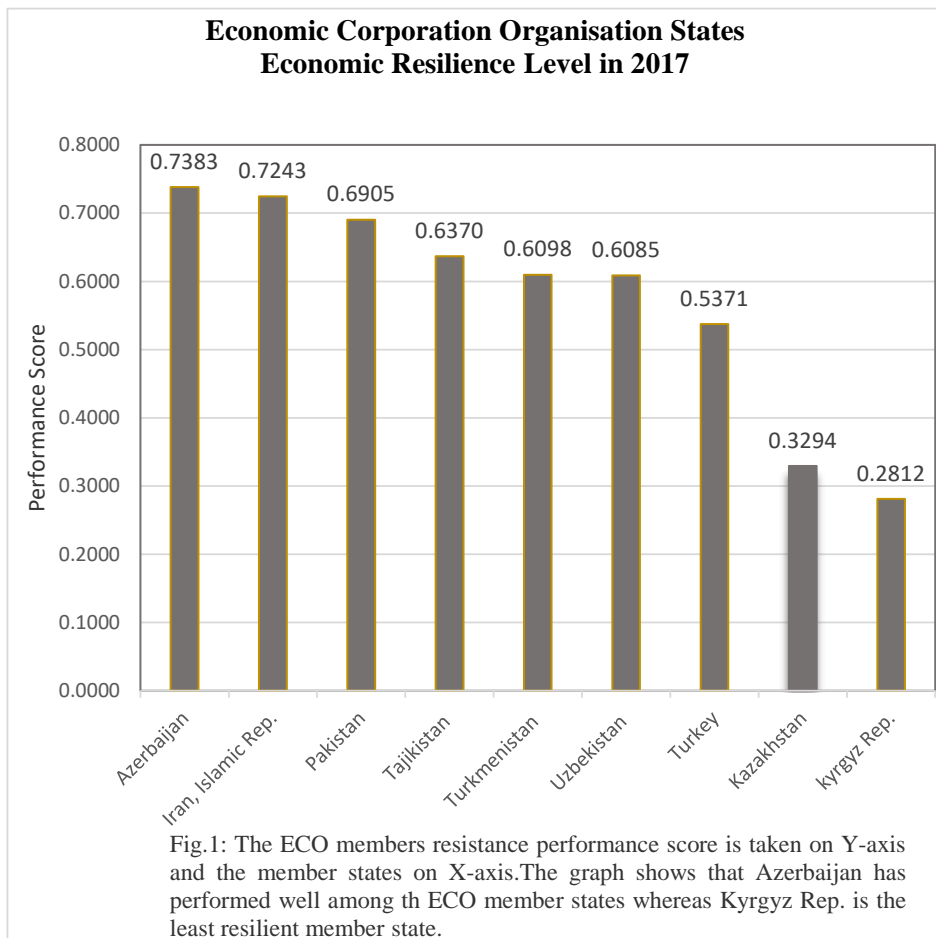
Alessi et al., (2019) result shows that government expenditures on social protection, political stability or a favorable business environment are strongly linked with resilient outcomes. However, our result shows that a country with low level of external debt can freely mobilize domestic resources and it is considered as one of the most important variable after misery index and strongly associated with economic resilience.

In addition, Iran has the minimum external debt to GDP and it is one of the main reasons helping the Islamic Republic of Iran to secure second position in terms of economic resilience despite having poor performance in some other indicators including financial freedom, trade freedom and labor freedom. Iran has an edge over other ECO member states in terms of low level of external debt and minimum budget deficit in 2017. Also, Iran maintained a high social development that suggests standard education and good quality of life. Our results are similar to Briguglio et.al (2008) where Iran was ranked higher than Pakistan and Turkey in economic resilience index.

Pakistan ranked third in the context of resilience index with 0.69 points as shown in figure 1. Pakistan has performed well in 2017 in many different area, however, high government budget deficit and low social development weakened its performance. Briguglio et.al (2008) resilience index rank Turkey slightly higher than Pakistan. In this current research Pakistan has relatively performed better than Turkey.

Similarly, Tajikistan ranked fourth in terms of resilience index. Tajikistan has the lowest government deficit amongst the selected countries (Only Uzbekistan running surplus in the year 2017) and followed by Turkmenistan and Uzbekistan ranked 5<sup>th</sup> and 6<sup>th</sup> respectively. Turkmenistan and Uzbekistan both performed badly in financial freedom index. However, Uzbekistan is the only country with government budget surplus, whereas other countries are experiencing budget deficit in the year 2017.

Figure 1.



Source: Author's calculation

Turkey has shown impressive economic and social development performance since 2000—increased employment and income making it an upper-middle-income country. However, growing economic vulnerabilities and more challenging external environment is threatening to undermine these achievements. Turkey performed poorly in the context of economic resilience index and ranked 7<sup>th</sup>, primarily in macroeconomic indicators including misery index and external debt to GDP ratio.

World Bank report (2019) noted that: “overheating in the economy since 2017, combined with tightening global financial conditions, has given rise to a stagflationary environment and a debt overhang. Turkey’s poor performance in resilience index and secure requires deeper analysis and cannot be elaborated further here due to space crunch.”

Kazakhstan’s performance was undermined by skyrocketing external debt and high government deficit to GDP ratio despite performing well in other sectors. Kazakhstan is the largest economy in central Asia worth \$162.8 billion. According to the National Bank of Kazakhstan, its external debt exceeds than its GDP making the economy’s debt servicing capacity vulnerable to future endogenous and exogenous shocks. Kazakhstan is the second low resilient country amongst the ECO member states. It was followed by the Kyrgyz Republic at the bottom of the list which is a land-locked, lower-middle-income country of 6.3 million people with around \$7.8 billion nominal GDP as of 2017. It is the least resilient country among the ECO member states.

Kyrgyzstan's economic performance has been hindered by widespread corruption, judicial ineffectiveness, low foreign investment, regional instability and high degree of dependence on Kumtor gold mine operations which is a major driver of Kyrgyz economy (see, Gullette & Kalybekova, 2014). Moreover, its external debt to GDP ratio was highest among the selected countries in 2017. Thus, the Kyrgyz Republic is likely to remain at moderate risk of debt distress (for details, see Asian Development Bank Report, 2018).

## **8. Conclusion**

This paper sheds some light on the economic resilience of ECO member states. In particular, it has addressed the following questions:

- What are the main economic indicators in strengthening the economy against adverse shocks?
- Which country has shown sound economic resilience in the year 2017?

The current research has led to the following main results and conclusions. First, questionnaires were distributed among renowned academics in Tehran and top economists to get their opinions on the

importance of the economic variables in terms of the economic resilience to strengthen economies against adverse shocks. After filling the questionnaires, we weighted the indicators through AHP approach—weightage for selected indicators and then ranked through the TOPSIS approach. The AHP result shows that misery index, external debt to GDP and HDI has been the most important indicators of economic resilience. Also, the TOPSIS results suggests that countries with good performance in misery index, external debt and HDI have strong resilient level.

Second, Azerbaijan, a small country has a sound economic resilience among the ECO member states. It has performed really well in almost all the economic sectors despite being a small state. Small developing states tend to be inherently prone to exogenous shocks over which they can exercise very little control (Briguglio et al., 2008). It was followed by Iran despite perpetual sanctions since past 40 years. While Kyrgyz Republic was the least resilient country in 2017 mainly because of high degree dependence on mining sector and less diversified export structure. This paper presents a measurement framework for the quantitative assessment of economic resilience by taking the socio-economic system as a whole. Our analysis contributes in improving economic resilience thinking in the policy arena in important ways. Also, this article provides further insight to policy makers on strengthening the level of resilience of national economy to fight exogenous shocks.

## **9. Policies Recommendations**

Countries that perform poorly in the resistance economy index in this current research paper should adopt the following policies to improve this index.

1. Optimal monetary and fiscal policy to reduce inflation.
2. Support small and medium-sized enterprises in boosting their productivity to increase employment level.
3. Policy makers should support and promote e-businesses and commerce at domestic and foreign levels to gain economic prosperity.
4. Optimal use of foreign debts in the country and efforts to pay them on time.
5. Efficiently utilizing foreign resources in the development of infrastructure and domestic production.



6. Using the capacity development and domestic resources to improve welfare and economic growth of the country.
7. Introducing educational development programs on childhood levels and on different university levels with new tools and techniques.
8. Initiating programs to modify health sector and improving living standard of households.
9. Policy-making to diversify the country's exports, especially in the high-tech sector.
10. Annual and continuous review of the economic resistance level of the state to strengthen economy against adverse shocks to minimize its economic cost.

#### **10. Future Research Direction**

In order to determine economics resilience for combined indicators, researchers can use combined principal components analysis, taxonomy, factor analysis, Morris method and fuzzy logic. The efficiency and results of these methods should be evaluated and compared to the current research. It is also necessary for researchers in future research to identify the sub-indices of each indicator using the scientific literature to define the combined index with more up-to-date indicators. Furthermore, the role of fundamental justice, knowledge-based economy and role of people in the economy should be precisely defined in strengthening the economy. Also, using different mathematical techniques will help to determine the optimal status of each selected indicator in stimulating economic resilience of a country.

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**APPENDIX****Table I:** Normalized Matrix

<b>Countries</b>	<b>Govt. Deficit</b>	<b>Misery Index</b>	<b>External Debt</b>	<b>HDI</b>	<b>Property Rights</b>	<b>Judicial Effectiveness</b>	<b>Government Integrity</b>	<b>Business Freedom</b>	<b>Financial Freedom</b>	<b>Labor Freedom</b>	<b>Trade Freedom</b>
<b>Azerbaijan</b>	0.800	1.553	1.190	0.298	2.483	1.840	2.184	2.994	2.864	3.362	2.918
<b>Iran</b>	0.770	1.916	0.099	0.314	1.593	2.007	1.719	2.713	0.568	2.443	2.138
<b>Kyrgyz</b>	0.554	0.873	5.168	0.265	2.503	0.959	1.760	3.086	2.840	3.577	2.954
<b>Kazakhstan</b>	0.631	1.071	5.048	0.315	2.759	3.150	2.207	3.119	2.840	3.698	3.079
<b>Pakistan</b>	0.154	0.866	1.339	0.221	1.790	1.901	1.771	2.562	2.272	1.694	2.636
<b>Tajikistan</b>	1.001	0.781	1.974	0.256	2.238	2.542	1.899	2.747	1.704	2.205	2.899
<b>Turkey</b>	0.816	1.905	2.621	0.311	3.015	2.927	2.364	2.692	3.408	2.174	3.114
<b>Turkmenistan</b>	0.616	0.815	1.230	0.278	1.593	0.279	1.719	1.256	0.568	0.896	3.138
<b>Uzbekistan</b>	1.155	1.746	1.744	0.280	2.360	2.336	1.597	2.713	0.568	2.259	2.620



**Table III:** Normalized Weighted Matrix

<b>Countries</b>	<b>Govt. Deficit</b>	<b>Misery Index</b>	<b>External Debt</b>	<b>HDI</b>	<b>Property Rights</b>	<b>Judicial Effectiveness</b>	<b>Govt. Integrity</b>	<b>Business Freedom</b>	<b>Financial Freedom</b>	<b>Labor Freedom</b>	<b>Trade Freedom</b>
<b>Azerbaijan</b>	0.0760	0.2501	0.1845	0.0394	0.1614	0.1398	0.1419	0.2096	0.1817	0.1950	0.1693
<b>Iran</b>	0.0731	0.3085	0.0154	0.0415	0.1036	0.1525	0.1117	0.1899	0.0363	0.1417	0.1240
<b>Kyrgyz</b>	0.0526	0.1406	0.8011	0.0349	0.1627	0.0729	0.1144	0.2160	0.1817	0.2075	0.1713
<b>Kazakhstan</b>	0.0600	0.1724	0.7824	0.0416	0.1793	0.2394	0.1434	0.2184	0.1817	0.2145	0.1786
<b>Pakistan</b>	0.0146	0.1395	0.2076	0.0292	0.1164	0.1445	0.1151	0.1794	0.1454	0.0983	0.1529
<b>Tajikistan</b>	0.0951	0.1257	0.3060	0.0338	0.1454	0.1932	0.1234	0.1923	0.1090	0.1279	0.1681
<b>Turkey</b>	0.0775	0.3068	0.4062	0.0411	0.1959	0.2224	0.1536	0.1885	0.2181	0.1261	0.1806
<b>Turkmenistan</b>	0.0585	0.1313	0.1906	0.0367	0.1036	0.0212	0.1117	0.0879	0.0363	0.0520	0.1820
<b>Uzbekistan</b>	0.1097	0.2812	0.2703	0.0369	0.1534	0.1775	0.1038	0.1899	0.0363	0.1310	0.1520

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**Table IV: Ideal Solutions**

<b>V</b> +	0.10 97	0.12 57	0.01 54	0.04 16	0.19 59	0.23 94	0.15 36	0.21 84	0.21 81	0.21 45	0.18 20
<b>V</b> -	0.01 46	0.30 85	0.80 11	0.02 92	0.10 36	0.02 12	0.10 38	0.08 79	0.03 63	0.05 20	0.12 40

**Table V: Euclidean Distance, Performance Score and Ranking**

<b>Countries</b>	<b>Si+</b>	<b>Si-</b>	<b>Pi</b>	<b>Rank</b>
<b>Azerbaijan</b>	0.2416	0.6817	0.7383	1
<b>Iran, Islamic Rep.</b>	0.3084	0.8103	0.7273	2
<b>Kyrgyz Republic</b>	0.8078	0.3161	0.2812	9
<b>Kazakhstan</b>	0.7712	0.3789	0.3294	8
<b>Pakistan</b>	0.2904	0.6477	0.6905	3
<b>Tajikistan</b>	0.3325	0.5836	0.6370	4
<b>Turkey</b>	0.4422	0.5132	0.5371	7
<b>Turkmenistan</b>	0.4095	0.6399	0.6098	5
<b>Uzbekistan</b>	0.3728	0.5796	0.6085	6