

## Evaluation of Banks' Sustainability Performance in Turkey with Grey Relational Analysis

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### ABSTRACT

*Commitment to sustainable development and adopting sustainability issues have strategic importance in current global competitive environment. Sustainability reports which have come out recently, take environmental and social performance of companies as well as financial performance into account and show firms' efforts towards sustainable development. The aim of this study is to evaluate the sustainability performance of banks in Turkey that issue sustainability report by using grey relational analysis method. In this context, the specified ratios relating to banks' economic, environmental, and social performance were compiled from the banks' sustainability reports of 2011. Banks performances have been analyzed based on 3 financial, 2 social and 4 environmental ratios and banks have been listed based on their sustainability performance. According to the sustainability performance of banks, TSKB ranks first and is followed by Garanti Bank and Akbank respectively.*

**Keywords:** Corporate sustainability, sustainability performance, performance evaluation, grey relational analysis.

**Jel Classification:** C6, M10, M14, M41.

### *Türkiye'de Bankaların Sürdürülebilirlik Performanslarının Gri İlişkisel Analiz Yöntemiyle Değerlendirilmesi*

#### ÖZET

*Küresel rekabet ortamında sürdürülebilir kalkınmaya bağlılık ve sürdürülebilirlik konularını benimsemek stratejik öneme sahiptir. Son yıllarda ortaya çıkan sürdürülebilirlik raporu finansal performansa ek olarak şirketlerin çevresel ve sosyal performanslarını dikkate almakta ve şirketlerin sürdürülebilir kalkınmaya yönelik çabalarını göstermektedir. Bu çalışmada sürdürülebilirlik raporu yayınlayan bankaların sürdürülebilirlik performanslarının gri ilişkisel analiz yöntemi ile değerlendirilmesi amaçlanmıştır. Bu bağlamda bankaların 2011 yılı sürdürülebilirlik raporlarından ekonomik, çevresel ve sosyal performanslarına ilişkin belirlenen oranlar derlenmiştir. Bankaların performansı 3 finansal, 2 sosyal ve 4 çevresel orana göre analiz edilmiş ve bankalar sürdürülebilirlik performansına göre sıralanmıştır. Yapılan analizin sonucuna göre TSKB sürdürülebilirlik performansı açısından ilk sırada yer alırken bunu, Garanti Bankası ve Akbank takip etmektedir.*

**Anahtar Kelimeler:** Kurumsal sürdürülebilirlik, sürdürülebilirlik performansı, performans değerlendirme, gri ilişkisel analiz

**Jel Sınıflandırması:** C6, M10, M14, M41.

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## **1. INTRODUCTION**

Nowadays companies are facing increasing pressure from stakeholders to demonstrate social and environmental responsibility and are asked to provide information about how they manage social and environmental issues. Also there has been an increased pressure on organizations from the stakeholders to broaden the focus of business performance beyond the financial performance. Companies have started to respond to these pressures by adopting pillars of sustainability and disclosing social and environmental reports. Companies, financial sector, non-governmental organizations and all other groups have responsibility in the sustainable development process. In the Brundtland report sustainable development is defined as “development that meets the needs of the present generations without compromising the ability of future generations to meet their own needs” (WCED, 1982). The World Business Council for Sustainable Development defined sustainability as “ensuring a better quality of life for everyone, for now and for generations to come” (Goel, 2010: 34). From the organizational perspective corporate sustainability is defined as meeting the needs of a firm’s direct and indirect stakeholders without compromising its ability to meet the needs of future stakeholders (Turan et al., 2009: 308).

Sustainability reports show companies progress towards sustainable development. Sustainability reporting, triple-bottom line reporting, corporate social responsibility reporting, social responsibility reporting are used synonymously (Roca and Searcy, 2012: 103). Sustainability reports include quantitative and qualitative information on financial/economic, social/ethical, and environmental performance in a balanced way. Sustainability reports are not mandatory; they are on a voluntary basis. (Hu et al., 2011: 843). Sustainability reports in developing countries are emerging but the awareness is limited. Many companies in Turkey have started to incorporate sustainability into their business strategies and report their sustainability practices according to the Sustainability Reporting Guidelines of the Global Reporting Initiative (GRI) in the name of sustainability reports, corporate social responsibility reports, etc. They are also participating in the United Nations’ Global Compact Initiative. Only 57 Turkish firms have issued sustainability reports. When it is compared to the total number of firms in Turkey the number is not enough and unsatisfactory. Some firms’ sustainability reports are based on GRI indicators and some are not. Firms, which prepare their reports based on GRI indicators, disclose them at various levels such as G4, G3, G3.1, G2, G1, and A, B, and C level. Most of the firms do not issue their sustainability reports on a regular basis.

Incorporating sustainability into corporate strategy reveals the need for performance evaluation of sustainability strategy as awareness of sustainability and firms’ operations for sustainability increase (Goyal et al., 2013: 362). Since what has to be measured is changing ceaselessly; measuring organizational performance is becoming more complex and difficult. Firms report on their initiatives on sustainability in ways that are difficult to understand and

compare. There is a need to establish clear, user-friendly methodologies and tools to measure the progress that companies are making toward sustainability.

The sustainable performance of a company is generally measured by assessing three aspects of sustainability: economic, social and environmental performance. The aim of this paper is to measure the sustainability performance of Turkish banks which issue sustainability reports by using grey relational analysis (GRA). Although finance sector is regarded as environment-friendly sector, they should take social and environmental results besides economic effects into consideration and take an effective role in the sustainable development process. In this study in addition to the literature we also tried to show that GRA can be used as a benchmarking tool for both financial and non-financial performance. GRA is a practical tool applied to carrying out performance evaluation, managing projects and making important decisions. Therefore, it is appropriate to use GRA for sustainability performance benchmarking. In recent years there have been some studies on the comparison of financial performance of financial institutions (banks and insurance companies) with GRA in the literature. But studies on measuring and evaluating sustainability performance are scarce and we can not find any studies in Turkey on sustainability performance which is based on sustainability reports. This study includes environmental and social indicators into the analysis which makes it different from the studies analyzing the performance of banks according to the financial indicators. The performance of 3 banks has been analyzed based on 3 financial, 2 social and 4 environmental ratios and banks have been listed according to their sustainability performance. That there are few banks issuing sustainability reports and only a few of them issue their reports in the same period constitute the limitations of this study. Also, firms use different units of measurements for the assessment of social and environmental performance, which led to a difficulty for the researchers in setting the criteria for evaluating the banks.

The organization of the paper is as follows: First, corporate sustainability and banks' role in sustainability are explained. Next, sustainability reporting, current situation of sustainability reporting in Turkey are expressed and a brief description of sustainability performance evaluation is given. In the next section relevant literature review is presented. In the methodology part GRA and sample selection are explained and the results of the empirical research are presented. Finally, the paper ends with a summary of the overall findings and recommendations for future researches on this subject.

## **2. CORPORATE SUSTAINABILITY AND BANKS' ROLE IN SUSTAINABILITY**

Sustainability is about building a society in which a proper balance is created between economic, social, and ecological aims. Corporate sustainability is the transfer of sustainable development idea to the business level. Corporate sustainability means adopting and pursuing ethical business practices, creating sustainable jobs, building value for all of the company's stakeholders (Székely and Knirsch, 2005: 5). Corporate sustainability demonstrates the

inclusion of social and environmental concerns in business operations and in interactions with stakeholders (Roca and Searcy, 2012: 104).

### **2.1. Banks' Role in Sustainability**

Banks have an important role in an economic system: they are intermediaries between people with shortages and surpluses of capital. From this perspective, the activities of banks do not have any relationship with the environment. When compared to the chemical, mining, health/drug, petroleum, textile sector, it can be stated that the banking sector is likely to have a minimum impact on the environment.

Directing fund flows in the globalizing world, having a major role in determining international policies and in ensuring macroeconomic stability, financial institutions are likely to affect the whole humanity and to have positive or negative impacts on the environment, human rights, and social justice even if indirectly as the funds all the businesses need are supplied by financial institutions. Therefore, the steps that the finance system is to take for sustainable development affect and direct all other sectors. It is widely accepted that financial institutions are quite likely to affect environmental and social sustainability (Öner Kaya, 2010: 79).

Environmental and social impacts of financial institutions arise in two ways: internal and external. Internal issues are related to the business processes within banks while external issues are connected to the banks' products. The environmental impact of financial institutions' internal activities is quite low when compared to the other sectors. The environmental burden of their energy, water and paper use is not comparable to many other sectors of the economy. However, the size of the banking sector is large enough to have a significant environmental impact. We express environmental impacts of banks' products by external activities of the banks. At the first sight it is not wrong to say the products of financial institutions do not pollute the environment. The products of the banks themselves do not pollute. Rather, it is the users of these products who impact on the environment and society. Therefore, the investments made by banks, the loans and other financial products indirectly damage the environment or society (Jeucken and Bouma, 1999: 26, 27).

According to Jeucken (2001), there are four phases including defensive banking, preventive banking, offensive banking and sustainable banking for the achievement of sustainability. In the defensive banking phase, banks with the concern of profitability and growth choose to be in a passive position and see the sustainability as a cost to be avoided. In the preventive banking phase, banks recognize potential cost savings (energy and paper saving etc.) in sustainable operations and take sustainability into account in internal operations. In the offensive phase, banks start to see opportunities in the sustainable development process (e.g. sustainable financial products, new markets, financing sustainable energy) and take into account sustainability in the external operations as well as internal operations. In the sustainable banking phase, all operations of banks become sustainable and

environmental; social and economic sustainability take the place of maximum financial return (Jeucken, 2001: 72, 73; Öner Kaya, 2010: 82).

There is no doubt that banks have power in the economic system and banks are of great importance to the achievement of sustainable development process. Banks should integrate sustainability into their corporate strategies, be respectful to the environment, contribute to the society at a higher level and put emphasis on the transparency in relations with stakeholders. Also banks should foster raising awareness about environment and provide support to the projects conducted for the minimization of climate change effects.

### **3. SUSTAINABILITY REPORTING**

Besides financial information, non-financial information is also important to the stakeholders of the organization. Non-financial reports give information to the stakeholders about the firms' positive and negative contributions to the environment and society.

Sustainability reporting as a type of non-financial reports is the practice of measuring, disclosing, and being accountable to stakeholders for organizational performance (Goel, 2010: 34). Sustainability reporting demonstrates a move towards increased transparency, and businesses are taking accountability to a higher level (Jackson et al., 2011: 56, 57). Sustainability reports communicate the organization's position and activities on economic, environmental, and social dimensions. In other words, it shows company's efforts towards sustainability progress to its stakeholders (Hu et al., 2011: 843; Roca and Searcy, 2012: 105). A sustainability report includes sustainability performance of the organization in terms of both positive contributions and negative effects that the company has toward achieving its goal of sustainability (Goel, 2010: 34).

Adopting sustainability activities and reporting their operational impacts bring many benefits to companies such as sustaining and expanding economic growth, improved competitiveness, shareholder value, prestige, corporate reputation, customer satisfaction and loyalty, customer-firm identification, price premium and brand equity, attracting and retaining quality employees, improved employee motivation, cost savings, and preventing costly stakeholder conflicts (Searcy, 2012: 239; Assaf et al., 2012: 597; Ngai et al., 2013: 2). Also sustainability reporting provides increased understanding of risks and opportunities emphasizes the link between financial and non-financial performance and diminishes negative environmental, social and governance impacts. By applying sustainability activities in their operations, firms avoid being implicated in publicized environmental, social and governance failures and become more transparent and accountable in their activities (globalreporting.org, 2014).

In order to be reliable, most of the firms have been following guidelines on sustainability reporting. The Global Reporting Initiative (GRI) is the most widely known guideline on sustainability reporting. Sustainability reporting guidelines were first set out in 2000. G4, the most up-to-date version, was published in 2013. Each version contains

extended guidelines. To indicate that a report is GRI-based, reporters should declare the level to which they have applied the GRI Reporting Framework via the “Application Levels” system. To meet the needs of beginners, advanced reporters, and those somewhere in between, there are three levels in the system. They are titled C, B, and A. The reporting criteria at each level reflect a measure of the extent of application or coverage of the GRI Reporting Framework. A “plus” (+) is available at each level (e.g., C+, B+, A+) if external assurance was utilized for the report (GRI, 2013).

Recently, an increasing number of Turkish companies have engaged in economic, environmental, and social disclosures through sustainability reports in order to become responsible corporate citizens. In Turkey, 57 companies published sustainability reports between the years 2004-2013. There are 139 reports and 90 of them are GRI reports. The distribution of reports according to sectors is as follows: 17.5% of reports from the holdings, 14% from the health/drug, 10.5% from the energy, 8.8% from the financial institutions, 7% from the textile, 5% from the food, 3.5% from the consultancy services, 3.5% from the aviation, 3.5% from the construction products, 3.5% from the metal products, 3.5% from the telecommunication, 3.5% from the other sector, 1.8% from the transportation/logistics, 1.8% from the public organizations, 1.8% from the IT, 1.8% from the chemistry, 1.8% from the automotive, 1.8% from the universities, 1.8% from the technological equipment, 1.8% from the non-profit organizations and 1.8% domestic appliances and furniture sector.

#### **4. SUSTAINABLE PERFORMANCE EVALUATION**

Performance measurement allows the management to assess the success of the firm’s adaptation to a changing environment. Traditional management tools are built on financially-driven performance measurement systems. Financial statements are the main source of information when assessing the company’s financial situation. Under the current competitive conditions, successful evaluation of a company can not rely on solely the financial indicators. When changing market and competitive conditions are taken into account, managers need to consider non-financial performance goals as well as economic goals. Increased awareness of society on environmental and social issues necessitated environmental and social performance measures to be taken into consideration within the set of non-financial performance measures. The concept of non-financial performance measures is not a new phenomenon. Kaplan and Norton proposed the Balanced Scorecard (BSC) as a management tool which integrates financial and non-financial performance measures and build a connection between organizational strategy and operational activity (Turan et al., 2008: 1026). Also after the publication of John Elkington’s book *Cannibals with Forks: The Triple Bottom Line for the 21st Century Business*, the triple bottom line (TBL) accounting system became popular (Elkington, 1997; Turan et al., 2008: 1026). Triple bottom line accounting means expanding the traditional reporting framework to take into account ecological and social performance in addition to financial performance and expands stakeholders’ knowledge of the company (Goel, 2010: 31; Jackson et al., 2011: 56). Triple bottom-line (TBL) reporting, a term coined

by John Elkington as a method for measuring sustainability, considers not only the economic performance of a firm but also the company's environmental and social performance as well. (Jackson et al., 2011: 56).

The sustainable performance of a company is generally measured by assessing three aspects of sustainability: economic, social and environmental performance. Economic performance encompasses issues conventionally reported in a company's annual financial report and also involves investments in human capital, research and development, wages and benefits paid, community development initiatives etc. Environmental performance includes the amount of resources that companies use in their operations such as energy, land, water and the results of its activities like waste, air emissions, chemical residues, and effluents. The environmental performance of companies is measured mainly by assessing their externalities to society and the environment-in other words, by measuring their "environmental footprint." The assessment of environmental performance is still very limited since it is mainly based on primary environmental impacts such as natural resource depletion, pollution emissions, energy consumption and waste generation-but not on the long term environmental impacts of firms' operations. Social performance encompasses the impact of companies (and their suppliers) on the communities they are operating in. It includes employee relations, health and safety, ratio of wages to cost of living, non-discrimination, employee turnover rate, education etc. The assessment of the social impact of companies, however, seems a more difficult task and much less developed than the assessment of economic and environmental performance. Companies today tend to focus and report on their philanthropic initiatives and improved labor practices (i.e. reducing accidents at work, hiring more women, and employing a more ethnically diverse workforce) (Goel, 2010: 31, 32; Hubbard, 2009: 180; Székely and Knirsch, 2005: 4). Measuring performance of the organizations against these performance measures is not an easy job because there are various multiple criteria which are qualitative. It is difficult to evaluate criteria that are verbally evaluated, cover different cycles, and are set based on various units of measurement.

## **5. LITERATURE REVIEW**

In the literature review part, studies that use GRA for the evaluation of financial performances and studies on sustainability reporting in Turkey are presented. Uçkun and Girginer (2011) examined the financial performances of public and private banks in Turkish Banking System by using GRA and sorted banks according to their financial performance within their own group. They found out that the most important financial indicators in financial achievement are profitability for public banks and assets' quality for private banks. Peker and Baki (2011) aimed to rank the financial performance of three companies in the insurance sector with GRA for the year 2008. They concluded that a firm which has high liquidity ratios may have high performance. Elitaş et al. (2012) examined the financial performance of insurance companies using GRA. They found out that the most important financial indicators are liquidity ratios and according to their results Aksigorta ranked first.

Ayrıçay et al. (2013) used 23 financial ratios and evaluated the financial performance of non-financial firms in ISE 30 with GRA. They sorted firms based on their financial performance and the results could be used by other firms in their financial benchmarking. Bektaş and Tuna (2013) measured the performance of 11 enterprises trading in BIST Emerging Companies Market for the year 2011 with GRA. They found the firm which had the highest performance. Doğan (2013) aimed to measure and compare financial performance of 10 banks with GRA and reduce the number of financial ratios which determine bank performance and identify which financial ratio is more important in measuring performance. According to his results, Akbank ranked first while Yapı Kredi Bank ranked last in terms of financial performance. They also found that a bank with high “Return on Assets” could have high financial performance. Tayyar et al. (2014) evaluated the financial performance of information technology sector in Borsa Istanbul between the years 2005-2011 with AHP and GRA. They found that the profitability ratios are the weightiest criteria and that the firm (Link Bilgisayar Sistemleri Yazılımı ve Donanımı Sanayi ve Ticaret A.Ş.) has the highest financial performance among the other companies operating in the same sector.

Öner Kaya (2010) dealt with the role of banks in the process of sustainable development and evaluated the application of sustainable banking practices in developing countries. Altuntaş and Türker (2012) analyzed how sustainable supply chains were strategically conceptualized and practiced in Turkey and examined sustainability reports of 10 production firms in terms of supply chain applications. Öztel, Köse and AYTEKİN (2012) used compromise programming to assess the corporate sustainability performance of Henkel Company. They derived data from the annual reports of Henkel Company and they proposed this model for the evaluation of corporate sustainability. Aktaş et al. (2013) analyzed the sustainability reports of nine firms in Turkey. They analyzed the sustainability reports based on the GRI indicators. Their results show that the sustainability reports of the firms selected fulfill the requirements related to “Part I-Profile Disclosure” and “Part II-Disclosure on Management Approach”, but they fail to consistently disclose “Performance Indicators”.

## **6. METHODOLOGY**

In this study GRA is used for the sustainable performance evaluation of banks.

### **6.1. Grey Relational Analysis (GRA)**

Decision making is a process of selecting the most appropriate one among the alternatives in a decision set. In real life situations, decision makers (DMs) should evaluate various criteria and a large number of alternatives. These kinds of problems are called Multi-criteria decision making (MCDM) problems (Akkoç and Vatansever, 2013: 56).

MCDM problems can be solved by MCDM techniques which provide some benefits for DMs in terms of evaluating various alternatives in different units and an advantage by using quantitative and qualitative variables simultaneously (Akkoç and Vatansever, 2013: 57).



In this study, GRA is used to evaluate the alternatives with respect to their sustainability performance (economic, environmental and social performance).

The grey system theory, which has been proved to be useful for dealing with poor, incomplete and uncertain information, was proposed by Deng (1982). The term “grey” indicates the deficiency or lack of information in decision making process. Grey system theory is frequently used in analysis of the relationships between systems, modeling and estimation in decision making process (Doğan, 2013: 217).

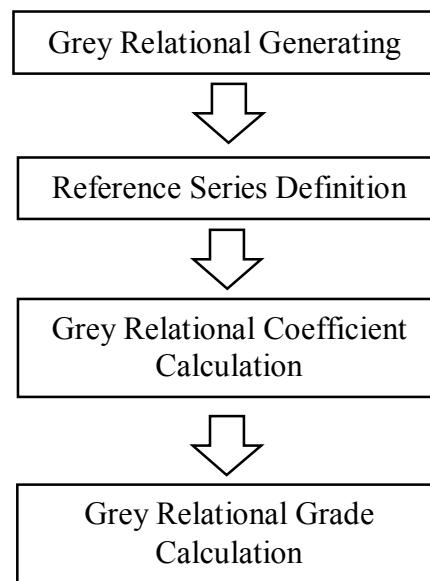
Grey relational analysis (GRA), which is a part of the grey system theory, is appropriate for identifying both qualitative and quantitative relationships among complex factors with insufficient information (Girginer and Uçkun, 2012: 23) and applicable for MCDM problems with complicated interrelationships between multiple criteria and alternatives. GRA solves MCDM problems by combining performance criteria considered for every alternative into one single value (Kuo et al., 2008: 81).

The GRA technique is a method that can measure the correlation between series. DMs usually set the target series based on the main objective of the MCDM problem as the reference series (Lin et al., 2009: 1524). The GRA is a quantitative analysis technique to determine the similarities and dissimilarities between the reference series and alternatives (Kung and Wen, 2007: 843). The purpose of GRA is to measure the relative influence of the compared alternative series on the reference series (Lin et al., 2007: 1949). The best alternative series for the problem have the closest similarity to the reference series (Hamzaçebi and Pekkaya, 2011: 9186).

Via GRA method, the uncertain relation between reference series and other alternatives within the system can be modelled. GRA is used when there are uncertain relations between variables or when the effect of a variable on the whole system is uncertain. GRA tries to explain the relations between series by using less data.

Traditional statistical methods like factor analysis and regression analysis can be used to measure the performance of the banks. But there are some limitations to using these methods. They have needed to analyze a large amount of data and the results achieved by these methods may not be acceptable without sufficient data to reach desired confidence levels. GRA supplements such limitations of using traditional statistical methods (Girginer and Uçkun, 2012: 23). Also, GRA method’s results are based upon the original data and the calculations are simple and straightforward (Wu, 2002: 211). The problem of evaluating sustainability performance of the banks can be considered as a MCDM problem with various criteria and alternatives. In the GRA method, there are no limitations to the values that the alternatives gain for the criteria. The values expected to be large or small and those expected to have an ideal (nominal) level can be evaluated all together during the decision making process. For these reasons, GRA method is preferred to evaluate the sustainability performance of the banks which issue sustainability reports in Turkey.

The main procedure of GRA starts with translating the performance of all alternatives into comparability series. This step is called grey relational generating and according to these series, reference series (ideal target series) are defined. Then, the grey relational coefficients between all comparability series and the reference series are calculated. At the last step, the grey relational grades between the reference series and every comparability series are calculated based on their grey relational co-efficiencies. The procedure of GRA is shown in Figure 1 (Kuo et al., 2008: 81).



**Figure 1:** Procedure of Grey Relational Analysis

GRA includes the following six steps (Wu, 2002: 211-212; Zhai et al, 2009: 7074; Hamzaçebi and Pekkaya, 2011: 9189; Tayyar et al, 2014: 29-31):

**Step 1:** Construction of an initial decision matrix  $X = x_i(j)$ . Assuming that there are  $n$  alternatives characterized by  $m$  criteria and  $x_i(j)$  is the value of the  $i^{\text{th}}$  alternative with respect to  $j^{\text{th}}$  criterion.

$$x_i(j) = \begin{bmatrix} x_1(1) & x_1(2) & \dots & x_1(m) \\ x_2(1) & x_2(2) & \dots & x_2(m) \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ x_n(1) & x_n(2) & \dots & x_n(m) \end{bmatrix} \quad i = 1, 2, \dots, n \quad j = 1, 2, \dots, m \quad (1)$$

**Step 2:** Normalization of the data set.

In order to make values free of unit, the normalization process is carried out. This process is called grey relational generating. Data can be normalized one by one of the three types; i. e., larger-is-better, smaller-is-better and nominal-is-best.

For larger-is-better transformation  $x_i(j)$  can be transformed to  $x_i^*(j)$  with the formula (2):

$$x_i^* = \frac{x_i(j) - \min_{i=1}^n x_i(j)}{\max_{i=1}^n x_i(j) - \min_{i=1}^n x_i(j)} \tag{2}$$

For smaller-is-better, the formula to transform  $x_i(j)$  to  $x_i^*(j)$  is:

$$x_i^* = \frac{\max_{i=1}^n x_i(j) - x_i(j)}{\max_{i=1}^n x_i(j) - \min_{i=1}^n x_i(j)} \tag{3}$$

If there is a nominal value for the criterion nominal-is-best transformation is applied and  $x_i(j)$  can be transformed to  $x_i^*(j)$  with the formula (4) where  $x_{idl}(j)$  is the ideal (target) value for the  $j^{th}$  criterion and  $\min_{i=1}^n x_i(j) \leq x_{idl}(j) \leq \max_{i=1}^n x_i(j)$ .

$$x_i^* = 1 - \frac{|x_i(j) - x_{idl}(j)|}{\max\{\max_{i=1}^n x_i(j) - x_{idl}(j), x_{idl}(j) - \min_{i=1}^n x_i(j)\}} \tag{4}$$

After the normalization process, all the three types of criteria have been transformed into the “larger-is-better” type with the maximum value at “1”.

**Step 3:** Construction of the normalized matrix  $X^* = x_i^*(j)$  and generation of the reference series. In this step normalized matrix is constructed by using the normalized values in Step 2.

$$x_i^*(j) = \begin{bmatrix} x_1^*(1) & x_1^*(2) & \dots & x_1^*(m) \\ x_2^*(1) & x_2^*(2) & \dots & x_2^*(m) \\ \cdot & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ x_n^*(1) & x_n^*(2) & \dots & x_n^*(m) \end{bmatrix} \quad i = 1, 2, \dots, n \quad j = 1, 2, \dots, m \tag{5}$$

$x_0^*(j)$  is the reference value which is related to the  $j^{th}$  criterion and is determined by the largest normalized value of each criterion.

$$x_0^*(j) = \max_{i=1}^n \{x_i^*(j)\} \tag{6}$$

$$x_0^*(j) = \{x_0^*(1), x_0^*(2), \dots, x_0^*(m)\} \tag{7}$$

**Step 4:** Difference matrix calculation.

In this step  $\Delta_{0i}(j)$  values are calculated and they show the differences between normalized values and their reference values. Then the difference matrix is constructed as follows:

$$\Delta_{0i}(j) = |x_0^*(j) - x_i^*(j)| \tag{8}$$

$$\Delta_{ij} = \begin{bmatrix} \Delta_{01}(1) & \Delta_{01}(2) & \dots & \Delta_{01}(m) \\ \Delta_{02}(1) & \Delta_{02}(2) & \dots & \Delta_{02}(m) \\ \cdot & \cdot & & \cdot \\ \cdot & \cdot & & \cdot \\ \Delta_{0n}(1) & \Delta_{0n}(2) & \dots & \Delta_{0n}(m) \end{bmatrix} \tag{9}$$

**Step 5:** Grey relational coefficient calculation.

Grey relational coefficient is an indicator of the similarity between the reference series and alternative series. Grey relational coefficient is calculated by formula (10)

$$\gamma_{0i}(j) = \frac{\min_{i=1}^n \min_{j=1}^m \Delta_{0i}(j) + \zeta \times \max_{i=1}^n \max_{j=1}^m \Delta_{0i}(j)}{\Delta_{0i}(j) + \zeta \times \max_{i=1}^n \max_{j=1}^m \Delta_{0i}(j)} \tag{10}$$

where  $\zeta (0 \leq \zeta \leq 1)$  is known as distinguishing coefficient. DMs prefer to take 0.5 as a  $\zeta$ , because this value usually offers moderate distinguishing effects and good stability.

**Step 6:** Grey relational grade calculation.

If all decision criteria have equal importance degree, grey relational grade  $\Gamma_{0i}$  can be calculated by formula (11):

$$\Gamma_{0i} = \frac{1}{m} \sum_{j=1}^m \gamma_{0i}(j) \tag{11}$$

For different importance degrees grey relational grade can be calculated as:

$$\Gamma_{0i} = \sum_{j=1}^m w(j) \gamma_{0i}(j) \quad , \quad \sum_{j=1}^m w(j) = 1 \tag{12}$$

Where  $w(j)$  values represent the relative importance weights of the criteria.

$\Gamma_{0i}$  is the grey relational grade which indicates the magnitude of similarity (correlation) measured between the alternative series and reference series. Grey relational grade is used to evaluate overall performance of alternatives depending on all the criteria used

in analysis. The alternative with the highest grade of relation will be identified as the best solution (or closest to the ideal reference series).

## 6.2. Selection of A Sample and Performance Indicators

In Turkey, firms that issue sustainability reports are so few, and some are based on GRI indicators whereas some are not. Also firms which base their reports on GRI indicators differ in their application levels, in reporting periods and cycles. Some firms issue reports encompassing two years while some issue them for one year period. There are 5 banks in the financial service industry which issue sustainability reports. These are Akbank, Türkiye Garanti Bank, Türkiye İş Bank, TSKB, and Yapı kredi. Since banks have not issued their sustainability reports for the year 2012 yet, the year 2011 was chosen for the analysis. Due to the fact that Yapı kredi's 2011 report was not based on GRI indicators and the report did not include enough data for the performance evaluation, Yapı kredi was excluded from the analysis. İş Bank started to issue sustainability reports after 2011, so this bank was also excluded. Only 3 banks' performance (Akbank, Garanti, and TSKB) for the year 2011 was evaluated. According to 3 financial, 2 social and 4 environmental ratios, the performance of banks has been analyzed and banks have been sorted by their sustainability performance. While choosing the ratios, we encountered some problems including reporting terms, cycles and lack of a standardized form. Some banks evaluate some measures verbally and some give numerical values. The units of measurement in the reports were converted into the same unit so as to make a comparison and a value per employee was found.

The criteria that are used in the analysis and their formulas can be seen in Table 1 and the hierarchical structure of the problem is shown in Figure 2. Also, there is a target column showing the features of the criteria used in Table 1. In this study, the values preferred to be large and small were used in the target column.

**Table 1:** Sustainability Performance Indicators (Criteria)

Criteria	Criteria Names	Criteria's Formulas	Target
<b>Economic Criteria</b>			
C <sub>1</sub>	Capital Adequacy Ratio	Shareholders' equity/(Credit + Market + Amount subject to operational risk)	Larger-is-better
C <sub>2</sub>	Return on Equity	Net Profit/Equity	Larger-is-better
C <sub>3</sub>	Return on Assests	Net Profit/Total Assets	Larger-is-better
<b>Environmental Criteria</b>			
C <sub>4</sub>	Electricity Consumption	kwh/employee	Smaller-is-better
C <sub>5</sub>	Water Consumption	m <sup>3</sup> / employee	Smaller-is-better
C <sub>6</sub>	Total Paper Consumption	kg/ employee	Smaller-is-better
C <sub>7</sub>	CO <sub>2</sub> Emissions	CO <sub>2</sub> Emissions (kg)/employee	Smaller-is-better
<b>Social Criteria</b>			
C <sub>8</sub>	Employee Turnover Rate	Number of seperations during the year/Average number of	Smaller-is-better

		employees during the year	
C <sub>9</sub>	Education Hour per Employee	Education hour/employee	Larger-is-better

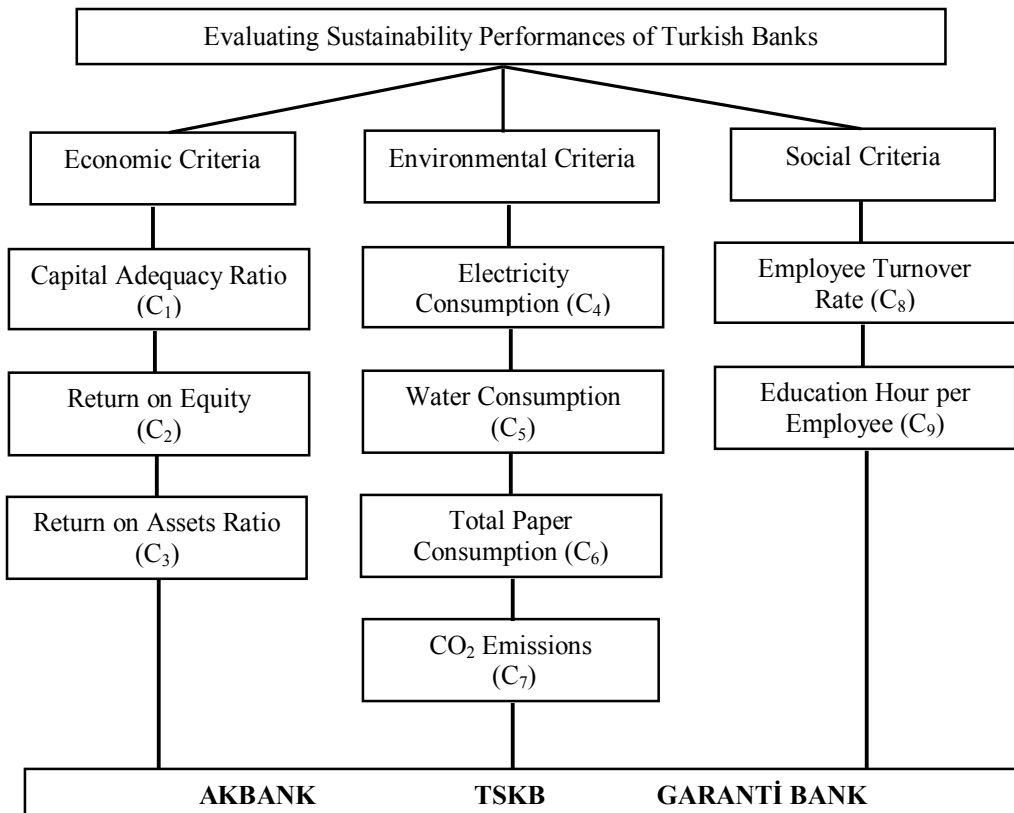


Figure 2 : Hierarchical Structure of the MCDM Problem

The GRA method is applied by the following steps.

**Step 1: Construction of the Decision Matrix**

The first step of GRA method is the construction of a decision matrix that shows all alternatives’ values with respect to each criterion used in the analysis. Decision matrix of our analysis is shown in Table 2.

Table 2: Decision Matrix

Banks	Criteria								
	Economic Criteria			Environmental Criteria				Social Criteria	
	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>	C <sub>9</sub>
<b>Akbank</b>	0.168	0.143	1.8	6209	25.374	73	3.67	0.088	66.5
<b>TSKB</b>	0.191	0.194	2.9	3125	23.667	19	3.24	0.29	40
<b>Garanti Bank</b>	0.158	0.195	2.2	6783	11.109	30	5.21	0.17	51

**Step 2: Normalization of Data Set, Construction of Normalized Matrix and Generation of Reference Series.**

In order to make values free of unit, the values in the decision matrix are normalized by using formula 2 and 3. Formula 2 is used for the criterion which has ‘larger-is-best situation’ (C<sub>1</sub>, C<sub>2</sub>, C<sub>3</sub>, C<sub>9</sub>) and formula 3 is used for the criterion which has ‘smaller-is-best situation’ (C<sub>4</sub>, C<sub>5</sub>, C<sub>6</sub>, C<sub>7</sub>, C<sub>8</sub>). Then reference series are generated by taking the highest values for each criterion. Normalized decision matrix and reference series are shown in Table 3.

**Table 3: Normalized Decision Matrix And Reference Series**

	Criteria								
	Economic Criteria			Environmental Criteria				Social Criteria	
Banks	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>	C <sub>9</sub>
Akbank	0.303	0.000	0.000	0.157	0.000	0.000	0.782	1.000	1.000
TSKB	1.000	0.981	1.000	1.000	0.120	1.000	1.000	0.000	0.000
Garanti Bank	0.000	1.000	0.364	0.000	1.000	0.796	0.000	0.594	0.415
Reference Series	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000

**Step 3: Calculation of Difference Matrix**

In this step the difference matrix is formed by calculating the distances between the reference series (highest values for each criterion) and normalized values that belong to the related criterion. Difference matrix is calculated by using formula 8 and shown in Table 4.

**Table 4: Difference Matrix**

	Criteria								
	Economic Criteria			Environmental Criteria				Social Criteria	
Banks	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>	C <sub>9</sub>
Akbank	0.697	1.000	1.000	0.843	1.000	1.000	0.218	0.000	0.000
TSKB	0.000	0.019	0.000	0.000	0.880	0.000	0.000	1.000	1.000
Garanti Bank	1.000	0.000	0.636	1.000	0.000	0.204	1.000	0.406	0.585

**Step 4: Calculation of Grey Relational Coefficients**

Formula 10 is used to calculate grey relational coefficients which indicate the similarity between the reference series and the alternatives by taking  $\zeta = 0.5$  to provide moderate distinguishing effect. Grey relational coefficients of alternatives and their ranking order with respect to each criterion are given in Table 5.

**Table 5:** Grey Relational Coefficients Of The Banks With Respect To Each Decision Criterion

Banks	Criteria								
	Economic Criteria			Environmental Criteria				Social Criteria	
	C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>	C <sub>5</sub>	C <sub>6</sub>	C <sub>7</sub>	C <sub>8</sub>	C <sub>9</sub>
<b>Akbank</b>	0.418 (2)	0.333 (3)	0.333 (3)	0.372 (2)	0.333 (3)	0.333 (3)	0.696 (2)	1.000 (1)	1.000 (1)
<b>TSKB</b>	1.000 (1)	0.963 (2)	1.000 (1)	1.000 (1)	0.362 (2)	1.000 (1)	1.000 (1)	0.333 (3)	0.333 (3)
<b>Garanti Bank</b>	0.333 (3)	1.000 (1)	0.440 (2)	0.333 (3)	1.000 (1)	0.711 (2)	0.333 (3)	0.552 (2)	0.461 (2)

Banks' performances for the main criteria are calculated and shown in Table 6.

**Table 6:** Performances Of The Banks For The Main Criteria

Banks	Economic Performance	Environmental Performance	Social Performance
<b>Akbank</b>	0.361 (3)	0.434 (3)	1.000 (1)
<b>TSKB</b>	0.988 (1)	0.841 (1)	0.333 (3)
<b>Garanti Bank</b>	0.591 (2)	0.594 (2)	0.506 (2)

According to the Table 6, while TSKB is first in terms of economic and environmental performance, Akbank is first in terms of social performance.

### Step 5: Calculation of Grey Relational Grades

Decision criteria are assumed to have a degree of equal importance. Because of this, formula 11 is used to calculate the grey relational grades ( $\Gamma_{0i}$ ). The banks are ranked according to their  $\Gamma_{0i}$  values Table 7 shows the  $\Gamma_{0i}$  values and ranking order of the banks with respect to their sustainability performance.

**Table 7:** Grey Relational Grades, Ranking Order And Overall Sustainability Performances Of The Banks

Banks	Grey Relational Grade	Ranking
<b>Akbank</b>	0,535	3
<b>TSKB</b>	0,777	1
<b>Garanti Bank</b>	0,574	2

When banks ranked according to the grey relational grades, TSKB ranks first with its grade of 0.777, followed by Garanti Bank and Akbank with the grades of 0.574 and 0.535, respectively.



TSKB was found to have the highest overall sustainability performance. Although Garanti Bank and Akbank are close to each other in terms of their overall sustainability performance, Garanti Bank has a bit higher performance.

## **7. CONCLUSION**

There has been growing awareness of environmental issues, rising costs, and penalties associated with environmental damage, and increasing demand for investments in environmentally friendly processes and products. Companies, financial sector, non-governmental organizations and all other groups have responsibility in the sustainable development process. Companies should have a balance between financial, social and environmental performance in order to be competitive and to survive in the long term. Today companies issue reports on their economic, environmental and social aspects of performance based on “triple bottom line” reporting system that is used mostly as a tool to demonstrate good corporate citizenship. At the same time, this helps them to increase their revenues and profitability through enhanced reputation. The voluntary sustainability reporting indicates that companies take a broader responsibility than merely looking for profits and companies gain greater community recognition by being more transparent, responsible and accountable. As firm’s sustainable operations and sustainability consciousness increase, the need for sustainability performance evaluation emerges. The measurement of environmental and social performance and comparison of that performance between firms remain difficult. To address this there is a need to develop a methodology to standardize the measurement of environmental and social impacts within firms. In this study GRA method is used to assess the bank’s sustainability performance.

When banks ranked according to the grey relational grades, TSKB ranks first with its grade of 0.777, followed by Garanti Bank and Akbank with the grades of 0.574 and 0.535, respectively.

TSKB was found to have the highest overall sustainability performance. Although Garanti Bank and Akbank are close to each other in terms of their overall sustainability performance, Garanti Bank has a bit higher performance. The results of the study show that the ranking in terms of economic and environmental performance does not change when the banks are evaluated based on the main criteria, but Akbank was first in terms of social performance, followed by Garanti Bank and TSKB respectively. The reason why TSKB ranked last in terms of social performance is that the employee turnover rate of TSKB is higher and the training hour per employee is lower when compared to the other banks.

As mentioned before, Jeucken (2001) states that there are four phases that the banks need to complete to achieve sustainability. When the banks included into this study are considered in this respect, they seem to be in the sustainable banking phase. These banks are taking some steps to decrease carbon footprint by measuring their emissions, saving on paper and fuel energy, supporting social projects, attaching importance to sustainable supply chains,

providing training on the prevention of corruption, paying attention to not using child labor, and providing loans for projects on renewable energy.

In Turkey lack of legal arrangements and lack of public awareness on sustainable issues stand out as the factors preventing the sustainable reporting are widespread. Firms report on their initiatives on sustainability in ways that are difficult to understand and compare. There is a need to establish clear, user-friendly methodologies and tools to measure the progress that companies are making towards sustainability.

In this study the assessment of banks' sustainability performance with GRA is presented and this can be improved by taking into account different financial institutions, periods and different standardized measures when available. Also one bank's performance can be compared in terms of sustainability performance by years.

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