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Comparative Analysis of Sixty-two Countries Based on Financial Services with A Focus on Pakistan

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Abstract

The study aims to compare Pakistan's Insurance and financial services with sixty-one selected countries. The study's overall design comprises a literature survey, data acquisition, and analysis. The population under study is all sovereign countries of the world. The sampling design is purposive sampling and the sample size is sixty-two countries. The technique of analysis is Grey Relational Analysis (GRA). Data are acquired from World Development Indicators (WDI), i.e., World Bank's website. The study results show that Libya ranks at first position, Pakistan at the thirty-sixth, and Madagascar at sixty-second position according to financial services (including insurance services). The study is based on an authentic real dataset and the study provides propounding insights to the stakeholders. It also

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provides food for thought to the policymakers. It contributes country-wise Grey Relational Coefficients, Grades, and Ranks to the literature.

Keywords: Performance Measurement, Finance, Insurance, Grey Relational Analysis

Introduction

Insurance and financial services are the most critical components that play an important role in mitigating risks, promoting investments, and fostering economic stability (Liu, & Hsu, 2006; Ali & Ahmad, 2016; Audi et al., 2022). These sectors are foundational pillars of the global economy and support economic resilience, foster international trade, and promote long-term financial well-being across the globe. Efficiency is pivotal to the banking sector as it serves a linchpin for resource allocation and competitive prowess (Ali, 2022; Atuahene, & Xusheng, 2024; Sulehri et al., 2024). Service quality also has a substantial positive influence on customer satisfaction and bank reputation (Ati et al., 2020; Ali, 2022). Economic growth could be attained with financial development through the efficiency of the marginal productivity of capital, saving-investment channel and technological innovation (Ali, 2022; Audi et al., 2023; Armas & De Guzman, 2024). In businesses such as finance, the adherence of ethical norms is not merely an aspect of organizational culture but also a regulatory and legal obligation (Audi et al., 2023; Azila-Gbettor et al., 2024). Insurance industry plays a pivotal role in global economy. Scenarios of supply chain commotions, initiated by national and international warlike conflicts or international political skirmishes highlight the prominence of the insurance sector in market stability (Ali & Rehman, 2015; Dominique-Ferreira et al., 2024).

Insurance industry is a large economic contributor due to magnitude of its investment, volume of premiums it collects and fundamental social and economic function it provides by insuring individual and commercial risks (Ali, 2015; Horvey, & Odei-Mensah, 2024). In the times of anguish, interdependence among

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financial institutions has becomes more substantially as losses extend to different institutions, building the entire financial system susceptible (Ali, 2018; Armanious, 2024). Financial institutions use the anti-money laundering (AML) measures to follow regulations and to prevent unlawful activities (Ali & Audi, 2018; Roussel et al., 2021; Pattnaik et al., 2024). Financial development during the period from 1980 to present was considered by the researchers as an interplay between a person's environment and their financial well-being (Ali & Zulfiqar, 2018; Carton et al., 2024). However, the development of the financial sector in some countries like East Africa, is still facing challenges such as; limited access to affordable credit, weak regulatory frameworks and underdeveloped financial markets are some of the obstacles (Fengju, & Wubishet, 2024; Wang & Huang, 2024; Musa, 2024). Over the past 40 years, life insurance has become an integral part of the financial sector allowing an assortment of financial services to the consumers and becoming a foremost source of investment in capital market (Beck, & Webb, 2003; Idris, 2023). Financial advising services can make up for the lack of financial literacy in insurance and pension planning (Huseyin, 2021; Mazzoli et al., 2024). The use of financial technologies may help to elevate consumer experiences and assist the financial advice process (Sumaira, 2020; Neilson et al., 2024).

Financial inclusion is a significant mechanism for poverty reduction and growth of economy (Abdulai, & Issahaku, 2024). Financial inclusion means having access to affordable and useful financial services and products to meet people's needs, and supplied in a sustainable and responsible way (Fatima & Zaman, 2020; Carton et al., 2024). It allows people the chance to take advantage of financial services (Ismail & Saeed, 2019; Dash & Mohanta, 2024). Contactless payments which are more efficient, and safer than traditional means of payments; enhance financial inclusion (Shahabuddin & Ali, 2024; Broekhoff, van der Cruijsen, & de Haan, 2024). E-money services have a positive impact on the total financial inclusion as compared to banks and microfinance institutions, that don't

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have as much of an impact (Ndione, Ashta & Bako Liba, 2024). Financial inclusion is crucial for sustainable development and economic growth of the country (Qasim & Su, 2022; Basnayake et al., 2024). The need for financial inclusion is because of the importance of financial sector in the economic growth of a country regardless of the country's development stages (Bashir & Rashid, 2019; Abdulai, & Issahaku, 2024). Financial inclusion increases the effect of foreign direct investment (FDI) on economic wealth in countries that work in a highly industrialized sector of the economy as compared to the ones working in low industrialized economy (Perveez, 2019; Ofori-Sasu et al., 2024). Developed markets are more likely to be affected as a result of economic slowdown (Zahid, 2018; Preda et al., 2021; van Zanden, 2023). Interest free financial system is superior to interest based financial system (Basit et al., 2019; Ali & Mohsin, 2023). The high priority on the Global Agenda and Universal Health Coverage is to increase equitable access to health services financial protection (Khan, 2022; Afriyie et al., 2024). To detect, assess and manage the climate-related financial risks the central banks and financial regulators around the world have made significant advancement (Omri, 2022; Garcia-Jorcano, & Sanchis-Marco, 2024).

Pakistan's economy greatly relies on the strength and efficiency of its financial services that provides capital for businesses and entrepreneurs and also ensures financial inclusion, risk management and global trade facilitation (Ahmed et al., 2019; Kalkianiotis, 2022; Sulehri et al., 2024). This comparative study of sixty-two countries with a particular focus on Pakistan based on indicators such as: insurance and financial services (% of commercial service exports), financial intermediary services indirectly measured (current LCU), financial and insurance services (% of service exports, BoP), insurance and financial services (% of commercial service imports), and insurance and financial services (% of service imports, BoP) (Table 1). The objectives of the study are: i) to provide a comprehensive understanding of the financial development of the countries, ii) to

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determine grades and ranking of the countries according to the chosen indicators, and iii) to formulate some policy guidelines for regulators. The study considered a wide range of methodological choices for analysis and found GRA an appropriate choice as used in Basit, et al., 2019; Basit et al., 2021; Naeem et al., 2021; Niazi et al., 2021; Qazi, et al., 2020 and Qazi, et al., 2021b. The choices include considering Technique for Order of Preference by Similarity to Ideal Solution (TOPSIS), Stepwise Weight Assessment Ratio Analysis (SWARA), VIekriterijumsko KOmpromisno Rangiranje (VIKOR), Grey Relational Analysis (GRA), Analytical Hierarchy Process (AHP) and, Analytical Network Process (ANP). The technique used in this study for the analysis is the Grey Relational Analysis (GRA) technique. The comparative analysis across sixty-two countries is conducted using quantitative data of five different indicators taken from WDI. This study provides insights to policymakers and other stakeholders. The remaining study is represented as a literature review (section two), methodology (section three), modeling, analysis, results, & discussion (section four), and conclusion (section five).

Literature Review

The insurance and financial service sectors are important for economic development as they facilitate risk management, promote savings and enhance investments. The importance of these sectors in the economic development is well documented (Beck & Webb, 2003). It is essential to review the literature of insurance and financial sector to determine Pakistan's position on a global scale. The literature related to Pakistan's insurance and financial service sector is limited but revealing. This literature explores databases like ScienceDirect, Emarald, JSTOR, Talyor & Francis etc. for relevant data and information. This literature underscores the critical role of insurance and financial services in economic development while also highlighting the significant disparities among different countries. Financial services play a role in capital mobilization and investment

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while insurance services help in risk management and financial security (Zhytar et al., 2021; Adjasi & Yu, 2021). Investors and financial institutions are progressively arranging environmental norms in their decision-making processes that shimmering a wider shift toward sustainability (Jammazi & Mokni, 2021; Choi et al., 2024). Alqahtani et al., (2024) evaluated insurance policies across different countries. Recent studies have shown increase in digitalization and growth in fintech which are reshaping consumer behaviour and service delivery in various countries (Signé & Johnson, 2020). Onorato et al., (2024) analyzed all of the Italian fintech firms and banks. Their study concluded efficiency levels of both institutions. FinTech, has fundamentally reshaped the landscape of financial services (Zubair & Hayat, 2020; Elouaourti, & Ibourk, 2024). They (with the blend of finance and technology) have strangely prejudiced financial permanency through markets and restructured business models, prolonging an innovative evolution in the global financial landscape (Ali & Sajid, 2020; Elsayed et al., 2024).

To promote financial stability in the banking sector; deposit insurance is one of the widely adopted policies (Roy & Madheswaran, 2020; Anginer, & Demirguc-Kunt, 2024). Emerging technologies have profoundly influenced on the banking sector's journey toward sustainability, transiting a vital shift in financial services by way of enhancement of green finance and introduction of innovative banking models (Server, 2019; He et al., 2024). Dörfling, & Godspower-Akpomiemie, (2024) provide actionable insights for practitioners in the insurance sector. According to World Insurance Report (2021) emerging markets are experiencing significant growth in insurance penetration driven by increasing awareness and regulatory support (Ahmad & Rehman, 2019; Preda et al., 2021). Financial regulators have deployed numerous strategies and reforms aiming at promotion of financial inclusion in Morocco (Elouaourti, & Ezzahid, 2024). Shen, Huang, Nazar & Chin, (2024) evaluated the financial inclusivity and economic growth of top ten Middle East nations namely: Oman, Israel, Iran, Turkey, Qatar, Saudi Arabia, Egypt,

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Bahrain, UAE and Kuwait. Neilson, Marty & Daley, (2024) applied data collection software on financial planning processes to determine the benefits that might assist in reducing the barriers in accessing the financial advice. Their research examined the impact that data collection methodologies can have on reducing barriers to access financial services in Australia. The use of Artificial Intelligence (AI) has rapidly increased in the recent years resulting in the transformation of ways in which businesses operate (Pattnaik et al., 2024). AI helps in improving the processes like financial risk management and investment decision making (Polireddi, 2024). Montagnani, Najjar & Davola, (2024) discuss the progress of AI (Artificial Intelligence) and its application to financial service markets and the risks it poses to its users. Tóth & Blut, (2024) focused on the use of AI to address potential ethical issues in financial services.

A number of comparative studies focus on the financial service sectors across countries (Zhytar et al., 2021). Montero, Naimy, Abi Farraj & El Khoury, (2024) study the behavior of property and liability insurance companies in the United States and provide tools to manage volatility of the stock prices and value at risk. Comparative studies about financial services shed light on how various countries structure their insurance and financial markets and systems (Schwarcz, 2009). Counties that have strongly-built financial systems usually show higher GDP growth rates (Wali, 2018; Liu & Hsu, 2006; Sulehri et al., 2024). Comparison of banking systems show differences in financial inclusion and service accessibility (Carney, 2019; Audi et al., 2024). Under developed countries are forced for financial inclusion in their economies as of its potential benefits (Iqbal, 2018; Nur & Kumar, 2023; Fayyad, & Al-Sinnawi, 2024; Sulehri & Ali, 2024). According to Meier et. al, 2023, comparative analysis of countries by Swiss Re (2020) based on insurance penetration and density shows that countries like USA and Germany are in lead, while countries in South-Asia, including Pakistan, lag behind. Regulatory frameworks are important for development of insurance and financial services

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(Widiyastuti, & Widijantoro, 2019; Kinritcioglu, 2023). Strong regulatory environments enhance market confidence and protect consumers (Nastiti & Kasri, 2019; Senturk, 2023; Sulehri et al., 2024). Countries with strong regulatory authorities such as Singapore and Australia demonstrate higher level of trust in financial institution (Zhytar et al., 2021; Areki, 2022). Factors like lack of awareness, cultural factors and inadequate regulatory frameworks hinder the development in financial and insurance sectors (Ahmed, Khan & Ali, 2019). The countries with well-structured regulatory frameworks and higher literacy tend to have more developed insurance markets (Deb & Sarma, 2016; Oloko, 2022). The application of Grey Relational Analysis (GRA) offers valuable insights about the said sectors. Many studies have used GRA to compare financial services across different various regions. Liu et al. 2016 applied GRA to evaluate the financial performance of banking institutions in China, showing its utility in comparing various financial entities based on performance metrics.

Zhang et al. 2015 used GRA to compare financial markets of different countries focusing on risk-adjusted returns, financial stability and market efficiency to show how GRA can be applied to cross-country financial data for comparison and decision making. These studies show the versatility of GRA in evaluating the performance of financial and insurance sectors, which in turn help the policymakers and business leaders to make decisions based on the evaluated data. The application of GRA can identify areas where Pakistan lags and can suggest ways for improvements. Ahmad et al., (2019) explored how corporate governance affects the profitability of insurance companies in Pakistan. Research on the financial and insurance service sectors of Pakistan highlights the challenges that are faced by the said sectors (Ati et al., 2020). COVID 19 had a terrible impact on the economy of Pakistan which resulted in the decline of growth rate to a negative figure (Naeem, Muhammad & Niazi, 2021). With a focused analysis on Pakistan, it becomes clear that while challenges exist there are promising

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opportunities for growth and development. According to State Bank of Pakistan (2021), Pakistan's insurance penetration remains low as compared to global averages which poses significant challenges for growth (Hassan & Salha, 2020; Fatima & Jamil, 2021). Understanding the comparative performance of different countries can help policymakers in Pakistan formulate strategies to enhance the effectiveness of insurance and financial service sectors (Iqbal & Ahmed, 2019; Anwar & Akhtar, 2019). Innovations such as mobile insurance and Insurtech can increase insurance penetration in emerging markets like Pakistan (Tufano, 2009).

Methodology

The study follows positivism as research philosophy, deductive approach, and Grey Systems theory as used in Basit, Qazi, & Niazi, 2020b; Qazi, Niazi, & Basit, 2021; Niazi, et al., 2021a; Basit, Khan, & Qazi, 2021 and Qazi, Niazi, & Inam, 2019). It is based on the belief that data from various countries can be measured, observed and analyzed by using GRA. This analysis utilizes GRA to quantify, compare and asses Pakistan's position in insurance and financial service sector. The population under study consists of all the sovereign countries of the world. The sample size consists of 62 countries and the sampling design used in this study is purposive sampling. The sampling method involves selecting sixty-two countries based on the availability of all five indicators' (Table 1) data for 2018 to find Pakistan's position in insurance and financial sector.

Data Collection

The quantitative data for analysis of five indicators (Table 1) for sixty-two countries of the world is collected from the World Bank Collection of Development Indicators (WDI). This study uses Grey Relational Analysis (GRA) which is a technique commonly used for multivariate analysis of complex systems with incomplete or uncertain information. The basis purpose of GRA is to compare the degree of similarity between target performance and performance data from each country (Ertuğrul, Öztaş, Özçil, & Öztaş, 2016). The follow is

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stepwise procedure and mathematical algorithm as used in Basit, et al., 2021; Basit, Qazi, & Niazi, 2020a; Niazi, et al., 2021b; Qazi, et al. 2021a; and Rashid, et al., 2021. Firstly, in order to compare the data (having different measurement unit,) correctly, we transform the data by applying normalization operations to obtain values in 0-1 interval. $x_0^{(O)}(k)$ and $x_i^{(O)}(k)$ (= 1, 2…, ; = 1, 2…,) (m alternative, n criteria) show that original reference sequence and comparable sequence respectively (Ertuğrul, Öztaş, Özçil, & Öztaş, 2016).

Normalization method can be implemented by following formula;

$$x_i^*(k) = \frac{x_i^{(O)}(k) - \min x_i^{(O)}(k)}{\max x_i^{(O)}(k) - \min x_i^{(O)}(k)} \qquad (1)$$

This formula is applicable for variables having "maximum better" characteristics. but the simplest method of normalization is to divide each value with the first value of the sequence as;

$$x_i^*(k) = \frac{x_i^{(O)}(k)}{x_i^{(O)}(1)} \qquad (2)$$

Calculating of Grey Relational Coefficient and Grey Relational Grade

After data normalization, Grey Relational Coefficient is calculated by;

$$\gamma[(x_0^*(k), x_i^*(k))] = \frac{\Delta_{min} + \xi\Delta_{max}}{\Delta_{0i}(k) + \xi\Delta_{max}} \qquad 0 < \gamma[(x_0^*(k), x_i^*(k))] \leq 1 \qquad (3)$$

Where, the term is distinguishing coefficient in [0, 1] and its value is usually taken as 0.5 and $\Delta_{0i}(k)$ is deviation sequence between $x_0^*(k)$ reference sequence and $x_i^*(k)$ comparable sequence (Ertuğrul, Öztaş, Özçil, & Öztaş, 2016). This deviation sequence is calculated as;

$$\Delta_{0i}(k) = |x_0^*(k) - x_i^*(k)| \qquad (4)$$

The biggest deviation and the smallest deviation are calculated as;

$$\Delta_{max} = \max \max |x_0^*(k) - x_j^*(k)| \qquad (5)$$

$$\Delta_{min} = \min \min |x_0^*(k) - x_j^*(k)| \qquad (6)$$

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Grey Relational grade is the weighted sum of Grey Relational Coefficients and it can be calculated as;

$$\gamma(x_0^*, x_i^*) = \sum_{k=1}^{n} \beta_k \gamma\,[x_0^*(k), x_i^*(k)] \qquad (7)$$

Where,

$$\sum_{k=1}^{n} \beta_k = 1 \qquad (8)$$

In the equation 7, Grey Relational grade represents the level of correlation between the reference sequence and comparable sequences. If two are same then Grey Relational grade is equal to 1 (Ertuğrul, Öztaş, Özçil, & Öztaş, 2016).

Table 1: Performance Indicators/Variables

Code	Indicators	Definition
1	Financial intermediary services indirectly Measured (FISIM) (constant LCU)	Financial intermediation services indirectly measured (FISIM) is an indirect measure of the value of financial intermediation services (i.e. output) provided but for which financial institutions do not charge explicitly as compared to explicit bank charges. Although the 1993 SNA recommends that the FISIM are allocated as intermediate and final consumption to the users, many countries still make a global (negative) adjustment to the sum of gross value added.
2	Insurance and financial services (% of commercial service imports)	Insurance and financial services cover freight insurance on goods imported and other direct insurance such as life insurance; financial intermediation services such as commissions, foreign exchange transactions, and brokerage services; and auxiliary services such as financial market operational and regulatory services.
3	Insurance and financial services (% of service exports, BoP)	Insurance and financial services cover various types of insurance provided to nonresidents by resident insurance enterprises and vice versa, and financial intermediary and auxiliary services (except those of insurance enterprises and pension funds) exchanged between residents and nonresidents.
4	Insurance and financial services (% of commercial service exports)	Insurance and financial services cover freight insurance on goods exported and other direct insurance such as life insurance; financial intermediation services such as commissions, foreign exchange transactions, and brokerage services; and auxiliary services such as financial market operational and regulatory services.
5	Insurance and financial services (% of service imports, BoP)	Insurance and financial services cover various types of insurance provided to nonresidents by resident insurance enterprises and vice versa, and financial intermediary and auxiliary services (except those of insurance enterprises and pension funds) exchanged between residents and nonresidents.

Table 2: Defining the Criteria of Acceptability

Code	Indicators	Criteria
1	Financial intermediary services indirectly Measured (current LCU)	Maximum better
2	Insurance and financial services (% of commercial service exports)	Maximum better
3	Insurance and financial services (% of service exports, BoP)	Maximum better
4	Insurance and financial services (% of commercial service imports)	Maximum better
5	Insurance and financial services (% of service imports, BoP)	Maximum better

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Analysis, Results and Discussion

The generic formula for representing the matrix of dataset;

$$x_i(k) = \begin{bmatrix} x_1(1)x_1(2) & \cdots & x_1(m) \\ \vdots & \ddots & \vdots \\ x_n(1)x_n(2) & \cdots & x_n(m) \end{bmatrix}$$

In the next step we establish a reference sequence using classical rule of reference and comparison.

Table 3: Original Dataset

Sr.	Country	1	2	3	4	5
0	Reference Sequence	16,794,173,000,000.00	41.51	41.51	25.56	22.86
1	Algeria	115,046,090,961.69	9.66	9.55	2.59	2.51
2	Armenia	11,372,552,532.87	1.97	1.93	3.70	3.64
…	…	…	…	…	…	…
…	…	…	…	…	…	…
30	Rwanda	8,794,193,521.86	2.08	1.48	1.55	1.37
31	Samoa	711,996,792.35	2.77	2.77	7.11	6.96
…	…	…	…	…	…	…
…	…	…	…	…	…	…
61	West Bank and Gaza	18,047,500,000.00	0.02	0.02	4.77	4.27
62	Zambia	15,175,621,200.82	8.98	8.98	8.90	8.57

The data in the original dataset table cannot be compared due to measurement variances. Due to this reason, values must be transformed in [0, 1] interval by normalization operation (Ertuğrul, Öztaş, Özçil, & Öztaş, 2016). Normalized comparable sequence is shown in the following table;

Table 4: Normalized Comparable Sequence

Sr.	Country	1	2	3	4	5
0	Reference Sequence	1.0000	1.0000	1.0000	1.0000	1.0000
1	Algeria	0.0068	0.2325	0.2297	0.0433	0.0528
2	Armenia	0.0006	0.0470	0.0460	0.0897	0.1054

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…	…	…	…	…	…	…
…	…	…	…	…	…	…
30	Rwanda	0.0005	0.0498	0.0352	0	0
31	Samoa	2.4246	0.0664	0.0664	0.2314	0.2599
…	…	…	…	…	…	…
…	…	…	…	…	…	…
61	West Bank and Gaza	0.0010	0	0	0.1340	0.1348
62	Zambia	0.0008	0.2159	0.2160	0.3061	0.3350

The values in original dataset have "maximum better" characteristic, so the normalized values are attained by using Eq. 1.

$$x_i^*(k) = \frac{x_i^{(0)}(k) - \min x_i^{(0)}(k)}{\max x_i^{(0)}(k) - \min x_i^{(0)}(k)}$$

For example, **1** (variable code) for Algeria is calculated as;

$$x_i^*(1) = \frac{\max x_1^{(0)}(1) - \min x_1^{(0)}(1)}{\max x_1^{(0)}(1) - \min x_1^{(0)}(1)} = \frac{115046090961.69 - 304802105.90}{16794173000000.00 - 304802105.90} = 0.0068323$$

Similarly, other values are obtained by Eq. 1 as well.

Once the normalized sequence is attained, the deviation sequence is measured between the reference sequence and comparable sequences to calculate the grey relational coefficient (Ertuğrul, Öztaş, Özçil, & Öztaş, 2016). The calculated values are as follows:

Table 5: Deviation Sequence

Sr.	Country	1	2	3	4	5
0	Reference Sequence	1.0000	1.0000	1.0000	1.0000	1.0000
1	Algeria	0.9931	0.7674	0.7702	0.9566	0.9471
2	Armenia	0.9993	0.9529	0.9539	0.9102	0.8945
…	…	…	…	…	…	…
…	…	…	…	…	…	…

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30	Rwanda	0.9994	0.9502	0.9647	1.0000	1.0000
31	Samoa	0.9999	0.9335	0.9335	0.7685	0.7400
…	…	…	…	…	…	…
…	…	…	…	…	…	…
61	West Bank and Gaza	0.9989	1.0000	1.0000	0.8659	0.8651
62	Zambia	0.9991	0.7840	0.7839	0.6938	0.6649

The values in the above table are calculated by using Eq. 4:

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

For Example, 1 for Algeria is calculated as:

$$\Delta_{01}(1) = |x_0^*(1) - x_1^*(1)| = |1 - 0.006832332| = 0.993167668$$

The deviation sequence calculates the distance between the values of comparable sequences and the values of the reference sequence. If the value of deviation is close to 1, then that comparable sequence is far away from the reference sequence. But if the value of deviation is close to 0, they are close to each other (Ertuğrul, Öztaş, Özçil, & Öztaş, 2016).

Grey Relational coefficients are calculated using Eq. 3, once the deviation sequence is attained. The calculated values are as follows:

Table 6: Grey Relational Coefficients

Sr.	Country	1	2	3	4	5
0	Reference Sequence	1.0000	1.0000	1.0000	1.0000	1.0000
1	Algeria	0.3348	0.3944	0.3936	0.3432	0.3455
2	Armenia	0.3334	0.3441	0.3438	0.3545	0.3585
…	…	…	…	…	…	…
…	…	…	…	…	…	…
30	Rwanda	0.3334	0.3447	0.3413	0.3333	0.3333
31	Samoa	0.3333	0.3487	0.3487	0.3941	0.4032
…	…	…	…	…	…	…
…	…	…	…	…	…	…

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61	West Bank and Gaza	0.3335	0.3333	0.3333	0.3660	0.3662
62	Zambia	0.3335	0.3894	0.3894	0.4187	0.4292

For example, before calculating the coefficient of 4 for Algeria, the biggest deviation and the smallest deviation are needed,

$$\Delta_{max} = \max\max\left|x_0^*(4) - x_j^*(4)\right| = 1 \quad , \quad \Delta_{min} = \min\min\left|x_0^*(4) - x_j^*(4)\right| = 0$$

After that, by the help of Eq. 3,

$$[(x_0^*(k), x_i^*(k))] = \frac{\Delta_{min} + \xi\Delta_{max}}{\Delta_{0i}(k) + \xi\Delta_{max}}$$

Grey Relational coefficient is calculated as follows;

$$\gamma[(x_0^*(4), x_1^*(4))] = \frac{\Delta_{min} + \xi\Delta_{max}}{\Delta_1(4) + \xi\Delta_{max}} = \frac{0 + (0.5 \times 1)}{0.956678496 + (0.5 \times 1)} = 0.34324664$$

Coefficient in Eq. 3 was chosen as 0.5 for calculating Grey Relational coefficients.

Grey Relational grade is measured after Grey Relational coefficients are attained. The importance of each variable was selected equal. Grey Relational grades are as follows;

Table 7: Grey Relational Grade

Sr.	Country	Grade	Sr.	Country	Grade	Sr.	Country	Grade
0	Ref. Seq.	1.0000	21	Panama	0.3783	43	Sri Lanka	0.4029
1	Algeria	0.3623	22	Paraguay	0.3800	44	Sudan	0.3565
2	Armenia	0.3469	23	Peru	0.3658	45	Sweden	0.3586
3	Bolivia	0.3548	24	Philippines	0.3545	46	Switzerland	0.4132
4	Cambodia	0.3562	25	Poland	0.3565	47	Tajikistan	0.3504
5	Comoros	0.3697	26	Portugal	0.3872	48	Tanzania	0.3479
6	Congo, Dem. Rep.	0.5405	27	Qatar	0.3426	49	Thailand	0.3577
7	Dominica	0.4229	28	Romania	0.3492	50	Timor-Leste	0.3593

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8	Eswatini	0.4623	29	Russian Federation	0.3372	51	Togo	0.3943
9	Ethiopia	0.3435	30	Rwanda	0.3656	52	Tunisia	0.3403
10	Guinea	0.4288	31	Samoa	0.3384	53	Turkiye	0.3810
11	Iraq	0.4499	32	San Marino	0.3564	54	Uganda	0.3448
12	Jamaica	0.3624	33	Saudi Arabia	0.3777	55	Ukraine	0.3476
13	Jordan	0.3868	34	Senegal	0.3394	56	United Kingdom	0.4873
14	Kenya	0.4249	35	Serbia	0.3990	57	United States	0.6139
15	Kuwait	0.5559	36	Sierra Leone	0.4088	58	Uruguay	0.3665
16	Libya	0.8668	37	Singapore	0.3465	59	Uzbekistan	0.3452
17	Madagascar	0.3357	38	Slovak Republic	0.3491	60	Vanuatu	0.3559
18	Oman	0.3942	39	Slovenia	0.3549	61	West Bank and Gaza	0.3465
19	Pakistan	0.3585	40	Solomon Islands	0.3639	62	Zambia	0.3920
20	Palau	0.3593	41	South Africa	0.3646			

Grey Relational grades equal to weighted sum of the values in Table 6 (Ertuğrul, Öztaş, Özçil, & Öztaş, 2016). The one with highest correlation is selected the best choice/decision. It is calculated by Eq. 7,

$$\gamma(x_0^*, x_i^*) = \sum_{k=1}^{n} \beta_k \gamma\left[x_0^*(k), x_i^*(k)\right]$$

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For example, the grade for Algeria is calculated as,

$$\gamma(x_0^*, x_1^*) = \sum_{k=1}^{n} \beta_k \gamma\,[x_0^*(1), x_1^*(k)]$$
$$= 0.2 \times (0.334 + 0.39 + 0.393 + 0.343 + 0.345) = 0.362$$

The reason of selecting β_k as 0.2 is 1/5=0.2, according to Eq. 8.

The comparison of countries according to the total score and GRA is shown as follows,

Table 8: Ranks Based on Grey Relational Grade

Sr.	Country	Rank	Sr.	Country	Rank	Sr.	Country	Rank
1	Algeria	*31*	22	Paraguay	*32*	43	Sri Lanka	*13*
2	Armenia	*51*	23	Peru	*21*	44	Sudan	*39*
3	Bolivia	*44*	24	Philippines	*26*	45	Sweden	*35*
4	Cambodia	*41*	25	Poland	*45*	46	Switzerland	*11*
5	Comoros	*24*	26	Portugal	*38*	47	Tajikistan	*46*
6	Congo, Dem. Rep.	*4*	27	Qatar	*18*	48	Tanzania	*49*
7	Dominica	*10*	28	Romania	*57*	49	Thailand	*37*
8	Eswatini	*6*	29	Russian Federation	*47*	50	Timor-Leste	*33*
9	Ethiopia	*56*	30	Rwanda	*61*	51	Togo	*15*
10	Guinea	*8*	31	Samoa	*27*	52	Tunisia	*58*
11	Iraq	*7*	32	San Marino	*60*	53	Turkiye	*20*
12	Jamaica	*30*	33	Saudi Arabia	*40*	54	Uganda	*55*
13	Jordan	*19*	34	Senegal	*23*	55	Ukraine	*50*
14	Kenya	*9*	35	Serbia	*59*	56	United Kingdom	*5*
15	Kuwait	*3*	36	Sierra Leone	*14*	57	United States	*2*
16	Libya	*1*	37	Singapore	*12*	58	Uruguay	*25*

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17	Madagascar	*62*	38	Slovak Republic	*52*	59	Uzbekistan	*54*
18	Oman	*16*	39	Slovenia	*48*	60	Vanuatu	*42*
19	Pakistan	*36*	40	Solomon Islands	*43*	61	West Bank and Gaza	*53*
20	Palau	*34*	41	South Africa	*29*	62	Zambia	*17*
21	Panama	*22*	42	Spain	*28*			

We compared five variables for sixty-two countries related to insurance and finance. We then applied the Grey Relational Analysis

Discussion

This study has compared and evaluated the performance of the countries in the domain of insurance and financial services by using an elaborate quantitative technique known as Grey Relational Analysis (GRA), which is well suited for dealing with uncertain or incomplete information, typical in economic and financial assessments. The population of the study is all countries of the world but only countries with data available for all indicators are chosen i.e. sixty-two countries. Similarly, all the insurance and financial services sectors related indicators are considered but analysis is done on five indicators with completely available data. The financial sector plays a pivotal role in nurturing the economic growth, notwithstanding of the Nation's developmental stage (Fengju, & Wubishet, 2024). Recent studies have shown trends affecting the insurance and financial sectors. Financial performance has become a trending notion in strategic management and corporate finance (Dzingirai, & Dzingirai, 2024). Organizations are under burden to adopt ESG practices to: attract the financial investment, follow the regulatory requirements, rejoin the desires of shareholders, customers & other stakeholders and grasp the expected positive outcomes (Choi, Jeong, & Park, 2024). Financial stress impacts financial markets that leads to financial market unrest which contributes to global financial stress (Hoque, Billah, Kapar, &

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Naeem, 2024). Inflation is a major issue in Pakistan that has a substantial impact on behavior of the consumer, particularly when it belongs to financial investments such as life insurance (Iqbal, & Ahmed, 2019). Similarly, inflation produces unpredictable environment wherein people turn to insurance products for risk reduction and financial stability (Iqbal, & Ahmed, 2019). Furthermore, the efforts of the government to enhance the regulatory environment can also increase investor confidence and can also encourage foreign direct investment. A focused review of Pakistan reveals that, while obstacles remain, there are potential opportunities for growth and development is the said sectors.

Contribution

The study contributes to the existing body of knowledge: i) the grey relational grades, ii) grey relational coefficient and iii) grey relational ranks of each country.

Conclusion

In this study the comparison of Pakistan with 61 other countries provides a benchmark to understand the stance of Pakistan in insurance and financial service development, highlighting strengths and areas for improvements. Results of the analysis can help the policymakers to craft strategies to enhance the regulatory framework and address challenges in the insurance and financial sector. Different financial institutions along with investors can make use of this study to identify opportunities for investment and growth in emerging markets like Pakistan, which will in turn facilitate economic development. In this study sixty-two countries of the world are compared under 5 different criteria. The data for these indicators is obtained from the World Bank Collection of Development Indicators (WDI). In this study the weights of the criteria are considered equal. Using Grey Relational Analysis, valuable information is obtained. Firstly, the reference sequence is generated and the values are normalized. Then, calculation of grey relational grade and grey relational coefficient are developed on comparable sequences. Correlation between reference sequence and comparable sequences can

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be determined after these operations. A sequence with higher correlation is ruled out as a better ideal sequence. From this study we conclude that Libya ranks at the first spot with Madagascar at sixty second spot, while Pakistan ranks thirty sixth (Table 8). As technology continues to evolve, the insurance industry is also shifting toward digitalization to enhance customer experience, streamline operations, and increase efficiency (Asabere et al., 2024). The swift advancement of digital finance has extremely positive implications for both the society and economy (Liu, J., Chen, Chen, & Chen, 2024). Pakistan's insurance and financial service sectors showed moderate performance relative to the global landscape. To improve its in financial and insurance service sectors, Pakistan should work on improving regulatory frameworks, more investment in technology and foster innovation.

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