

Evaluation and Ranking of Pakistani Islamic Banks: Using CAMELS Model with GRA

Abdul Basit¹, Abdul Aziz Khan Niazi², Tehmina Fiaz Qazi³,
Shahrukh Imtiaz⁴

¹Lahore Institute of Science and Technology, Lahore, Pakistan

^{2,3,4}University of Engineering and Technology, Lahore, Pakistan

Abstract

Islamic Banking (IB) is one of the growing constituents of banking sector. This research article aims to evaluate and rank Islamic banks in Pakistan using CAMELS model in combination with Grey Relational Analysis (GRA) to examine the efficiency and soundness of banks. Overall design of the study is comprised of review of literature, data collection and analysis. Using archival research strategy, cross-sectional secondary data for the year 2017 has been obtained from official websites of banks, Pakistan Banks' Association (PBA) and State Bank of Pakistan (SBP). This study follows the philosophy of realism and uses unique mathematical methodology model and assigns a distinct consolidated rank to every Islamic bank. To investigate the issue, the study has employed CAMELS rating system theory, grey system theory and GRA. The results of the empirical analyses show that MCB Islamic Bank Limited (MCB-IBL) occupies first position in terms of efficiency and soundness whereas Bank Islami Limited (BIL), Meezan Bank Limited (MBL), Dubai Islamic Bank Limited (DIBL) and Bank Albaraka Limited (BAL) are second, third, fourth and fifth respectively. Plethora of published research is available on measuring and comparing the performance of Islamic and conventional (i.e. traditional) banks but hardly any research is found that ranks the Islamic banks. The findings reveal significant implications for the management of banks, regulators and customers, as it provides clear understanding of banks' efficiency and soundness.

Keywords: Pakistani Islamic Banks, Soundness, Efficiency, SBP, CAMELS and GRA.

1. Introduction

Islamic Banking (IB) has recently gained momentum and now, it has turned into reality by way of its existence in more than 70 countries of the world. Pakistan, with approximately 200 million people, is really an important hub of IB (Beloufi & Chachi, 2014). For the last four decades, the controversy of IB versus commercial banking had been very hot topic. Lot of research has surpassed and much remains

un-addressed. Researchers from Shariah, law, banking, academia and other disciplines of management have made a lot of theoretical, conceptual and empirical contributions in this dimension. The first modern IB can be traced back in Egypt by the establishment of the MitGhamr Saving Bank in 1963. Later developments in 1973 can be seen when OPEC (Organization of Petroleum Exporting Countries) and OIC (Organization of Islamic Countries) embarked on the foundation of Islamic development banks in 1974. Banking sector is largely envisaged as traditional commercial banks but in the last few decades, IB grew rapidly in terms of size and number of players. Islamic banks were initially established in Muslim countries but the first Islamic bank which was licensed by a non-Muslim country to undertake IB was Islamic Bank of Britain established in August 2004 (Chong & Liu, 2009). In Pakistan, IB started in 1970s and after that it underwent various experiments. As a result, in 2001, Meezan Bank Limited emerged as a first full fledged Islamic bank (Ali & Raza, 2015a). Pakistan is the world's sixth and Muslim world's second most populous country. Pakistan is amongst one of those countries where IB system is purely based on Shariah principles and employs strict rules to ensure interest free banking. Currently, there are five Islamic banks operating in Pakistan such as MCB-IBL, BIL, MBL, DIBL and BAL. They have several characteristics that differ from traditional banking but still services and operations in Islamic and traditional banks have high degree of resemblance with some exceptions of using different names and slogans. The most distinguishing characteristic of Islamic banks is that they operate on profit and loss sharing system and do not pay or charge interest and/or *riba* which is seemingly going to stay long.

Interest free banking is measured against the yardstick of traditional banking. Enormous efforts have been made by religious scholars across the world to conduct the comparative studies of interest free and interest-based banking (Ahmad, 2019). They asserted that interest free financial system is superior to interest based financial system but subject to no dishonesty particularly in financial crises due to high liquidity reserves and capital cushions (Beck et al., 2013; Khan, 1989). Some of the important studies in this context are reported here to set the very outset of the study. Ahmad and Haron (2002) claimed that interest free banking has good business potential and therefore it can be a better alternative to traditional banking system (Dusuki, 2008). Religiosity is not the priority of the banking customers even majority of the advocates of interest free banking give priority to traditional banks (Ahmad et al., 2008). Rashid and Hassan (2009) found core-banking services, confidence and corporal efficiency important than interest free features of banking. On the same token, Widagde and Ika (2008) found no evidence of shuffling of

customers in Indonesian banking despite religious scholars' Fatwas against interest. Almost half of the customers of IB are non-Muslims for the reasons best known to them (Sajjad, 2010) and it shows the adoption of IB among the Muslim and non-Muslim customers (Molyneux & Iqbal, 2005). Suharto (2017) argued that riba and interest are not exactly the same, therefore, not an interchangeable terminology. Central bank of Pakistan, Shariah scholars, bankers and other stakeholders are striving to make this drive success story but despite of lot of research, there is still room for further empirical investigation. Particularly, there is dearth of studies on prioritizing the banks on the basis of soundness, efficiency and performance. Apart from Pakistan, international community is also looking forward for the developments happening in this dimension. Hence, it is imperative for regulators, academia, society and managements of the banks and even for international community to gain rather more accurate and new insights in order to embark on the right decision making. For this reason, authors are opting to conduct the empirical study to rank Islamic banks. This study is planned for underpinning further insights of IB for the stakeholders by analyzing the financial data using different methodology. The rationale behind this research is to provide insights to the customers while making decision to choose the best Islamic bank on the basis of bank's efficiency and soundness (Khan, 2019; Maghfuriyah, 2019). Primary importance of the study is to develop understanding of: i) customers regarding the best possible option, ii) management regarding the possible options for repositioning among banks, iii) regulators for policy decisions, iv) society for social cost and benefit analysis and v) international community to evaluate the drive of IB in Pakistan as compared to other countries. The study provides the instant insights to stakeholders based on a unique mathematical model that assigns a distinct consolidated rank to each bank by using real data. Islamic banks on lower ranks have opportunity to revisit their policies on capital adequacy, assets quality, management soundness, earnings capacity and liquidity. Many attempts have already been made in this dimension but still stakeholders face confusion because there is no study that uses consolidated indices for evaluation and ranking. Problem under investigation is, therefore vital to strike clarity. The study addresses this issue by using GRA in combination with CAMELS Model. GRA was first introduced by Deng (1982). He developed the grey system theory and introduced GRA as part of that theory for analyzing discrete data sets. GRA is a highly effective method for making decisions under uncertainty and confusing situations particularly where there is insufficient or limited data available for analysis. This methodology is widely used in the field of finance, management, engineering, and supply chain etc. It uses wide variety of data sets viz primary, secondary, survey or archival data. This methodology has a lot of advantages over other statistical, mathematical or

theoretical methodologies. GRA requires relatively lesser data and provides more insights. It is a distribution free technique of analysis against distribution based statistical ones. GRA is capable of simultaneously dealing with a multitude of variables having different volumes, scales and units and allows easy operationalization. This study uses a data set extracted from audited financial statements by way of financial ratios (namely CAMELS ratios) as recommended by Basel Committee for Supervision of International Banking. Stepwise procedure of GRA appropriate for secondary data of financial ratios is: construction of an initial decision matrix; normalization of the data set; construction of the normalized data matrix; generation of difference matrix; calculation of grey relational coefficients; ascertainment of grey relational grade and presentation of ranks in ascending order. The rest of the paper is structured into review of relevant literature, methodology, analysis and conclusion.

2. Literature Review

There is influx of literature on multitude of aspects of IB in Pakistan that includes comparative studies of banking industry, performance analysis of Islamic and traditional banks, comparative study of efficiency of Pakistani Islamic banks with that of other countries, customers preferences, efficiency, financial performance of Islamic banks (Ahmad, 2019; Mustafa, 2019). Most of these studies use single-single measures, common statistical methods and financial ratios for analysis but one can rarely find a study using mathematical multi-criteria-decision-making techniques. Some of the relevant studies were critically reviewed and reported here for setting the context of the study.

Islamic banks are differently capitalized, more fluid and more productive than traditional banks (Bitar et al., 2017). Western banks have also taken keen interest in IB and established the separate unit on “interest free” banking in compliance with “Shariah”(Shahzad, 2019) still, the Islamic banks confront challenges in Western nations on recognition, financial framework and administrative limitations (Bitar et al., 2017). A comprehensive study employing ratio analysis on IB has been conducted by Iqbal (2001). The evidence presented in his paper indicates that Islamic banks were more profitable, stable and better capitalized than traditional banks during the period of 1990-1998. Hassan and Bashir (2003) gathered the data of 21 countries over the period of 1994-2001 and findings revealed that financial environment and bank's characteristics have largely affected performance of Islamic banks. Mokni et al. (2016) have conducted an empirical study to investigate the bank risk taking in MENA (Middle East and North Africa) region (Hussain, 2019). The conclusion drawn from this study revealed that risk taking

determinants significantly vary between Islamic banks and traditional banks. Zarrouk et al. (2016) gathered data from 51 sampled Islamic banks operating in MENA region between 1994-2012 to ascertain the factors affecting profitability of Islamic banks and traditional banks. They found several similar elements affecting both Islamic and traditional banks except inflation rate which is negatively associated with Islamic banks profitability. Another empirical study pertaining the MENA region and Southeast Asia region has been conducted by Mezzi (2018) to analyze the efficiency of Islamic banks of the said regions. Results of this study confirmed that Islamic banks are experiencing an improvement in their cost efficiency. Jawadi et al. (2017) investigated the data collected from four regions (i.e. Africa, Asia, Europe and USA) during the period of 2007 to 2016 and revealed that geographical environment effects the performance of Islamic banks. Similarly, this research helps in clarifying the performance differences between Islamic banks in the East (Africa and Asia) and those in the West (Europe and the United States) to provide the means to adjust portfolio decision as per provincial specificities (Jawadi et al., 2017; Malik, 2019).

It is pertinent to explore the research conducted in different Islamic countries and efforts made by different researchers to measure the performance of Islamic banks. Bashir (2001) conducted a study across eight Middle Eastern countries between 1993-1998 to investigate the performance determinants of Islamic banks. He claimed that loans to assets ratio and high leverage ratios affected the performance of Islamic banks. Kader et al. (2007) employed ratio analysis to analyze the performance of traditional banks and Islamic banks of UAE during 2000-2004. Their findings indicate that Islamic banks were more efficient as well as profitable and less risky as well as liquid than traditional banks. Miah and HelalUddin (2017) have collected the data from Islamic and traditional banks of Gulf Cooperative Council (GCC) countries between 2005-2014 to examine the efficiency and stability. They found that Islamic banks were stronger in terms of short-term dissolvability; however, no such distinction exists to the extent of the long-haul solidness. Activities of Islamic banks are not the same as their traditional partners and the outcomes remain factually noteworthy even in the wake of controlling for bank particular factors (Miah & HelalUddin, 2017). Lot of research is surpassed on Islamic Banks of Malaysia. Ariff (1989) has concluded that during the first six years, the financial performance of Bank Islam Malaysia was impressive. Rosly and Baker (2003); Samad (1990); and Samad and Hassan (2000) reported that during 1990s, traditional banks performed better than Bank Islam Malaysia on account of efficiency, liquidity and risk measurement. The results of Kamaruddin et al. (2008) indicated that Islamic banks operating in Malaysia are more efficient at controlling

cost than generating profit. Yahya (2012) employed Data Envelopment Analysis (DAE) technique to compare the efficiency of both traditional and IB systems in Malaysia and concluded that both had same performance level. Saleh and Zeitun (2006) asserted that Islamic banks in Jordan had high growth rate in profitability and credit facilities between the period 1998-2003. In order to measure the performance of Islamic banks operating in Bangladesh, results from Sarkar (1999) provided evidence of different risk characteristics of Islamic products that demand prudential regulation needs to be modified. Hassan (1999) compared private banks and Islamic Bank Bangladesh Limited and the paper argued that Islamic Bank Bangladesh Limited was better than private banks in terms of investment and deposit growth. Eljelly and Elobeed (2013) measured the performance of Islamic Banks of Sudan using factor analysis and found that six factors (i.e. coverage, profitability, liquidity risk, efficiency, control and capital adequacy) carried 74% weightage in variation of performance of Sudanese Islamic Banks. Arslan and Ergec (2010) assessed the efficiency of traditional and Islamic banks of Turkey and concluded that Islamic banks performed better than traditional banks. Erol et al. (2014) have conducted peer comparison analysis between Islamic banks and traditional banks in Turkey between 2001-2009. It also asserted that Islamic banks perform better in assets management and profitability ratios whereas traditional banks perform better in sensitive to market risk and capital adequacy.

It is imperative to shed light on the issue under discussion by reviewing the important studies on IB in Pakistan. Lot of research has previously been conducted on measurement and evaluation of performance of traditional and Islamic banks in Pakistan. An attempt has been made by Ali and Puah (2017) to investigate the factors such as complexity, compatibility, observability, relative advantage and trialability that determine the customer adoption of IB in Pakistan. Majeed and Zanib (2018) found that Shariah supervisory board is not performing its due role to ensure interest free services and transactions offered by Islamic banks in Pakistan. Butt et al. (2018) concluded that users and non-users, both, presume that Islamic banks in Pakistan are not practicing IB in true spirit. Khan and Bhatti (2006) conducted a study in Pakistan to explore the reasons why IB (i.e. interest free) failed by considering socio-economic, religious and political factors of the country under study. The findings of the paper state that there is indispensable need to work along with allied forces to eliminate interest from institution which is damaging the cause of agenda. Similarly, another comprehensive study has been conducted by Khan (2008) to explore the reasons of failure of initiatives of interest free banking in Pakistan since its inception in 1980 to its demise in 2002. Khan (2008) claims that piecemeal solutions used to eradicate the interest from financial

sector, is devoid of real urge and effectiveness. Abbas et al. (2015) used DEA technique together with Malmquist productivity growth index (which is further bifurcated into technological change index, efficiency change index, scale efficiency change index and pure efficiency change index) to get an insight of the reasons for change in productivity of Islamic banks and traditional banks of Pakistan in the sample period of 2005-2009. Results of both techniques showed that growth index of Islamic banks is higher than traditional banks in 2007 and 2008 but in 2009, traditional banks also showed improvement in getting higher productivity change. In addition to this, Malmquist index revealed that amongst others, technological change index is a major source of productivity decline. Abbas and with his colleagues conducted a similar study in 2016. In this study, only DEA technique has been employed to compare the performance of Islamic banks and traditional banks in Pakistan during the period of 2004 to 2009. The study found that the efficiency of Islamic banks is positively related to age, minimum capital requirement, capitalization, size, non-markup expenditure, and GDP and negatively related to inflation, market concentration and profitability (Abbas et al., 2016). Majeed and Zanib (2016) have conducted an empirical study to analyze the efficiency of Islamic banks and traditional banks in Pakistan between 2007-2014. Findings of this study revealed that Islamic banks are less efficient in management, total technical efficiency and pure technical efficiency than their counterpart i.e. traditional banks and Islamic branches of traditional banks. In contrary to the results of Abbas et al. (2016) and Majeed and Zanib (2016) efficiency of Islamic banks of Pakistan is better than traditional banks (Khan et al., 2017). Similar findings have been revealed by Rashid et al. (2017) that Islamic banks in Pakistan have performed better as compared to traditional banks. Admittedly, there is no dearth of literature on IB in general and in Pakistan in particular. The above representation of literature reveals that the literature well addresses the issues like inter-bank/sector comparison, customer's motives/choices/references for choosing islamic banks (Akhtar, 2019; Chowdhury, 2019), dynamics of profitability and/or liquidity of Islamic banks, Islamic HRM practices (Godil, 2019), risk management, relationship of IB with economic growth and monetary policy, inter-country/region comparisons, case studies of differenet products/banks (Bibi, 2019) but the researchers could not find any material research on ranking of Islamic banks of Pakistan on the basis of efficiency and soundness particularly by using some consolidated measure. In fact, there is a gap in literature which needs to be fulfilled in order to help the discerners. However, to the best of authors' knowledge, hardly any study can be found that ranks the Islamic banks in Pakistan on the basis of efficiency and soundness using an internationally acceptable CAMELS model in combination with a very different mathematical technique i.e. GRA.

3. Methodology

This research study follows positivism as research philosophy. It is comprised of literature review, data collection and analysis with mixed methodology. Overall design of the study is envisaged on deductive approach, cross sectional secondary data extracted from financial statements of the banks. The study covers five full fledge Islamic commercial banks presently scheduled with central bank of Pakistan. The study used CAMELS rating system theory, grey system theory and GRA in combination with CAMELS set of financial ratios. The secondary data for the year 2017 has been obtained from official websites of banks, PBA and SBP. The Efficiency of Islamic banks can possibly be assessed through traditional methods for examining profitability and market share but such methodology takes time to make prompt and optimal decision and does not account for all major criteria for assessment (Bibi, 2019). Hamzaçebi and Pekkaya (2011) argued that GRA together with CAMELS model can better assess efficiency/performance of banks. The combination of GRA with CAMELS model can unleash the potential of IB efficiency (Pakkar, 2017).

CAMELS Model: It is widely used model to evaluate the performance of banks (Agarwal & Sinha, 2010; Sangmi& Nazir, 2010). It was first developed by three federal banking supervisors of the United States in 1970s wherein banks were judged on the basis of five different criteria under the acronym C for capital adequacy, A for assets quality, M for management soundness, E for earnings capacity and L for liquidity (Ishaq et al., 2016; Pesendorfer & Lehner, 2016). The capital adequacy ratios identify utilization of capital into a successful investment portfolio. Moreover, capital adequacy ratios track financial risks in terms of interest rate, foreign exchange, and credit risk (Shah, 2019). Thus, the stability of the capital adequacy ratio gives soundness and efficiency of banking operations. Assets quality ratios measure banking healthiness against loss of value of the assets. Lin and Wu (2011) highlight the potential and existing credit risk related to portfolio and advancement of assets, off-balance sheet transactions and investments (Ayo, 2019). Management of banking can be established through technical competence, change execution, superior leadership and administrative ability. Therefore, sound management reflects higher customer satisfaction because quality management drives the efficiency of banking operations while dealing with clients. Earning ability ratios recognize the availability of income to equity shareholders (Karapinar& Dogan, 2015). The earning ability measures capacity to absorb losses, establish an adequate level of capital, pay a dividend to shareholders and financial expansion. Liquidity ratios refer to a situation to obtain adequate funds by converting an asset into the cash. Thus, the liquidity ratios can underpin solvency of

banks (Ishaq et al., 2016). Financial ratios determine how the Islamic banks make sound and efficient process of operations (Ishaq et al., 2016). The Islamic banks can ensure a higher level of efficiency with the help of CAMELS to set a sharia compliance benchmark that inspects and supervises IB operations. Aftab et al. (2015) claim that CAMELS ratios can be used to measure the efficiency of Islamic banks of Pakistan; moreover, the framework of CAMELS ratios helps decision-makers analyze financial health as well as taking a preventive measure from uncertainty. Ishaq et al. (2016) claimed that CAMELS ratios completely focus on financial efficiency of banks which ultimately anticipate the risk and soundness of banks. Rozanni and Rahman (2013) also concluded that CAMELS bank rating is used by bank's management to evaluate financial health and efficiency. CAMELS ratios are used to classify overall conditions of banks and calculated in manner given in Annexure I.

Grey Relational Analysis (GRA): Once the ratios are calculated, GRA has been used to weigh each bank on the basis of CAMELS ratios (i.e. Capital adequacy, Assets quality, Management soundness, Earnings capacity and Liquidity). GRA output helps stakeholders in identifying which bank is better and credible (Aftab et al., 2015). It can also be used for the determination of internal processes that lead to higher efficiency (Özcelik& Özturk, 2014). GRA was applied using the data of ratios in following seven steps. Before applying the procedures of GRA for convenience of handling the criteria, sub criteria and alternatives, we have assigned symbols and fixed target against each criterion (Table 1). Since financial ratios are the criteria, therefore we have also mentioned formulae against each criterion.

Table 1: Assignment of Symbols and Acceptable Target of Each Criteria

Criteria	Name	Formula	Target
Capital Adequacy (C1)			
χ_1	Capital Adequacy Ratio	Tier1+Tier2/Risk Weighted Assets*100	Larger Acceptable
χ_2	Debt Equity Ratio	Debt/Equity	Smaller Acceptable
χ_3	Advance to Assets Ratio	Advance/Assets	Larger Acceptable
χ_4	Government Securities to Total Investment Ratio	GovernmentSecurities/Investments	Larger Acceptable

Assets Quality (C2)			
χ_5	Net NPAs to Total Assets	Net NPA/Total Assets	Smaller Acceptable
χ_6	Net NPAs to Net Advances	Net NPA/Total Loans	Smaller Acceptable
χ_7	Total Investments to Total Assets	Total Investment/Total Assets	Larger Acceptable
χ_8	Gross NPAs to Total Advances	Gross NPA/Total Loan	Smaller Acceptable
χ_9	Advance Yield Ratio	Income on Advances/Total Advances	Smaller Acceptable
Management Efficiency (C3)			
χ_{10}	Total Advance to Total Deposits	Total Advance/Total Deposits	Larger Acceptable
χ_{11}	Profit Per Employee	Profit after tax/Number of Employees	Larger Acceptable
χ_{12}	Business Per Employee	Total Income/Number of Employees	Larger Acceptable
Earning Quality (C4)			
χ_{13}	Markup Income to Total Income	(MarkupIncome-Expended Markup/Total Assets*100	Larger Acceptable
χ_{14}	Growth in Net Profit	Current Years net profit-previous years net profit/Previous Years Net profit*100	Larger Acceptable
χ_{15}	Dividend Payout Ratio	Dividend/Net Profit	Larger Acceptable
χ_{16}	Markup Income to Total Income	Markup Income/Total Income	Larger Acceptable

Liquidity (C5)			
X ₁₇	Liquid Assets to Total Assets	Liquid Asset/Total Assets	Larger Acceptable
X ₁₈	Liquid Assets to Total Deposits	Liquid Assets/Total Deposits	Larger Acceptable
X ₁₉	Government Securities to Total Assets	Government Securities/Total Assets	Larger Acceptable

After assignments of the symbols and fixing the targets, GRA has been applied as follows:

Step 1: Construction of an initial decision matrix using following formula:

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

Where $i=1, 2, \dots, n$ (index of rows) and $j=1, 2, \dots, m$ (index of columns)

Using the CAMELS model (set of financial ratios), the data has been extracted from financial statements of Islamic banks for the year ended on December 31, 2017 (Table 2).

Table 2: Original Data Matrix

	C1			C2					C3					C4					C5				
	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉				
Y ₁																							
	16.44	4.38	0.61	24.44	0.94	0.10	0.18	0.10	0.33	0.96	-219.16	1245.27	9.84	429.09	0.32	6.91	0.14	0.23	4.34				
Y ₂	13.39	11.22	0.66	0.14	0.01	0.02	0.23	0.02	0.09	0.80	46.59	241.85	3.62	87.25	0.00	1.30	0.09	0.11	0.03				
Y ₃																							
	10.17	10.21	0.59	0.77	0.06	0.11	0.16	0.11	0.09	0.72	-30.44	352.43	3.02	150.40	0.11	1.49	0.14	0.17	0.12				
Y ₄	12.89	19.46	0.53	0.69	0.01	0.02	0.16	0.02	0.09	0.62	614.89	3011.70	2.65	-12.46	0.05	1.27	0.28	0.32	0.11				
Y ₅	14.68	14.27	0.55	0.00	0.22	0.41	0.20	0.41	0.09	0.66	1778.49	6657.53	2.34	161.14	0.02	1.63	0.16	0.19	0.00				

Step 2: Normalization of the data set: After getting the ratios in matrix form, the data was normalized. To make value units free and direction free, normalization was carried out. The data was normalized using following formulas:

a). Formula for larger acceptable

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

b). Formula for smaller acceptable

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

c). Formula for target acceptable

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

Table 3: Normalized Data Matrix

	C1		C2		C3		C4		C5										
	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19
Y1	1.00	1.00	0.61	1.00	0.00	0.79	0.29	0.79	1.00	1.00	0.00	0.16	1.00	0.00	0.00	1.00	0.29	0.56	1.00
Y2	0.51	0.55	1.00	0.01	1.00	0.99	1.00	0.99	0.02	0.52	0.13	0.00	0.17	0.87	0.87	0.00	0.00	0.00	0.01
Y3	0.00	0.61	0.46	0.03	0.94	0.77	0.06	0.77	0.03	0.29	0.09	0.02	0.09	0.98	0.56	0.04	0.27	0.29	0.03
Y4	0.43	0.00	0.00	0.03	1.00	1.00	0.00	1.00	0.00	0.00	0.42	0.43	0.04	0.71	1.00	0.00	1.00	1.00	0.02
Y5	0.72	0.34	0.11	0.00	0.77	0.00	0.54	0.00	0.00	0.12	1.00	1.00	0.00	1.00	0.92	0.06	0.36	0.38	0.00

According to acceptable criteria and using the formulae, above referred Table 3 has been constructed which also contains reference series.

Step 3: Construction of the normalized data matrix using following formula:

$$x_i^*(j) = \begin{bmatrix} x_1^*(1) & x_1^*(2) & \dots & x_1^*(m) \\ x_2^*(1) & x_2^*(2) & \dots & x_2^*(m) \\ \vdots & \vdots & \ddots & \vdots \\ x_n^*(1) & x_n^*(2) & \dots & x_n^*(m) \end{bmatrix}$$

Where $i = 1, 2, \dots, n$ $j = 1, 2, \dots, m$
 Generated reference series using following formulas:

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

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

Table 4: Normalized Data Matrix and Reference Series

	C1				C2				C3				C4				C5			
	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	
Reference Series	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
γ_1	1.00	1.00	0.61	1.00	0.00	0.79	0.29	0.79	1.00	1.00	0.00	0.16	1.00	0.00	0.00	1.00	0.29	0.56	1.00	
γ_2	0.51	0.55	1.00	0.01	1.00	0.99	1.00	0.99	0.02	0.52	0.13	0.00	0.17	0.87	0.87	0.00	0.00	0.00	0.01	
γ_3	0.00	0.61	0.46	0.03	0.94	0.77	0.06	0.77	0.03	0.29	0.09	0.02	0.09	0.98	0.56	0.04	0.27	0.29	0.03	
γ_4	0.43	0.00	0.00	0.03	1.00	1.00	0.00	1.00	0.00	0.00	0.42	0.43	0.04	0.71	1.00	0.00	1.00	1.00	0.02	
γ_5	0.72	0.34	0.11	0.00	0.77	0.00	0.54	0.00	0.00	0.12	1.00	1.00	0.00	1.00	0.92	0.06	0.36	0.38	0.00	

Step 4: Difference Matrix Calculation: Difference matrix has been calculated by using following formula:

$$\Delta_{ij} = \begin{bmatrix} \Delta_{0i}(j) = |x_0^*(j) - x_i^*(j)| \\ \Delta_{01}(1) & \Delta_{01}(2) & \dots & \Delta_{01}(m) \\ \Delta_{02}(1) & \Delta_{02}(2) & \dots & \Delta_{02}(m) \\ \vdots & \vdots & \ddots & \vdots \\ \Delta_{0n}(1) & \Delta_{0n}(2) & \dots & \Delta_{0n}(m) \end{bmatrix}$$

Table 5: Calculation of Difference Matrix

	Capital Adequacy				Assets Quality				Management Efficiency				Earning Quality				Liquidity			
	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18	X19	
γ_1	0.00	1.00	0.39	0.00	0.00	0.79	0.71	0.79	0.00	0.00	1.00	0.84	0.00	1.00	1.00	0.00	0.71	0.44	0.00	
γ_2	0.49	0.55	0.00	0.99	1.00	0.99	0.00	0.99	0.98	0.48	0.87	1.00	0.83	0.13	0.13	1.00	1.00	1.00	0.99	
γ_3	1.00	0.61	0.54	0.97	0.94	0.77	0.94	0.77	0.97	0.71	0.91	0.98	0.91	0.02	0.44	0.96	0.73	0.71	0.97	
γ_4	0.57	0.00	1.00	0.97	1.00	1.00	1.00	1.00	1.00	1.00	0.58	0.57	0.96	0.29	0.00	1.00	0.00	0.00	0.98	
γ_5	0.28	0.34	0.89	1.00	0.77	0.00	0.46	0.00	1.00	0.88	0.00	0.00	1.00	0.00	0.08	0.94	0.64	0.62	1.00	

Table 5 contains the difference between reference series and respective data points in series concerned.

Step 5: Grey Relational Coefficients Calculation: Grey relational coefficients have been calculated by using following formula:

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

Table 6: Calculation of Grey Relation Coefficients

	Capital Adequacy			Assets Quality					Management Efficiency				Earning Quality			Liquidity			
	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅	X ₁₆	X ₁₇	X ₁₈	X ₁₉
γ ₁	1.00	0.33	0.56	1.00	1.00	0.39	0.41	0.39	1.00	1.00	0.33	0.37	1.00	0.33	0.33	1.00	0.41	0.53	1.00
γ ₂	0.51	0.48	1.00	0.33	0.33	0.34	1.00	0.34	0.34	0.51	0.37	0.33	0.38	0.80	0.79	0.33	0.33	0.33	0.33
γ ₃	0.33	0.45	0.48	0.34	0.35	0.39	0.35	0.39	0.34	0.41	0.36	0.34	0.35	0.96	0.53	0.34	0.41	0.41	0.34
γ ₄	0.47	1.00	0.33	0.34	0.33	0.33	0.33	0.33	0.33	0.33	0.46	0.47	0.34	0.63	1.00	0.33	1.00	1.00	0.34
γ ₅	0.64	0.59	0.36	0.33	0.39	1.00	0.52	1.00	0.33	0.36	1.00	1.00	0.33	1.00	0.86	0.35	0.44	0.45	0.33

Using the data of difference series, the grey relational coefficients matrix has been developed in order to finally calculate grey relational grade. Differentiator coefficient is 0.50 (ζ) whereas all the criteria has been assigned equal weight.

Step 6: Grey Relational Grade Calculation: Grey relational grade for each sub criteria has been calculated by using following formula:

$$\Gamma_{oi} = \frac{1}{m} \sum_{j=1}^m \gamma_{oi}(j)$$

$$\Gamma_{oi} = \frac{1}{m} \sum_{j=1}^m \gamma_{oi}(j) , \sum_{j=1}^m (j) = 1$$

Table 7: Soundness of Efficiency of Banks for Main Criteria

Banks	Capital	Assets	Management	Earning	Liquidity
γ ₁	0.723(1)	0.638(2)	0.568(2)	0.667(1)	0.649(2)
γ ₂	0.580(2)	0.468(3)	0.403(4)	0.575(4)	0.334(5)
γ ₃	0.401(5)	0.365(4)	0.369(5)	0.548(5)	0.387(4)
γ ₄	0.535(3)	0.333(5)	0.421(3)	0.576(3)	0.780(1)
γ ₅	0.481(4)	0.650(1)	0.788(1)	0.635(2)	0.407(3)

According to grey relational grades for sub criteria γ_1 (MCB-IBL) occupies first position on the basis of Capital and Earning whereas γ_5 (BIL) occupies first rank in terms of sub criteria Assets and Management. γ_4 (MBL) occupies first position in terms of Liquidity. γ_3 (BAL) occupies last position on the basis of Capital, Management and Earning. Similarly, γ_2 (DIBL) and γ_4 (MBL) occupy last position in terms of sub criteria Liquidity and Assets respectively. We have also calculated overall grey relational grade and respective ranks for each bank (Table 8).

Table 8: Calculation of Grey Relational Grade and Rank

Banks	Symbol	Grey Relational Grade	Rank
MCB-IBL	γ_1	0.620	1
DIBL	γ_2	0.459	4
BAL	γ_3	0.394	5
MBL	γ_4	0.486	3
BAL	γ_5	0.565	2

Step 7: Presentation of Results by way of Ranks in Ascending Order

Grey relational grade for every bank has been calculated using the formula given above and rank has been assigned against each grade on the basis of value of the grade and the banks are listed in ascending order (Table 9).

Table 9: Presentation of Rank in Ascending Order

Banks	Ranking
MCB-IBL	1
BIL	2
MBL	3
DIBL	4
BAL	5

According to the ranking on the basis of overall grey relational grade, MCB-IBL is first in terms of efficiency and soundness whereas BIL, MBL, DIBL and BAL are second, third, fourth and fifth respectively.

4. Discussion

The main purpose of this study is to develop the understanding of stakeholders on the basis of ranking the Islamic banks. Evaluation and Ranking of Islamic banks have been conducted by using GRA based on CAMELS ratios' secondary data. The analysis indicates that MCB-IBL occupies highest rank whereas, BIL second, MBL third, DIBL four and BAL fifth (the lowest). The result indicates that MCB-IBL should be the first preference for customers and BAL possibly the last preference. Hence, MCB-IBL has to evolve a strategy for maintaining the competitive advantage whereas, the BAL relatively has to reinforce and revisit its strategies. Current study is different from contemporary studies on different counts like methodology, data set, context, sample banks, objectives and approach, the result of which is useful to different stakeholders in many different ways. It is a seminal study conducted for ranking and opening up new prospects for future studies particularly using multi criteria decision making techniques.

5. Conclusion

There is no study presently available on ranking and evaluation of Islamic banks of Pakistan on the basis of efficiency and soundness particularly using combined indices. Debates on the performance of IB has become a vital for discerners. This paper has attempted to provide some empirical evidence with the help of CAMELS and GRA to evaluate the efficiency and soundness of Islamic banks in Pakistan. CAMELS financial ratios were implemented on each Islamic bank and then ranked with the help of GRA technique. Findings of the study show that according to grey relational grades for sub criteria, MCB Islamic Bank Limited (MCB-IBL) occupies first position on the basis of Capital and Earning whereas Bank Islami Limited (BIL) occupies first rank in terms of sub criteria Assets and Management. Meezan Bank Limited (MBL) occupies first position in terms of Liquidity. Bank Albaraka Limited (BAL) occupies last position on the basis of Capital, Management and Earning. Similarly, Dubai Islamic Bank Limited (DIBL) and Meezan Bank Limited (MBL) occupy last position in terms of sub criteria Liquidity and Assets respectively.

This study has significant contribution by way of shedding light on the soundness and efficiency of Islamic banks and ranking them by using combined indices with limited discrete data. This ranking is useful for discerners stakeholders. It also has

contribution by way of implying different techniques to supplement the results of contemporary research. It is also important for the future researchers to investigate the issues on different lines. The findings reveal significant implications for management of banks, regulators and customers, as it provides clear understanding of banks' efficiency and soundness. On the basis of the results of this study, it is recommended that the policy makers should revisit their model of articulation of issues and their analysis. It is also recommended that the customers should prefer high ranking banks and the lower ranking banks should revisit their performance indices.

6. Limitations and Future Research Directions

This study investigates Pakistani Islamic banks only on the basis of cross-sectional data for the year 2017. Future studies may be conducted on the basis of time series and/or panel data in different contexts in order to have rather more depth. To be more specific, the study has limitations also. Firstly, the sample has been taken from Pakistan, therefore, generalizability of the study is limited to data set; therefore, future studies may envisage on the data of other countries or other banks. Secondly, the study uses one of the multi criteria decision making techniques; therefore, the results might be affected by the weaknesses of the methodology (if any). Hence, it is recommended that future researchers should use other multi criteria decision making techniques like ISM, RIDIT, TOPSIS, SWARA etc. Thirdly, the study uses cross sectional data of five banks that obviously gives limited insight; therefore, future researches may be planned to involve panel or time series data for rather deeper insights.

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Annexure I

CAMELS Model (Ishaq et al., 2016; Pesendorfer & Lehner, 2016)

1. The value of Capital Adequacy Ratio was calculated using formula viz

$$\text{Capital Adequacy Ratio} = \frac{\text{Tier1} + \text{Tier2}}{\text{Risk Weighted Assets}} * 100$$

Where Tier 1=Bank's Core Capital& Tier 2=Bank's Supplementary Capital

2. The value of Debt Equity Ratio was calculated using formula viz

$$\text{Debt Equity Ratio} = \frac{\text{Debt}}{\text{Equity}}$$

3. Advances to Assets Ratio was calculated using formula viz

$$\text{Advances to Assets Ratio} = \frac{\text{Advances}}{\text{Assets}}$$

4. Government Securities to Total Investments Ratio was calculated using formula viz

$$\text{Government Securities to Total Investments Ratio} = \frac{\text{Government Securities}}{\text{Investments}}$$

5. Assets Quality of bank was measured by following four ratios:
 - a. Net NPA to Total Assets Ratio was calculated using formula viz

$$\text{NetNPA to Total Assets Ratio} = \frac{\text{NetNPA}}{\text{Total Assets}}$$

Where NPA=Non-Performing Assets

- b. Net NPA to Net Advances Ratio was calculated using formula viz

$$\text{NetNPA to Net Advances Ratio} = \frac{\text{NetNPA}}{\text{Net Advances}}$$

- c. Total Investments to Total Assets Ratio was calculated using formula viz

$$\text{Total Investments to Total Assets Ratio} = \frac{\text{Total Investments}}{\text{Total Assets}}$$

- d. Gross NPA to Total Loans Ratio was calculated using formula viz

$$\text{GrossNPA to Total Loans Ratio} = \frac{\text{GrossNPA}}{\text{Total Loans}}$$

6. Advance Yield Ratio was calculated using formula viz

$$\text{Advance Yeild Ratio} = \frac{\text{Markup Income on Advances}}{\text{Total Advances}}$$

7. Total Advances to Total Deposits Ratio was calculated using formula viz

$$\text{Total Advances to Total Deposits Ratio} = \frac{\text{Total Advances}}{\text{Total Deposits}}$$

8. Profit per Employee was calculated using formula viz

$$\text{Profit Per Employee} = \frac{\text{Profit After Tax}}{\text{Number of Employees}}$$

9. Business per Employee was calculated using formula viz

$$\text{Business per Employee} = \frac{\text{Total Income}}{\text{Number of Employees}}$$

10. Markup Income to Total Income Ratio was calculated using formula viz

$$\text{Markup Income to Total Income Ratio} = \frac{\text{Markup Income} - \text{Expended Markup}}{\text{Total Assets}} * 100$$

11. Growth in Net Profit was calculated using formula viz

$$\text{Growth in Net Profit} = \frac{\text{Current Years Net Profit} - \text{Previuos Years Net Profit}}{\text{Previous Years Net Profit}} * 100$$

12. Dividend Payout Ratio was calculated using formula viz

$$\textit{Dividend Payout Ratio} = \frac{\textit{Dividend}}{\textit{Net Profit}}$$

13. Markup Income to Total Income was calculated using formula viz

$$\textit{Markup Income to Total Income} = \frac{\textit{Markup Income}}{\textit{Total Income}}$$

14. Liquid Assets to Total Assets Ratio was calculated using formula viz

$$\textit{Liquid Assets to Total Assets} = \frac{\textit{Liquid Assets}}{\textit{Total Assets}}$$

15. Liquid Assets to Total Deposits Ratio was calculated using formula viz

$$\textit{Liquid Assets to Total Deposits Ratio} = \frac{\textit{Liquid Assets}}{\textit{Total Deposits}}$$

16. Government Securities to Total Assets Ratio was calculated using formula viz

$$\begin{aligned} \textit{Government Securities to Total Assets Ratio} \\ = \frac{\textit{Government Securities}}{\textit{Total Assets}} \end{aligned}$$