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Are Islamic banks really more solvent than conventional banks in a financially stable period?

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ABSTRACT

The knowledge value produced by this research was established in particular by the methodological challenges of the comparative study. Based on a process of bibliographic research, available conditional observation and the using of the Financial Ratio Analysis Method, the objective of this article is to solve the ambiguity of previous comparative research and innovated an equiprobable comparison between the solvencies of conventional and Islamic banks over the period (2010-2018). Our study is not only a matter of dealing generically with the financial solvency of conventional and Islamic banks but also, we analyzed the inherent implications that may alter the results of a banks' operative evaluation. Two samples were taken from two reference populations existing in the selected countries. The choice of banks is limited to countries whose banking systems incorporate both Islamic and conventional banks. Subsequently, each list bank was reduced based on qualitative and quantitative filtering criteria. Therefore, each conventional bank has its closest Islamic equivalence. This restriction reduced the sample size to 63 banks each. The selected banks are all large and listed in different stock exchanges. In conclusion, we found that conventional banks are more solvent than Islamic banks during a financial stable period.

Contribution/ Originality
This study uses a new estimation methodology and brings a potentially powerful empirical demonstration of the proposed hypothesis. Restriction of size has required the elimination of small banks that are generally not listed. This combination systematically reduces the effect of categorical homogeneity, of differences among banks, of the structures of banks, and of particularities of the solvency of banks in each sample.

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1. INTRODUCTION

Performance is a topic of debate and remains the primary goal of any business without exception (Gilbert and Charpentier, 2004). Numerous studies have focused on the performance of banks because of the impressive development and the accelerated pace of economic growth, marked by a succession of financial crises. Interest in the performance of Islamic Banks (IBs) is growing due to unexpected financial developments. Redesigning this type of institution as a panoply of the global monetary system leads to the intensification of a typical differential competition between two banking models in an increasingly hostile financial world always seeking the maximization of performance and wealth.

The assessment of bank performance is very important for all stakeholders: depositors, bank managers, investors, and regulators. In the financial market, the banks' performance provides a signal to the owners of capital, depositors, and investors to operate or withdraw their funds from the bank. Similarly, the assessment provides a signal to Islamic and conventional bank managers to improve their deposit and loan services or both to improve their financing capabilities. Regulators are also interested in knowing the degree of compliance as well as the horizon of its regulations. Systemic risk could in turn trigger a solvency crisis for banks in such a country ended by the destruction of the banking system at the international level in the broad sense. From here, the world of monetary exchange has given attention to the need to control the banks' solvency. However, previous studies of bank performance are diverse, but they are far from satisfactory (Yeh, 1996; Samad, 1999; Ariff and Khalid, 2000; Samad and Hassan, 2000; Rosly and Bakar, 2003; Webb, 2003; Lacewell, 2003; Halkos and Salamouris, 2004; Samad, 2004b; Yudistira, 2004; Majid *et al*., 2005; Tarawneh, 2006; Fadzlan, 2007; Bader *et al*., 2007; Toumi, *et al*., 2008; Siddiqui, 2008; Moin, 2008; Ben Khediri *et al*., 2008; Olson and Zoubi, 2008; Shamsher *et al*., 2008; Cihak and Hesse, 2010; Safiullah, 2010; Hasan and Dridi, 2010; Hussein and Charif, 2011; Ika and Abdullah, 2011; Jaffar and Manarvi, 2011; Omar and Muhammad, 2012; Johnes *et al*., 2012; Beck *et al*., 2013; Eljelly and Elobeed, 2013; Fayed, 2013; Rozzani and Rahman, 2013b; Moin, 2013; Najjar, 2013; Imran and Nishat, 2013; Al-Kayed *et al*., 2014; Hunjra and Bashir, 2014; Zarrouk, 2014; Cengiz *et al*., 2014; Youssef and Samir, 2015; Jaffar, 2016; Tlemsani and Al-Suwaidi, 2016). Although solvency is a parameter of performance, we have found from the comparison of bank solvency indicators that primary research has suffered from organizational and technical limitations to fill in the required application and analysis. Based on the correspondence of the same performance measures and the same scenarios in the context of classical or Islamic banks, two conclusions have been drawn from the literature. On one hand IBs are more solvent if the tested sample is large. The samples were taken from countries in which both conventional and Islamic banks operate. On the other hand, if the tested sample is average, conventional banks (CBs) are found to be more solvent than their Islamic counterparts. However, some researchers have found that solvency and stability are still volatile in countries where the market share of IBs is larger than that of CBs. CBs tend to be more solvent, but less stable. Nevertheless, this does not preclude a third stream of researchers finding that IBs could not be dominant in a banking market if they operated in parallel with a conventional banking framework (Sarker, 1999a).

Various indices have been provided by financial management theories to measure the performance of banks to distinguish between conventional and Islamic banks in terms of financial performance. Since we have chosen the accounting approach, solvency has very often been used in the literature as a key indicator for measuring changes in financial performance. Among the founders using financial ratios to explain these bank performance indicators we quote (David and Elyas, 1994; Sabi, 1996; Metwally, 1997; Karim and Ali, 1989; Samad, 1999; Samad and Hassan, 2000; Rosly and Bakar, 2003; Kader *et al*., 2007; Olson and Zoubi, 2008; Parashar and Venkatesh, 2010; Hasan and Dridi, 2010; Jaffar and Manarvi, 2011; Iqbal, 2012; Osama *et al*., 2013; Beck *et al*., 2013; Wasiuzzaman and Gunasegavan, 2013; Fayed, 2013; Cengiz *et al*., 2014).

The existence of two banking models in the financial market does not protect the solvency of one part to the solvency of other parts. On the other hand, the literature revealed that the two categories went bankrupt in one context or another if not, the weakness of the solvency of any banks' type varies from one context to another. The period of the Subprime crisis forms a temporal space for reevaluating the conclusions of previous research focused on comparative studies between the solvencies of classical and Islamic banks. Moreover, the deterioration and variability of solvency, the appearance of financial crises randomly and sudden bankruptcy in one type of bank or another with different proportions explain the choice of our period of study. The Subprime financial crisis is, therefore, a good opportunity to test and distinguish the divergence between the two banking models. This crisis has forced developed countries to invent classical and Islamic financial models, alternative arrangements have become necessary, able to save each model apart from everything depends on its particularities.

Although in most cases previous studies results on the comparison between the solvency of Islamic and conventional banks are mixed or contradictory, through our study, we sought to answer definitively the following question: What is the type of banks, really, the most solvent in this comparative framework? This information makes it easier for economic agents and decision-makers to detect the best choices of financial backers in the event of savings and financing when investing in a world of financial competitiveness. Besides, our results will help policymakers set better solvency targets and enable bank managers to allocate capital more effectively, publish clear financial information and communicate a conclusive and definitive answer. Our study provided an overview of the fragility, vulnerability, and instability of conventional and Islamic banking systems, and makes a comparison between the two models. This research work makes it possible to achieve the following objective: establish a radical paradigm of choice between the banking solvencies that allows us to review its degree of validity and develop more precise, decisive and well-argued conclusions. Moreover, as the first contribution to the financial literature, our study answered explicitly to the proposed gap. The second contribution of this article concerns the conditional methodological approach in the choice of the banks' observations and by respecting a severe procedure of application of the statistical tests. Our third contribution is to make a comparison between 16 heterogeneous countries[1] covered three continents in a stable economic context. The fourth contribution, this paper brings a potentially powerful empirical demonstration and a validation of our hypothesis. Restriction of size has required the elimination of small banks that are generally unlisted, this combination systematically reduces the effect of the categorical homogeneity, the size, the extent of differences, and the particularities of banks' structures on the solvency of each sample. In addition, we distinguished between the two types of banks based on a very specific parameter of financial performance rarely taken alone in previous studies, also, we used a single measure of solvency.

The remainder of the paper is structured as follows. Section 2 presents the concept of solvency in banks and literature review based on previous contradictory conclusions. Section 3 describes the methodology and data. Section 4 discusses the empirical results and gives the implications of the findings. Section 5 concludes the study.

2. THEORETICAL APPROACH OF BANK SOLVENCY

For a long time, the previous studies dealing with the IBs' solvency are manifested in the simple research form on the management of financial instruments. It is important to note that these measures were inspired by other studies on CBs (Ariff and Khalid, 2000; Samad and Hassan, 2000). Previous studies have perpetually used proportional and approximate measures to assess CBs'

[1] The choice of countries is based on the simultaneous existence of CBs and BIs in the selected countries, the unavailability of data relating to CBs and IBs (As in Tunisia, Algeria, Singapore, Libya, etc.), take off the countries whose their economic context is not stable (Like Syria and Yemen), the elimination of countries in which we have not found equivalent between CBs and IBs (Like Germany, USA, France, Nigeria, Senegal, etc).

solvency. Subsequently, researchers adapted the same measures to estimate IBs' solvency. The studies for which they have compared the solvency of classical and Islamic banks are divided into two streams. The first current has considered that the joint existence of IBs along with CBs can let the former operate with their full levels of solvency. The decline in the solvency is not only due to the mechanical and systemic inadequacies of IBs, but also to the competition imposed by the conventional banking market; the toxic and restrained financial operations of the conventional banking system, and the contradictions between the particular dimensions of the two banking segments that hinder the smooth functioning of IBs. This does not mean that the success and survival of IBs is conditioned by the existence of a monopoly banking market. IBs can operate with minimal security effectiveness which guarantees its durability even in a conventional banking framework due to its operating system based on the mode of sharing profits and losses. Besides, management of IBs and selection of sectors or areas of activity is done judiciously. However, the second current has considered the lower solvency of IBs as the origin of the systemic inefficiency of the CBs. Moreover, IBs' solvency compared to their conventional counterparts varies from one region to another depending on whether it is an Islamic country or not. This view was justified by the difference between the prudential rules of the transactions applied in the two banking segments. In fact, the risk level taken by the lender by granting credit via Mushraka or Mudaraba is higher than the risk level generated by the techniques involved in commercial-type financing (Khan, 2012; Thomi, 2014).

The choice of such a ratio depends on the importance of the obtained results (Modell, 2004; Vakkuri and Meklin, 2006), the inclusiveness, the complementarity and the precision of this ratio. This ensures the logic of interpretation and is a good means of analysis and an effective method of management. However, research in the literature has shown that the simultaneous highlighting of multiple solvency ratios has revealed contradictory or non-conclusive conclusions. Table 1a illustrates some comparative and recent studies between the solvency of classical and Islamic banks already published in the literature (See Appendix).

Referring to previous comparative studies of bank solvency through the use of multiple ratios, we have noticed that the conclusions are almost always mixed. They are sometimes similar, but they are also sometimes contradictory from one study to another. In both scenarios, the advanced results are inconclusive due to the lack of convincing confirmations and lack of generalization. Since the use of various ratios or the solvency measures are not efficient enough to obtain unique results, we have developed a new approach in our work. It consists of testing its approach is to test a single measure of efficiency in order to have convincing final answers.

Few studies have focused on the degree of IBs' solvency, despite that this issue has been widely explored against CBs. The Subprime crisis has not only cast doubt on the smooth functioning of CBs, but it has also triggered attention to demonstrate the solvency horizon of the IBs. To assess banks' solvency and the degree of exposure to credit risk, several methods of analysis are available to researchers. Although our choice was pre-established on the ratio method, we used the usual measure. Solvency ratios are primarily related to financial leverage. Leverage represents the extent to which a bank relies on debt financing rather than equity (Osama *et al*., 2013). Indeed, solvency also measures the degree of repayment of the credits granted and the financial risk that the bank has faced. (Tandelilin *et al*., 2007) concluded that Loan to Deposits Ratio has a significant effect on performance at a 1% confidence level. A bank is solvent when the total value of its assets exceeds its liabilities.

In the broad sense, a high level of this ratio can lead to a high probability of bankruptcy (Norhidayah *et al*., 2011). The measures on which most analyses of a bank's solvency are based rely heavily on the financing of debt rather than equities. On the one hand, these ratios determine the likelihood that a bank will not meet the demand for credit and the possibility that it will be able to meet its long-term debt obligations (Osama *et al*., 2013). On the other hand, the ratios measure the bank's ability to not pay its debts to its lenders. The higher the debts of a bank, the more it will become unable to

fulfill its contractual obligations. In other words, high leverage translates into rising debt levels, which can lead to financial distress and increase the likelihood of bankruptcy.

In the case of CBs, the Loans to Deposits rapport represents the depositors' contribution to cover loans granted by banks to their borrowers. Banks with low solvency ratios are considered to have excess liquidity. Besides, they are characterized by potentially low levels of risk, which means they are less profitable than CBs with high solvency ratios. However, a high solvency ratio indicates that the bank has taken a considerable financial stress (risk) following the granting of excessive loans to these depositors, up to the approval of loans with high exposure to losses and losses at low collection rates granted to doubtful or insolvent customers.

In contrast, in the case of IBs, the situation is different, since they are prohibited from granting loans and earning interest. Loans include project financing. Banks finance only projects that produce additional value. Several previous studies have confirmed the resilience of IBs during the Subprime crisis more than their conventional counterparts. They justified the enormous capacity of financing the engagements by the quality of investment portfolios performed by IBs. Reversals on these investments allow IBs to reduce their debts and improve in part their solvency levels. Solvency ratios provide a picture of a bank's ability to generate Cash-Flow and meet its long-term financial obligations. In other words, if the amount of total banking assets is greater than the amount of all types of debt (its own funds), then the bank is considered solvent. Deposits are a major responsibility and a contractual alliance commitment for all banks' types, be they Islamic or conventional. In IBs, this rapport signifies the ability of IBs to cover their claims for customer loans through deposits collected, while respecting the restrictions of Islamic Sharia.

A low ratio of depositors provides a significant proportion of loans to banks, which lead to a lack of liquidity. This makes it easier for banks to meet their commitments on time. On the contrary, a high ratio means that the bank is in financial difficulty because of insufficient liquid assets to meet their unexpected fund requirements.

As previous studies dealing with the topic of a convergent or recurrent conflict, the comparative results revealed in some cases the priority of Islamic banking because they are less risky and more solvent (Samad, 2004b; Kader *et al*., 2007; Moin, 2008; Hanif *et al*., 2012). However, other studies confirmed that CBs are more solvent and generated fewer risks, whereas, IBs were found to be riskier (Hasan and Dridi, 2010; Fayed, 2013).

In this context, Fayed (2013) carried out a differential comparative study between the solvency of IBs and that of CBs in Egypt during the period between 2008 and 2010. She followed solvency through the "Banco-meter model". She concluded that both types are considered insolvent, but IBs have shown superior insolvency. In the same way of thinking, Mousa (2015) studied the solvency risk of listed Bahraini banks in the period (2010-2013). She used the financial ratio analysis method and the non-parametric technique (DEA). To measure solvency, she used two ratios: Total Loans to Total Deposits and Capital Adequacy. The analysis of financial ratios did not sign definitive conclusions about the solvency capacity of CBs in Bahrain. In addition, banks periodically solvent in a year or rather the banks which recorded a single significant ratio were not solvent in other years in terms of periods and type of ratios.

In contrast, Ola and Suzanna (2015) studied the difference in the solvency between Islamic and conventional banks in UAE over the period (2008-2014). The study included panel data from 16 banks in the UAE, 5 of which are Islamic and 11 are conventional. To test the statistical difference, they chose the financial ratios analysis method (FRA). The empirical results showed the existence of a significant difference between the solvency indicators of the two types of banks. They concluded that CBs are, on average, more solvent and less risky compared to their Islamic counterparts (Kader *et al*., 2007).

However, other studies in the literature have found an inverse effect to that of the previous effect. In this sense, Samad and Hassan (2000) conducted a comparative study between BIMB's solvency risk and a group of eight classical Malaysian banks in two periods (from 1984 to 1989) and (from 1990 to 1997) using the analysis of variance method (ANOVA). They used three solvency ratios: Debt on Equity Ratio, Total Debt/Assets ratio and Total Loans/Total Deposits. They found that BIMB is quite solvent and less risky than the eight CBs. Average leverage (Debt Ratio) and Multiplier Equity Ratio increased significantly at the 0.5% level from (9.14) to (19.59) and (10.38) to (19.49), respectively. Similarly, Loans to Deposits Ratio reflected a considerable deterioration in the BIMB specific risk. This deterioration was explained by the massive holding of Islamic capital compared to the less capitalized CBs. In the end, Samad and Hassan, have shown that the Islamic Bank (IB) has resisted more against losses on loans between (1984-1989) and (1990-1997). The involvement of Islamic loans in the presentation of special products (Mudarabah and Musharakah) increased from (0.0002) to (0.002), except that the difference in averages between the two periods is not statistically significant. As a result, this finding held back all promulgation initiatives and decisive statements about the recognition of expanded Mudarabah and Musharakah loan offers during this period.

Indeed, Toumi *et al*. (2008) compared the solvency of Islamic and conventional banks in a sample of CBs consisted of 59 institutions and a sample of IBs made up of 50 institutions in 18 countries over the period (2004-2008). To measure the banks' solvency, they used the method of analysis by ratios. Four ratios were identified, Total Debt to Common Equity, Long-Term Debt Common Equity and Total Debt to Total Asset, and the Size of the Banking Asset. The empirical results revealed that IBs have a Debt to Equity Ratio, a Debt to Assets Ratio and a Long Term Debt Ratio lower than those of CBs. Empirical results have also revealed that IBs have less leverage compared to the leverage effects recorded in CBs.

Similarly, Sehrish *et al*. (2012) compared the financial performance of an IB with their conventional counterparts in Pakistan over the period (2007-2011). To measure solvency, they used the financial ratios analysis method. The analysis of the results of all the risk and solvency measures indicated that there is a statistically significant difference between the solvency parameters. They found that in terms of lending, IBs are less risky and more solvent than their conventional counterparts. This indicates that the two groups of banks do not belong to the same risk class.

Also, Onakoya and Onakoya (2013) conducted a study to compare the solvency of CBs and IBs in the United Kingdom during the period (2007-2011). They chose three financial ratios to measure solvency risk: Equity Multiplier, Debt to Total Assets Ratio and Debt to Equity Ratio. Empirical results have shown that IBs are less exposed to solvency risk, while CBs rely more on additional external sources of finance.

In addition, Hanif *et al*. (2012) compared the solvency capacity of a Pakistani IB (Meezan Bank Limited) to 5 CBs over the period (2003-2007). Solvency was measured by a Banco-meter model already developed by Shar *et al*. (2010). The results showed that the IB is more solvent (less risky) than the list of CBs.

Similarly, Bilal and Amin (2015) analyzed whether IBs are less operationally risky than CBs in Pakistan during and after the Subprime crisis. They supported Loan to Deposit Ratio (LDR) to measure the degree of solvency risk of Islamic and conventional banks. The analysis period is between 2007 and 2012. They concluded that IBs had less solvency risk than their conventional counterparts throughout the study period. Indeed, Kader *et al*. (2007) confirmed the same result in the UAE.

Moreover, Maysa and Rasha (2015) conducted a comparative study aimed at comparing the financial performance of IBs compared to their conventional competitors in the Jordanian banking market during the period (2009-2013). Their work was applied to a sample of 13 CBs and another sample of 3 IBs. They chose the ratio analysis approach to study performance in terms of profitability,

liquidity, efficiency, and solvency. From the empirical results, Maysa and Rasha (2015) revealed that in Jordan, IBs are found to be statistically more liquid, more solvent and less efficient than their conventional counterparts during the study period. This indicates that IBs are less risky, which reflects their financial strength to pay their debtors.

Hence our hypothesis is the following:

Hypothesis: IBs are more solvent than CBs in a financial stable period.

To overcome the theoretical confusion of this subject and to answer the question posed in the literature review, in the next section, we proceed to empirically demonstrate the evolutionary aspects of the solvency of Islamic and classical banks from a comparative perspective. In what follows, we try to answer and interpret empirically the test which aims to provide answers to the question previously asked: Are the IBs really financially more solvent and more solid than CBs or is the opposite assertion right?

3. METHODOLOGICAL FRAMEWORK

According to the literature review of this topic, we tested the empirical validity of the hypothesis already proposed and to qualify the interdependence, which may exist, between the solvency of CBs and that of IBs. Numerous studies have confirmed the advantage of of IBs because they can withstand international financial crises and economic collapses (Jouini and Pastre, 2009; Siddiqui, 2009). Indeed, other comparative studies have demonstrated the stability of the Islamic financial system and its continued ability to ensure sustainable improvement of the solvency of IBs even after the occurrence of the crisis. However, a third current has proved that the assumption of financial strength / fragility of Islamic and conventional banks has been destroyed during difficult periods of financial crisis / stability.

To continue our approach, we began our empirical study after having discussed the main empirical results elaborated on the topic of the financial stability of the banks. This section is structured as follows: We develop the related methodological choices in the first section and we discuss our empirical evidence in section 2 after analyzing the comparative results of the solvency values of IBs and CBs.

In this section, we highlight the best operational approach of comparing solvencies' ratios of conventional and Islamic banks. We adopted the Financial Ratios Analysis Method which is the most practical method applied after an adaptation procedure and a convergent methodological demonstration. This choice is explained by several reasons. First, all performance indicators are measured by non-confirmatory ratios (Teker *et al*., 2011; Rashid and Khaleequzzaman, 2015). Secondly, because the solvency specific data of conventional and Islamic banks are not easily collected from their annual reports, the reduction of our samples' size is crucial since the requested information on solvency is not always disclosed. Finally, given the available banking information, we conducted a conditional study, in which the selection of observations constitutes a methodological contribution of high-quality results and a basic limit to the data collection process. The preliminary observations taken into account necessarily affected the hypotheses put forward, so that the observation that does not comply with the rules of the game has been eliminated in the order of the following hypotheses until the two final samples are obtained. Our contribution is to compare a single solvency ratio.

First, we explained the procedure for selecting two bank samples definitively selected after applying the database collecting method. In the second step, we defined the two measures of variables. Afterward, we have exploited the preferable method to interpret the results found.

3.1. Description of the Samples

3.1.1. Constitution of the samples

Both samples tested were taken from two base populations. The first population constituted by 1788 conventional financial institutions, while the second population composed of 467 Islamic financial institutions. These populations covered three continents: Europe, Asia, and Africa. Sixteen countries are involved in our work: Egypt, Bangladesh, Indonesia, Pakistan, Malaysia, Turkey, United Kingdom, Bahrain, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, United Arab Emirates, South Africa, and Sri Lanka.

However, after the exclusion of all financial institutions operating with specific regulations, we tested samples include only purely conventional or Islamic banks. Besides, given the difficulties in collecting financial information, we excluded banks for which we detected missing observations, variables or data. Moreover, we also dismissed multi-type mutated banks (IB with conventional windows and CB[2] with Islamic windows). These three conditions allowed us eliminate 337 conventional financial institutions and 231 Islamic financial institutions. Subsequently, the number of remaining banks of each type of bank was reduced based on qualitative and quantitative filtering criteria (equality of samples, type of activity, similarity of country's origin, bandwidth). Therefore, each CB has its closest Islamic equivalence, taken from the same country in terms of capital and size. This restriction reduced our samples' size to 63 banks each. Finally, after several elimination and deletion steps, we obtained two pairs of equal samples (n1= n2)[3].

3.1.2. Data collection

The data was collected from the DATASTREAM database. To better understand the dissimilarities between the two groups of banks and to improve the clarity of the results, the choice of the observations relates essentially to individual data, even if the bank belongs to a group of banks. Nevertheless, the accuracy of the results required following a data filtering procedure so that observations containing some missing data were eliminated. For this reason, we have been careful to remove financial institutions that do not qualify as banks. Furthermore, we have also excepted the banks belonging to the same sample whose types are heterogeneous in order to obtain a sample of CBs which is almost similar to its Islamic counterpart and vice versa.

Similarity includes also equality between CBs and IBs samples' size. Moreover, the number of IBs chose from each country is equal to the number of CBs in the same country. While, as revealed in Table 1, the affinity means that in each country, the conventional or the Islamic bank (CoB[4], InB[5] or UnB[6]) of the first sample must have its counterpart of the second sample located at the same country with a probability of 94.7%~(95%). After filtering, each sample has a total of 63 banks and 567 observations collected during the period (2010-2018). The following table summarizes of the process followed, as well as the different stages of the observation selection process.

Table 1: Samples filtering process of classical and Islamic banks

Gait	Number of CBs	Number of IBs
Populations of initial financial institutions	1788	467
Exclusion of non-bank financial institutions and banks whose data are not published, available or have missing data as well as non-	1451	236

[2] CB: Conventional Bank
[3] See the steps of the filtering process in Table 1
[4] CoB: Commercial type
[5] InB: Investment type
[6] UnB: Universal type

conventional or Islamic banks.						
Exclusion of additional banks at the limit of choice of similar banks and converge.		274			168	
Final sample		63			63	
Bank type	CoB	InB	UnB	CoB	InB	UnB
Number of banks	41	15	7	36	19	8
Proportion of total sample	65.08%	23.81%	11.11%	57.14%	30.16%	12.70%
Similarity rate	92.06%	93.65%	98.41%	92.06%	93.65%	98.41%
Difference rate	7.94%	6.35%	1.59%	7.94%	6.35%	1.59%

3.2. Measurement of the variables to be compared

Since the findings in the literature are inconclusive due to the heavy use of financial ratios, we symbolized the solvency by a single ratio. Our ratios choice is justified by two main reasons. On the one hand, in practice, a deep contention arises. The large CBs listed adopt accounting rules established by international standard setters (IASB)[7] and (FASB)[8]. The prohibition of using of interests means that some conventional accounting practices may not be applicable in Islamic financial institutions. Therefore, not all measures are valid for performing a comparative study between banking systems. In this case, the choice of a single ratio to assess the solvency situation provides conclusive results that better reflect the bank's reality, whatever its type. On the other hand, the two models differ in terms of the asset valuation method, the drafting of financing contracts, the recognition and treatment of income (Ahmed, 2002; Haniffa and Hudaib, 2002). Therefore, the financial ratios of the two models are not calculated in the same way and the informational content of its measures will not be treated and interpreted identically. To remedy these problems, (A.A.O.I.F.I.)[9] has issued custom-tailored accounting and auditing standards in coordination with other specific agencies for use by listed and unlisted IBs. This does not mean that existing conventional accounting measures and concepts will all be ignored or adopted. But, concepts inconsistent with Sharia rules have been rejected or modified, while concepts converging with Sharia principles have been incorporated into the norms) (Lewis and Algaoud, 2001).

Although each country has its own accounting framework that is more/less different from other countries, this is the theoretical proof that avoids the lack of clarity related to differences in the application of accounting standards. Before the determination of the financial ratios, the account must be taken of the constitutional and functional differences between CBs and IBs. Practically, the functions of IBs resemble those of CBs. Islamic scholars have compared the discrepancies to develop similar products to those of CBs, allowing them to replace interest rate payments and update fee (Beck *et al*., 2013; Ada and Dalkilic, 2014). For example, Waseem (2008) argued that financing costs are almost the same in IBs and CBs. His argument was that interest rates take into account administrative costs, the sharing of profits and record ancillary costs.

In particular, (Turen, 1996) has assimilated methods for calculating financial ratios of the two types of banks. He suggested that the IB activity depends on the combined effect of three laws governing the degree of the gap between the two banking models. First, the deposits holders at the level of CBs are replaced by the shareholders of IBs. Second, interest paid to depositors is converted by shared profits or losses. Third, loans to CBs customers are converted into equity investments in IBs. Compliance with these three principles indicates that most financial ratios in the two categories of banks are defined in the same way. However, the net income of an IB includes the conventional net income before taxes, plus Zakat, which has been supplemented by the income tax. Moreover, interest expenses are replaced by commission income and expenses. Indeed, the loans and advances granted by the CBs are essentially equivalent to the investments according to the technique of Mudaraba,

[7] IASB: International Accounting Standards Board
[8] FASB: Financial Accounting Standards Board
[9] A.A.O.I.F.I.: Accounting and Auditing Organization For Islamic Financial Institutions.

Murabaha, and Moucharaka. As a result, all researchers tend to evaluate the major sections of the financial statements of two banks' types. They find that the main elements are almost similar.

To measure bank solvency, we have separated this notion by a single indicator. Table 3 summarizes all the information needed to qualify this variable.

Table 2: Clarification, description, and symbolization of banks' solvency

CBs Rating	IBs Rating	Measurement	Previous studies
Stc	Sti	Total Loans / Total Deposits	Tandelilin *et al.* (2007) Olson and Zoubi (2008) Bougatef (2011) Norhidayah *et al.* (2011) Onakoya and Onakoya (2013) Ola and Suzanna (2015)

3.3. Operative method of interpreting the comparison results between solvencies of Islamic and conventional banks

The review of the literature assessed the resistance of conventional or Islamic banking institutions to financial shocks, allowed us to draw two conclusions. In previous studies, researchers have in most cases applied a deterministic or demonstrative approach, but they have never tested the exploratory approach. Besides, they conducted either single-sector impact studies encompassing only CBs, only IBs or exceptionally case studies, the objective being to demonstrate the effect of financial crises or other banks characteristics on a solvency parameter, or comparative studies between two or more models to make a simple comparison to determine the type of impact between the two groups. At first sight, they justified the bankruptcy of CBs independently of their competitors in the banking market and without performing causal linear reasoning. Researchers in the previous studies have shown that CBs have been hit hard because of the rapid decline in the value of their assets. Some institutions went bankrupt while other institutions were saved because of public bailouts. Furthermore, the Islamic banking institutions, in all cases, even if they had been impacted, they had lowered their financial performances and they were not widely affected.

To answer the previously asked questions, it is interesting to choose the constructivist analysis approach. This approach would be a key factor and a necessary tool for successful recognition and legitimization of research Moreover, the proposed approach is the most appropriate for assessing knowledge and suggesting new thinking. Constructivism has been defined by Perret and Seville (2003) as "an approach to knowledge in terms of ethical validity. That is, based on criteria and methods that can be discussed". Our study aims to reveal empirically the most solvent banking model during a period of economic stability, after a comparative analysis between two heterogeneous samples of Islamic and classical banks. The choice of an empirical process has a direct effect on the trends in the synthesis results and the interpretations' quality, which was why we had established a specific and original method of samples' composition.

The evaluation technique of associated bank solvency frequently used in comparative studies between IBs and CBs is the "Financial Ratio Analysis Method" (O'Connor, 1973; Chen and Shimerda, 1981; Ross, 1991; Hempel and Simonson, 1998; Iqbal, 2001; Rosly and Bakar, 2003; Haron, 2004; Samad, 2004b; Olson and Zoubi, 2008). Our contribution consists in adopting a single parameter to express the bank solvency, St.

After presenting our samples and our test subjects variables, this section is devoted to the analysis of the empirical results of the two samples. The statistical interpretation began with the verification of the distribution' normality. Then, we tested averages comparison. However, the application of such a parametric test depends on autonomous conditions before its adoption. Moreover, the implementation of the comparison test between the averages of two or more samples requires the

satisfaction of certain approved conditions. The choice varies according to the case depending on the close link with the type of sample (independent or matched sample), the type of variables (qualitative or quantitative) and if the variables to be tested are quantitative, it is necessary to make sure of the normality of distributions. In this case, before verifying the hypotheses, we first checked the normality of the variables of each sample. Finally, in the light of empirical results, we adopted the most solvent group of banks.

Since the two samples are independent, the comparison cannot be made without testing the equality between the two groups. In other words, whether the two samples come from the same reference population or belong to two distinct populations. We need to know in advance whether the average of the normally distributed solvency of CBs is higher (or lower) than the average solvency of IBs under the same law.

3.3.1. Test of normality

This test allows us to know if there is a significant difference between the two types of banks and determine the meaning of the correlation if it exists. First, we verified the distributions' normality of the variables explained by the Skewness and Kurtosis Test or by another test of normality. Then we went on to analyze the results of the comparison tests between the means through the Student Test and Variance Comparison Test or the Mann-Whitney Test, if necessary. It all depends on the outputs of the statistical tests cited, which means that the variables follow the normal law or not and the rigorous approach to compare two independent samples.

The selection of one test instead of another is determined by two conditions:
-Variables distributions' normality of the two samples or the non-satisfaction of the simultaneous normality condition of the variables to be compared;
-Variances' equality of similar variables to test two by two (homoscedasticity).

Figure 1 illustrated the choosing process of the appropriate test according to the data collected and the results of the statistical tests obtained.

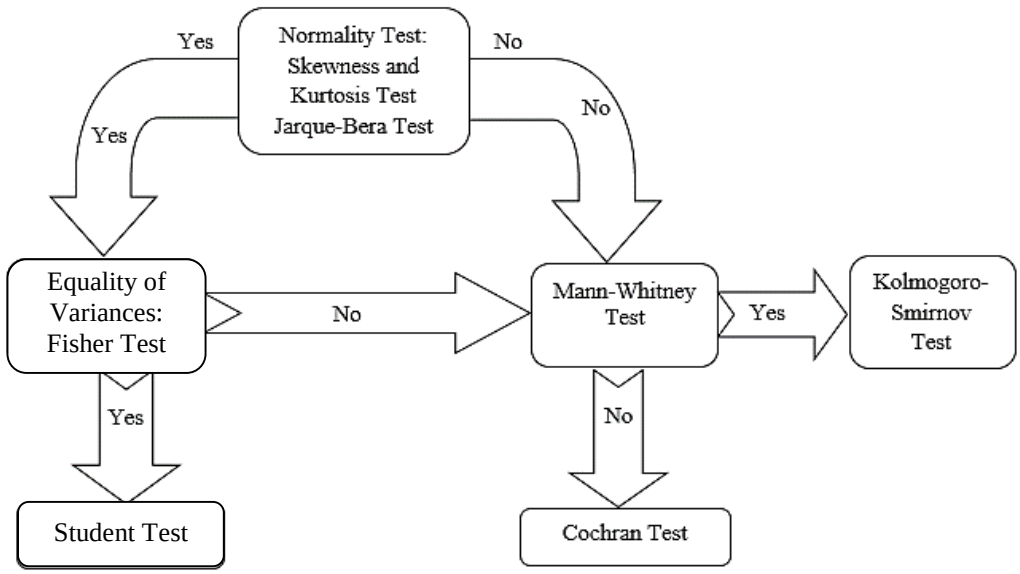

Figure 1: Method of choosing the appropriate comparison test to the results of the normality test

For all the variables that follow the normal law, before applying the Student Test, the procedure of this test imposes the verification of the variances' equality. It means that the estimation of the difference between the average solvency measurements through the Student Test depends on the validity of the hypothesis of equality between solvency variances. If this assumption is not verified, we apply another substitute test. In case some variables do not satisfy the normality condition, the parametric tests are not applicable. To solve this problem, we can call, as the case may be, either the Mann-Whitney Test or the Cochran Test.

In practice, normality scanning is mandatory if the samples' size is less than 30 observations. This restriction is not essential when the sample exceeds 30 observations, the minimum size sufficient to ensure the quasi-normality of the sampling distributions. However, the size of our CBs' sample, as well as that of IBs, are equal to 63 banks. Notwithstanding our selection, to ensure the quality of the results and the reliability of interpretations we worked on 315 observations and we verified the normality of distributions, the assurance variables normality maintains the choice of the appropriate tests. Furthermore, there is a package of normal-fit tests, among which we have chosen the Skewness and Kurtosis Test. Our approach consists in testing two sets of variables that explain the bank's solvency. One set of variables symbolizes the IBs, and the other represents the CBs.

The results of the hypothesis test showed that the normality proposition when the probability associated with the Kurtosis coefficient is less than or equal to 5%. Table 3 revealed that the p-value of to the CBs' solvency is less than 5% (0.000). Otherwise, the normality test allows to state, with a certainty of 95%, the non-normality of the data distribution.

Table 3: Detection normality of the solvency relative to the CBs' sample

Bank type	**CBs / Number of observations = 315**					
Measurement	**Skewness**	**Pr (SK)**	**Kurtosis**	**Pr (KUR)**	**Prob > χ^2 p-value**	**Normality**
Stc	12.461≠0	0.000	26.078≠3	0.000	0.000	No

Similarly, Table 4 revealed that the Skewness and Kurtosis Test specific to the IBs' solvency generated a p-value (0.005) less than 5%. Therefore, we rejected the null hypothesis, which indicates that the solvency of IBs does not follow the normal law.

Table 4: Detection normality of the solvency relative to the sample of IBs

Bank type	**IBs / Number of observations = 315**					
Mesurement	**Skewness**	**Pr (SK)**	**Kurtosis**	**Pr (KUR)**	**Prob > χ^2 p-value**	**Normality**
Sti	6.624≠0	0.000	38.423≠3	0.000	0.005	No

3.3.2. Analysis of the non-parametric test: results for comparability of two-samples' solvencies (Mann-Whitney Test)

Although almost all statistical tests assume the normality of the random variables studied, this condition is not always confirmed. For variables that do not follow normality law, we can apply the Mann-Whitney test (U-Test). From two independent populations, this non-parametric test devoted to the comparison between two samples. The Mann-Whitney Test replaces the Student Test but never relies on the constraints of the frequency distribution parameters or the condition of the mean and variance estimate.

When the distributions are not normal, the Mann-Whitney Test is appropriate and effective because this test is widely applicable independently of the samples' size, even if they are not subject to the normality requirement. If the solvency ratio does not validate the normality test for one of two samples, this leads us to ignore the application of the Student Test even if the normality hypothesis is accepted for the same variable in the other sample. Therefore, the distribution of St isn't normal for both types of banks. In this case, the application of the Mann-Whitney Test will then be automatic

According to Table 5, we have detected the existence of a considerable difference between the pair of bank solvency parameters. Also, we noticed that the P-value (0.006) of St is less than 5%. For this reason, we rejected H0. So, there is a significant difference between the CBs' solvency and that of IBs over the period (2010-2018).

Table 5: Mann-Whitney and Kolmogorov-Smirnov Test for the detection of differences between the solvency of conventional and Islamic banks

Measurement	Kolmogorov-Smirnov	p-value	Mann-Whitney NCB = 315 NIB=315	p-value	Comparison test between averages
Stc and Sti	0.481	0.026 <5%	2.391	0.006<5%	H0 Rejected

4. INTERPRETATION OF THE COMPARATIVE RESULTS BETWEEN CONVENTIONAL AND ISLAMIC BANKS' SOLVENCY

A bank is solvent when the total value of its assets exceeds its responsibilities. If the bank has lost its capacity of solvency, it may face financial difficulties both internally and externally. The solvency ratio used in our study is "Loan deposits". The ratio of total credits to deposits measures the risk of insolvency thanks to the large amount of credits granted by the classic or Islamic bank in relation to its main sources of financing of its credits. This ratio represents a measure of the bank's ability to finance its non-liquid assets (loans) through stable funding availability (deposits). This report allows banks to assess their ability to manage cash in order to summarize their operational solvency. Besides, the lower the ratio, the more the bank is classified as a solvent bank (Jasim, 1994) and the more it assures its favorable monetary equilibrium position and vice versa. A high value of this ratio indicates the presence of a potential source of insolvency which originates either from the excessive granting of credits or the drop-in customer deposits.

The harmony between deposits and loans has clearly shown that there is a significant difference between the average solvency of IBs and that of CBs. In our case, Table 7 showed that the solvency values are marked by a divergence between averages. The average solvency generated by IBs (19.745) is much higher than the solvency generated by CBs (3.168). The Mann-Whitney Test suggests a risk of rejection of the very low null hypothesis (0.006<5%). Indeed, the comparison test reported the existence of a significant difference between the two average solvencies. By deduction, Table 6 indicates the presence of a significant effect (0.728 ± 5%). IBs are less solvent and are much more sensitive to the risk of credit distribution compared to their traditional competitors (Hasan and Dridi, 2010) and (Fayed, 2013). This consequence is justified by a largely volatile oscillation (standard deviation = 36.57) comparing to the variation and sensitivity of solvency risk in CBs (standard deviation = 9.37). While the change in the solvency risk is due to a drop-in the level of deposits or a growth in distributed loans, it does not seriously affect performance as IBs are still trying to find the financial equilibrium across future Cash-Flows. But the solvency variation signals rather the possibility of the continuity and the operational, financial and systematic durability, which assure their vitality and guarantees their operations. The huge amount of loans allocated by IBs continuously reflects the high demand for Islamic products. This act allows explaining that the rise in the risk of solvency is a normal consequence after the crisis of lack of confidence in CBs from (2007-2008). A very high level of liquidity reduces the potential for investment. This implies meeting a threshold of liquid assets from which the bank must invest to maintain its solvency and meet its short-term obligations (Tanimulislam and Ashrafuzzaman, 2015). Although the probability of comparing bank solvency is lower among IBs, it confirms that CBs are more solvent. Also, CBs are more solvent. Also, CBs have a quality of control conscious of their risk of solvency; they take account of deposits and short-term financing systematically insofar as they will be used for the creation of credits. Therefore, we have reversed the fourth hypothesis. This is consistent with the

findings of the survey conducted by Hussain and Al-Ajmi (2012) who found that the risk levels faced by IBs were significantly higher than those experienced by CBs.

Table 6: Comparison between the solvency' ratio of Classical and Islamic banks

Measurement	Hypothesis test of comparison between the ratios of the solvency	Decision
Stc and Sti	P(Stc>Sti) = 0.728 > 0.05 H Accepted	H Rejected Presence of significant difference

The advantage of the superior CBs' solvency, compared to that of IBs, is explained by two reasons. On the one hand, after the crisis of 2007, CBs have met a credit account application that has minimized the volume of credit default. Moreover, they have kept the same asset position. On the other hand, in a reset-off period, the stability of the solvency level of the CBs is not the result of a positive evolution of the level of deposits, but it reflects a drying up of liquidity. The lack of liquidity is due to a weakness of customer deposits and the reception of additional capital made available to banks. As a result, the situation reflects the drop-in funds collected by natural persons in the case of commercial banks or received from companies in the case of investment banks.

However, Islamic banking activity is mainly based on three main contracts allowing the bank to raise funds, deposit contracts (QardAl Hasan), savings contracts whose remuneration depends on the result achieved, the contracts of Moucharaka and Moudharaba that feed the bank with investment resources. The average liquidity relative to IBs is positive (0.682) during the study period, which means that on average, IBs do not have to deposit difficulties as long as the solvency risk is not accompanied by a decrease in liquidity. For this reason, they provided greater confidence for depositors and creditors to save and invest in Islamic investments. The number of overwhelming credits granted by IBs to its customers made us question the degree of control of credit risks. Therefore, referring to Table 8, although they did not collect 78.91% of deposits from CBs, IBs distributed more than 80.81% of the loans of its funds with a density higher than its competitors (95.46% >93.22%) while exceeding the constraint of size and seniority. These results show that IBs relied less on other non-deposit funds since the ratio (Loans / Deposits) is higher than that of CBs. Thus, IBs had more reserves for loan losses and less nonperforming loans. While CBs have made relatively unproductive large loans and are less stable, they have 1.267 of the total deposits of IBs and they have granted 1.237 of the total amounts of loans distributed, but they have reached a rate of less than IBs (93.22% <95.46%).

Table 7: Descriptive statistics of the solvency of classical and Islamic banks

Measurement	Obs	Mean	Std. Dev	Min	Max
Stc	315	3.168	9.370	-22.313	28.649
Sti	315	19.745	36.571	-134.015	173.506

Table 8: Relative solvency of classical and Islamic banks

Bank type/ Measurement	Total Loans	Total Deposits	Total Solvency
CBs	22138659M$	23748029.6 M$	0.932=93.22%
IBs	17892101.28 M$	18741491.34M$	0.954=95.46%
Ratio of relativity	1.237 0.808	1.267 0.789	-

Three reasons explain the rationality of our results. First, the customer base of CBs is much narrower than the customer base of IBs in that the two types of banks coexist simultaneously in the highlighted countries, whereas the CBs are older in the modern financial market. Secondly, the customer base of CBs is older, more loyal, more organized and more developed. Moreover, in our

study areas, IBs have succeeded in amplifying their customer bases and attracting the confidence of new depositors. With increasing demands for deposit account openings and increased credit applications, it is reasonable that a high crediting rate increases the risk of solvency, especially in Islamic institutions.

There are several differences in the mobilization of deposits and the use of funds between Islamic and classical banks. First and foremost, the reason for the increase in IBs lending is in terms of the facilities and the remarkable advantages that come with the process of obtaining credit. Secondly, excessive demand for loans then causes fewer problems of balance between customer deposits and the risk of credit distribution. The growth of credit and insolvency risk in IBs is a systematic mechanism. As it depends on the profitability of the investments financed by the IBs, the level of credit risk also depends on the projects' duration, their performances and their returns on funds. The risk of liquidity breach is still low. Money collected on the various forms of accounts will be invested in the markets for goods and services, raw materials, leasing or real estate funds. Therefore, solvency is dependent on the profitability of investments, correlated in turn with the level of risk borne.

In addition, the size of lending in the asset mix of IBs is marked by the solvency ratio. The volume of loans has shown that Sharia-compliant products are very attractive to the segment of the population that requires financial services consistent with their religious beliefs. IBs offered a wide range of Islamic financial products and services ranging from deposits, savings, investment, direct financing products, real estate financing to working capital financing, etc. They invested their funds mainly under Murabaha, Moucharaka, Bai-Muajjal, Rental Purchase and Qard Al Hasan, Ijara and various Islamic lease-back programs. It is reasonable to assume that the inherent risks of the Murabaha, Ijara, Mushraka or Mudaraba financing technique are different from those involved in trade receivables, leasing, participation, and other portfolio activities or option leases. The prudential rules applied to these transactions are mechanically different (Sarker, 1999b). Based on this observation, we justified the allocation of decisive reserves explaining the protective policy, simultaneously to maximize the distribution of credits. Alternatively, IBs can operate at high risk because they maintain the necessary emergency reserves for late recoveries, non-recoverable debts, bad debts, and high-resistance recoveries. However, for a smaller number of loans distributed, CBs need to maintain more reserves on loan losses since they have more non-performing assets. Furthermore, they relied mainly on fee income, commissions, late penalties, interest, and premiums, so they bore more costs and more loan provisions than IBs. The high number of non-performing loans (Unproductive loans) indicates that CBs were riskier in their financial operations and also took more provisions when the proportion of bad debts increased. This causes losses on loans larger than those borne by its competitors. To compete in local and global deposit markets and become more profitable and more solvent in terms of commitments, IBs must design and innovate acceptable and innovative Islamic instruments in financial markets. In addition, they should find investment opportunities that can raise funds and offer competitive rates of return with low levels of risk (Hassan and Bashir, 2003).

5. CONCLUSION

The choice between the conventional and Islamic banking model by referring to the banks' solvency is not a random act, but the purpose of a complete rational analysis. By conducting a bank solvency analysis in a sharply focused single-ratio paradigm we have constructed a new approach that allows for precise clarification reflecting the actual state of the financial condition of classical or Islamic banks. The results of our study indicate that CBs are more solvent than their Islamic counterparts. However, IBs are very viable. CBs took solvency into account in solvency management, although the valuation showed some shortcomings. On the contrary, IBs have given preference to liquidity at the expense of solvency. They are characterized by a systemic capacity to absorb shock by smoothing their returns on assets (Hassoune, 2002).

Islamic finance attracts Muslim and non-Muslim customers because of its ethical foundation. Islam teaches that money must be channeled to the real economy and the production of real goods and services away from speculation. The Islamic finance system could create a more stable global financial market (Khan, 1989). PLS financing is not popular enough with IB's customers around the world (Ascarya and Yumanita, 2006; Ascarya, 2010). This reflects the lack of knowledge of Islamic financial products and its benefits to the holders of capital. In the absence of uniform operating analysis, and standard norms for the distribution of loans, the application of particular standard organization norms for PLS systems, consists in attracting a certain category of customers and depositors, who are ready to accept only moral benefits (religious or behavioral) and not tangible returns (interest). Subsequently, IBs will launch their offers. PLS is not suitable for short-term financing. The Islamic banking sector suffers from a shortage of specialists in Sharia law, control, accounting, and Islamic financial auditing. Indeed, like CBs, IBs can smooth their liquidity, either by extending the distribution of dividends to subsequent years or by retaining annual profits to transfer them to shareholders' accounts.

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Appendix

Table 1a: Methods of solvency evaluation in previous studies

Researcher(s)	Context	Period	Measurement	Results of research
Samad and Hassan (2000)	Malaysia	(1984-1997)	FRA method + ANOVA method	Bank Islam Malaysia Berhad is relatively less risky and more solvent than those of CBs.
Toumi *et al.* (2008)	18 countries	(2004-2008)	FRA method	IBs have a debt to equity ratio, debt to assets ratio and a long-term debt ratio lower than those of CBs. IBs have less leverage compared to the leverage effects recorded in CBs.
Mobeen *et al.* (2011)	UAE	(2006-2008)	FRA method	IBs are more solvent in the long run.
Hanif *et al.* (2012)	Pakistan	(2003-2007)	Banco-meter model	IB is more solvent (less risky) than the list of CBs.
Sehrish *et al.* (2012)	Pakistan	(2007-2011)	FRA method	IBs are less risky and more solvent than their conventional counterparts. This indicates that the two groups of banks do not belong to the same risk class.
Onakoya and Onakoya (2013)	United Kingdom	(2007-2011)	FRA method	IBs are less exposed to solvency risk, while CBs rely more on additional external sources of finance.
Fayed (2013)	Egypt	(2008-2010)	Banco-metre model	Both CBs and IBs are considered insolvent, but IBs have shown superior insolvency.
Zarrouk (2014)	10 MENA countries	(2005-2010)	FRA method	The findings further pointed out that IBs in non-GCC countries were less risky and more solvent during and after the period of the financial crisis than those in the GCC countries.
Ola and Suzanna (2015)	UAE	(2008-2014)	FRA method	CBs are, on average, more solvent and less risky compared to their Islamic counterparts.
Mousa (2015)	Bahrain	(2010-2013)	FRA method and DEA method	Analysis of financial ratios did not sign definitive conclusions about the solvency capacity of CBs. Banks periodically solvent in a year or rather the banks which recorded a single significant ratio were not solvent in other years in terms of periods and type of ratios.
Maysa and Rasha (2015)	Jordan	(2009-2013)	FRA method	IBs are found to be statistically more solvent than their conventional counterparts. This indicates that IBs are less risky, which reflects their financial strength to pay their debtors.
Bilal and Amin (2015)	Pakistan	(2007-2012)	FRA method	IBs had less solvency risk than their conventional counterparts throughout the study period.
Elgadi (2016)	Sudan	(2005-2013)	Regression method	Management quality of IBs is insufficient to predict and avoid the risk associated with leverage.
Tlemsani and Al-Suwaidi (2016)	UAE	(2007-2008)	FRA and a cross-sectional analysis	In terms of solvency risk mitigation, IBs outperformed CBs.