Journal of Islamic Finance Vol. 11 No. 2 (2022) 1-19
IIUM Institute of Islamic Banking and Finance
ISSN 2289-2117 (O) / 2289-2109 (P)

Risk-Taking in Public versus Private Banks: Evidence from Islamic Banking

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Abstract

This study examines risk-taking by publicly traded and privately owned banks in an Islamic banking sector employing a diversified international sample of 133 IBs across 35 countries. Unlike the vast majority of previous research, this study uses ordinary least squares (OLS) and Heckman's two-step models to analyse a comprehensive risk-taking by two proxies. It investigates the risk and stability features using the credit risk and Z-score as the insolvency proxy. The study finds that publicly traded banks engage in more risky activities than their privately owned peers. The study further analyses the link between ownership structure and risk in Islamic banks, finding that state ownership shows that it is not a determinant in taking risk differences. On the other hand, institutional investors are more likely to engage in risky activities when they hold higher stakes. Despite this, the results provide some advice to the financial actors in their attempts to deliver information to the risk-taking practices in concert with regulators and international policymakers.

Keywords: *Public and private bank; Islamic banking; Risk-taking*

1. Introduction

The impact of the financial crisis of 2007–2008 has shifted banks to focus from short-term profit maximisation to long-term sustainability. In response to the crisis, banking regulators worldwide implemented various policies intended to monitor banks' risk-taking behaviour, minimise the crisis's impact, and ensure the financial sector's long-term stability (Abedifar et al., 2013).

Furthermore, banks' business models vary from other businesses where the banks' model generates their value for the liabilities where the deposits are the most crucial aspect for the banks (DeAngelo and Stulz, 2015). Banks generate liquid claims, and the worth of a bank is determined by the success of the profit generated by these claims (Stulz, 2014). Deposits determine the bank's value; the more liabilities, the more deposits from which the bank may create more significant profit. Hence, the bank's ability to issue claims valued for its liquidity is conditional on its risk.

Consequently, the risk of these claims is intrinsic to banks' business models rather than the other business (DeAngelo and Stulz, 2015). Thus, banks can take risks that have an ex-ante risk. The banks will assume the risk based on the status of the deposits to meet the expectations of their shareholders; however, the risk will not depend just on loans issued from deposits, but from any source of liquidity, such as bonds or Sukuk. Therefore, banks may be able to assume greater risk (Falato and Scharfstein, 2016). Thus, the banks cannot flourish without taking risks (Jiménez et al., 2013).

Furthermore, market-dominant banks typically take on less credit risk and have a lower possibility of default. Capital requirements generally lower risk, but this effect is greatly diminished or even reversed for banks with market power (Agoraki et al., 2011). The banks with market power will be more cautious than the other banks in taking risks to maintain a reasonable stock price (Falato and Scharfstein, 2016). In general,

Article history
Received: 10 August 2022
Accepted: 31 December 2022

reducing risk would mean passing up on important initiatives contrary to what shareholders care about; thus, improved risk management cannot be defined from the shareholders' point of view.

In Islamic banking, the Islamic Bank (IB) comes with a unique set of hazards, as several studies have shown. For example, Errico and Farahbaksh (1998) argue that prudential supervision and rules for Islamic banks should focus more on operational risk and transparency. For example, Islamic banks may not be able to reduce credit risk by requiring customers to post collateral since their relationship is based on partnership; moreover, they lack sufficient control over projects funded via *Mudarabah*.

Furthermore, the world has observed various evolutionary stages in the field of banking; currently, it can be seen substantial growth in Islamic modes of banking and finance. (Reuters, 2017) reports that the assets of Islamic banking increased to $2,524 bn at the end of 2018 from $1,746 bn in 2012. The assets are expected to grow 30% by 2023. In addition, Islamic banking experienced more rapid growth than conventional banking after the 2008 crisis. Islamic finance extended to include non-Muslim countries. The extensions have made it more critical to rapidly develop a broad array of innovative solutions and literature demands (Hasan and Dridi, 2010).

Islamic financial principles have evolved based on Islamic rules. The rules are taken under the basis of Shariah law. Islamic financial regulations forbid payment or receipt of (Riba), which is the payment or receipt of interest (Obaidullah, 2005). The essential principle of Islamic finance is *Fiqh Al-Mu'amalat*, which mainly categorises Islamic finance. The first type of Islamic finance is the debt-based financing (DBF): "the financier purchases or has the underlying assets constructed or purchased and then this is sold to the client". The second type of financing is lease-based financing (LBF): "the financier purchases or has the underlying assets constructed or purchased and then rents it to the client". By the end of the rental period, the assets will be transferred to the client. The third type of financing is profit and loss sharing (PLS): the financier is the partner of the client, and the realised profit or loss is shared according to pre-agreed proportions (Abedifar et al., 2013; Ghazaly, 2016).

The PLS is expected to generate a high profitability level with higher risk (Kuppusamy et al., 2010). Attributed to that, the Islamic banks' credit risk cannot be mitigated due to their relationship as a partnership. In addition, they lack sufficient control over project management due to PLS financing rules (Khan and Ahmed, 2001). Excessive risk-taking may bring distress to the banks, increasing instability and risk. According to (Barry et al., 2011), banks are towards excessive risk-taking due to inherently unstable banking. More specifically, the market discipline variance and access to capital markets are important reasons for banks to be public. I investigate the characteristics that determine the risk-taking behaviour of publicly traded versus private listing status. A public bank may be exposed to capital market forces and, thus, endeavour to promote incentive risk-taking. The paper defines as "public" those banks whose stocks are publicly traded on the stock exchange, while private banks are all other banks.

To test my main conjecture, I use a diversified Islamic banking sample of 133 banks from 35 countries; 47 of the banks are publicly traded, and 86 are private banks. The study period extends from 2010 to 2018. Credit risk is the first proxy I determine in this paper. Credit risk is fast becoming a key instrument in the quality of loans. Furthermore, it has been used in previous studies (Abedifar et al., 2013; Altunbas et al., 2007; Lepetit et al., 2008). In addition, I use the Z-SCORE and Z as insolvency risk indicators. The positive relationship for the insolvency risk proxies is related to the probability of bank solvency. These indicators have been widely presented in previous studies (Boyd and Graham, 1986; Lepetit et al., 2008; Nichols et al., 2009; Samet et al., 2018). I find that publicly traded Islamic banks exhibit higher risk-taking than private equivalents (Laeven and Levine, 2009; Tran et al., 2019). The disciplining mechanism of the public banks traded influences the result. I use several control variables for the bank level and country level (Abedifar et al., 2013; Barry et al., 2011; Djankov et al., 2007; Kane, 2010; Masson et al., 1998; Michalopoulos and Papaioannou, 2017; Samet et al., 2018).

To my knowledge, no research has addressed whether risk-taking is different for publicly and privately banks traded under Islamic banking. I compliment the works of (Abedifar et al., 2013; Aggarwal and Yousef, 2000; Beck et al., 2013; Čihák and Hesse, 2010; Hasan and Dridi, 2010; Mollah et al., 2017). These studies are investigating the variation between Islamic and conventional banks (CBs). This study aims to extend the current literature and investigate the differences between Islamic public banks and risk-taking. A public bank's structure affects bank risk-taking and profitability in several directions. First, I work on a more precise classification of risk proxies by considering the credit and insolvency risks. Second, I consider the market

influence of bank risk-taking behaviour by separating my sample into public and private banks. Third, I consider the influence of each credit and insolvency risk component by investigating the components. Finally, I classify shareholders by considering the equity held by the state and institution.

2. Literature Review

Most previous studies explored the relationships between IBs and CBs concerning risk-taking. For instance, Beck et al. (2013); Bourkhis and Nabi (2013) indicate that there is no significant difference between IBs and CBs in their commercial focus. However, Abedifar et al. (2013), using a sample consisting of 553 banks from 24 countries between 1999 and 2009, report that IBs face additional risks because of the complexity of Islamic forms of financing and the limits on their fundraising, investing, and risk management operations. Therefore, it can be surmised that the IBs tend towards higher risk-taking. In addition, recently, Bektas et al. (2022) have found that the banking practises, riskier products, and underdeveloped legal frameworks of the IBs are less stable than their CBs counterparts.

On the other hand, Bourkhis and Nabi (2013) found that the IBs have a more prominent intermediation ratio and a greater capital-asset ratio, indicating a more cautious attitude to risk. In addition, Hasan and Dridi (2010) concur with Bourkhis and Nabi (2013) that the business models of IBs mitigated the effect of the financial crisis on their profitability. In the same context of the global crisis, Samet et al. (2018) found that the conventional publicly traded banks took a higher risk during the recent crisis in 2008. The study sample has an international bank sample consisting of 6,816 commercial banks from 77 countries. However, the study found that publicly traded banks take less risk due to the disciplining mechanism during the stable time. In addition, Tran et al. (2019) support the findings of Samet et al. (2018), who found that regulatory pressure influences limiting risk-taking by undercapitalised listed banks.

Correspondingly, Chang and Mais (2000) argued that managers in publicly traded banks, in particular, tend to preserve their reputations by being risk-averse to maintain their careers at a professional level. A recent study (Asutay et al., 2020) is consistent with the study by Chang and Mais (2000) where they examined 120 IBs from 21 countries over the period between 2000–2013. They found that the regulation and supervision proxies influence risk-taking negatively. Hence, the regulatory and supervisory environment can lower the risk-taking of the IBs. This point presents the higher importance of publicly traded banks with regard to risk-taking. The higher regulatory and supervisory environment for the market will lead to lower risk-taking for these banks.

On the other hand, privately owned banks are monitored by a small group of shareholders. Privately owned banks are also more likely to use greater caution and closely monitor bank management due to their limited shareholders. In addition, the ownership of privately owned banks is more likely to be concentrated among a limited number of shareholders (Iannotta et al., 2007). The concentration of the shareholders tends to provide a higher fraction of the benefits (Tran et al., 2019).

Furthermore, public equity is more liquid and cheaper to raise than private equity, stretching their flexibility to invest in risky projects with a higher expected return. In addition, the flexibility of the capital allows publicly traded banks to seek financing more quickly than a privately owned bank could (Dewatripont & Legros, 2005). In addition, the increase in risk will be based on the publicly traded banks that align the objectives of faster growth in order to achieve higher returns (Barry et al., 2011).

Empirically, Tran et al. (2019), in an interdisciplinary study, took a large panel of U.S. bank holdings from 2001–2015 and compared risk-taking behaviour among these banks. The evidence reviewed in the study by Tran et al. (2019) found that the asymmetry in information and agency problems substantially differ in terms of the banks' stability. The study found that publicly traded banks became riskier than their privately owned bank peers during the last crisis in 2008. In addition, the researchers found regulatory pressure influences limiting risk-taking by undercapitalised listed banks. In addition, managers can benefit from the banks with more risk due to the bonuses and stock options open to them (Cheng et al., 2015; Mehran and Rosenberg, 2007).

These consequences have been shown in publicly traded banks on the New York Stock Market Exchange (NYSE) by Laeven and Levine (2009) and supported by Nichols et al. (2009). They found that publicly traded banks earn lower returns per unit of risk than privately owned banks. Hence, for a publicly traded bank to fulfil faster growth, the bank must take on more risk. In addition, the risk may take by raising the equity capital where the publicly traded banks can issue new equity through easier transactions in the publicly traded market (Nichols et al., 2009). However, there is a dearth of evidence on public and private Islamic banking, with most

earlier studies comparing Islamic banks to conventional banks or focusing exclusively on conventional banks (e.g., Barry et al., 2011; Bourkhis and Nabi, 2013; Hasan and Dridi, 2010; Nichols et al., 2009; Samet et al., 2018). Hence it demonstrates the need for more study on the benefits and contributions of Islamic banking to fill the gap and investigate the different risk-taking by Islamic banking, where the first study considers this investigation.

3. Conceptual Framework

The 2008 financial crisis and ensuing economic slump were mainly blamed on the banks' excessive risk-taking. Hence, more attention has recently been focused on agency theory problems and risk-taking. The nature of the various shareholders' objectives and issues of conflict of interests is one of the factors that have given rise to the agency theory and risk-taking problems (Jensen and Meckling, 1976).

Market discipline is defined as "the effect of publicly available market signals from bank-issued securities that lead to less risk-taking by the issuing banks" (Kwan, 2004, p. 98). Hence, due to publicly traded bank securities, capital risk will cause market fluctuations, and the banks' excessive risk-taking behaviour will be visible to the public (Abedifar et al., 2013; Tran et al., 2019). Therefore, the discipline imposed by capital markets may make publicly traded banks take less risk than unlisted banks. Risk-averse investors would be able to appropriately evaluate the risk of a bank and modify the price of securities if the market signals are available (Tran et al., 2019). The banks will reduce risk-taking to follow the market discipline to avoid any issues that might reflect negatively on the stock prices instantaneously (Falato and Scharfstein, 2016). Thus, the signals generated by publicly traded securities in the capital market have the capacity to discipline managers and address any agency issues. Hence, concerning regulatory reactions, publicly traded banks are supposed to be more responsive because they are publicly traded and, therefore, less risky than privately owned banks (Kwan, 2004).

One of the agency theory's major issues might arise due to the agents' and principals' risk-taking. These problems will create a higher profitability risk for publicly traded banks (Barry et al., 2011). The risk-taking behaviour of publicly traded banks is affected by the separation between the agents and principals where the ownerships are dispersed. In addition, the easy access to the capital market may potentially lower the conservative approach to risk-taking by the agents to maintain their benefits such as bonuses and stock options (Beatty et al., 2002; Burgstahler and Dichev, 1997).

Furthermore, credit risk can place pressure on publicly traded banks in various ways. The intense competition between banks erodes margins and lowers the banks' bottom lines. Managers may sacrifice credit evaluation standards and expand loan growth, thus causing a rapid increase in the bank's profitability (Das and Ghosh, 2007). Any issues related to the portfolios of publicly traded banks will affect the stability of the banks by reducing their assets and equity (Berger et al., 2017). In addition, information regarding the quality of the loan loss reserve showed a high hedge for the publicly traded banks from the problem loans (Nugroho et al., 2021). In this circumstance, the loan loss reserves would reflect cash flow losses in the loan portfolio (Walter, 1991).

The second major difficulty with agency theory that affects publicly traded banks is that their owners are more scattered. (Gropp and Köhler, 2010) found that the ensuing separation of publicly-traded banks' control governance procedures will increase the information asymmetries greater than their privately-owned peers (Beatty & Harris, 1999). Consequently, information asymmetry will result in many risk factors, including capital risk, credit risk, interest rate risk, bankruptcy risk, and exchange rate risk (Nichols et al., 2009).

H1: Publicly traded banks show more risk-taking than privately owned banks.

4. Research Methodology

Sample construction

The sample begins with all the Islamic banks appearing in the central banks of the countries of the study and Eikon and the banker database websites. The sample was sorted by discarding all the banks with five consecutive years of missing financial data and those that had been established for less than three years. The same method was undertaken in previous studies (Farook et al., 2011; Mallin et al., 2014; Mollah et al., 2017). After the sample was sorted, it consisted of 133 Islamic banks from 35 countries.

I use the SNL data to find several data related to my sample of banks. First is the classification of being

Publicly traded and privately owned [1]. To identify the bank's ownership, I collect the ownership data from the annual reports due to the lack of data from other databases. I collect the proportion of the governments or institutions' ordinary shares when it is at least 5% of the bank shares to the bank's total shares, which is consistent with (La Porta et al., 2002; Morck et al., 1988). The data of the ownership sample support my assertions that a public bank is more likely to have more dispersed equity ownership, while ownership will be closely held among smaller numbers of shareholders in private banks. The banks are in diverse countries, as in Table 1.

Measuring bank risk-taking

My primary risk-taking measurements are classified into two risk-taking proxies. The first proxy is the credit risk, and the second is the insolvency risk. Credit risk is represented by the first indicator, LLR, of the ratio of loan loss reserves to gross loans. The second indicator is the PL, which presents the ratio of problem loans to gross loans. The third indicator, NPL, presents the ratio of impaired loans to gross loans.

Essentially, the loan loss reserve percentage should be at a suitable degree so as not to affect the bank stock prices and reduce assets (Ng and Roychowdhury, 2014). On the other hand, the loan is considered a problem loan in the financial statements when the borrower is more than 30 days past due for a scheduled payment (Walter, 1991). Impaired loans are loans in which the banks will not collect all the principal or in which the interest payments will also not be paid according to the loan contract terms (Walter, 1991).The credit risk characterises the quality of a bank's existing loans; the indicators are widely used in the empirical banking literature (Abedifar et al., 2013; Altunbas et al., 2007; Angbazo, 1997; Kwan and Eisenbeis, 1997; Lepetit et al., 2008).

The Z-SCORE symbolises insolvency risk, which is the logarithm of (ROA + CAR)/ σ(ROA); ROA is equal to net income divided by the average total assets, CAR is equal to equity divided by total assets, and σ(ROA) is the standard deviation of ROA. The second indicator of the insolvency risk is Z, which is the logarithm of (100 + ROE)/ σ(ROE); ROA is equal to net income divided by the average total equity, and σ(ROE) is the standard deviation of ROE, while Z-SCORE, and Z proxies represent the bank stability and distance to insolvency.

Consequently, a higher Z-SCORE and Z measure indicates higher stability of the bank. The Z-SCORE and Z standard deviation must fall below their expected value; this will cause a depletion of its equity and make the bank insolvent. Based on the absolute values of the Z-SCORE and Z, I use the logarithm to control the outliers and skewness of the distribution. The indicators Z-SCORE and Z are used widely by, for instance, (Barry et al., 2011; Boyd and Graham, 1986; Goyeau and Tarazi, 1992; Laeven and Levine, 2009; Lepetit et al., 2008; Nichols et al., 2009; Samet et al., 2018).

Bank and country level independent variables

One of the study's aims is to analyse how the different types of shareholder interactions impact banks' risk-taking. In my model, I investigate the subsidiary influence. The loan portfolio of the subsidiary might be structured as a risky portfolio due to any failed issues that will not be viewed as a bank's failure (Abedifar et al., 2013). On the other hand, the state ownership (SOE) and Institutions ownership (INS) projects may be considered risky as a result of the investors requirements (Lassoued et al., 2016; Shleifer, 1998).

I regress my risk-taking measures on the dummy variable (Public), which equals one if the bank is publicly traded and zero if it is a private bank. I control for several bank-level variables that have been shown to affect the cross-sectional differences in bank risk-taking (Houston et al., 2010; Laeven and Levine, 2009). I use Non-Interest Income to explain the importance of the loan activities. The bank may lose its focus on loans, which indicates the importance of non-interest income businesses (Lepetit et al., 2008). The second control variable is Cost Inefficiency. The inefficiency of the bank heightens the bank risk. A bank with greater cost inefficiency requires higher net interest margins from loan activities, resulting in losses in efficiency (Kwan and Eisenbeis, 1997). The larger banks can be riskier because they can extend their work in risky transactions (Kane, 2010).

In addition, the banks' ages in this study are defined by using two dummy variables. A Middle-Aged Bank takes a value of one when the bank has been operated for three to seven years and zero otherwise. For the variable Mature Age Bank, a value of one is assigned if the bank has operated for more than seven years and

[1] Publicly traded banks are publicly quoted banks (i.e., banks whose stocks are traded on a stock exchange). Privately owned banks are all other banks.

zero otherwise. The bank's age may present advantages in terms of being more efficient and less risky. The experience and informational advantages are higher with mature banks. Conversely, younger banks will face more burdensome regulations that will be caused operation cautiously (Abedifar et al., 2013).

To obtain a deeper look at how the relation between bank listing status and risk-taking may impact a country's institutional environment characteristics, I include a different country-level variable. Common, a dummy variable, equals one if the legal origin is common-law tradition countries and zero otherwise. I follow (Cole and Turk-Ariss, 2018; Samet et al., 2018) in terms of control for legal found that common-law tradition countries allocate significantly higher portions of their assets to risky loans than do their peers in civil-law-origin countries. I also include the inflation rate of each country to illuminate the stability of the economy. The economy's stability will be influenced by the inflation rate that will be affected by the credits. Higher inflation will lead to lower loan demand, which will affect the loan portfolio (Djankov et al., 2007; Masson et al., 1998). The variable of the GDP per capita is the natural logarithm of the real GDP per capita in U.S. dollars. The GDP is the proxy for the size of the economy, measured as the natural logarithm of the real GDP in U.S. dollars. Because the study includes diverse countries, including less developed, developed, and emerging, the countries will not meet the exact economic needs and sources (Djankov et al., 2007).

The study examines the relationship between bank risk-taking and the listing status of Islamic banks. I regress bank risk-taking proxies on bank listing status, bank-level control variables, and country-level control variables. The regression is the ordinary least squares (OLS) regression, correcting for robust the stander errors. To control for potentially country-level explanatory variables, I include country-level variables.

$$Risk\ taking_{it} = \alpha_i + \beta_1 Public_{it} + \beta_2 + Ownership\ variables_{it} + \beta_3 Bank - level\ variables_{it} + \beta_4 Country - level\ institutions_{it} + \varepsilon_{it}$$

Where *i* subscripts denote individual banks and *t* symbolises the time measurement. Risk-taking is divided into two proxies. The first proxy is the credit risk, and the second is the insolvency risk. The first proxy (credit risk) is represented by the first indicator, LLP, PL, and NPL. The second proxy is Z-SCORE and Z.

Endogeneity between listing status and risk-taking

To make further informative inferences about the research data, the sample uses robustness checks. The study potentially has an endogeneity problem in the regressions because banks that choose to be publicly traded or privately owned depend on their expectations regarding changes in growth and profitability. As stated at the beginning, endogeneity occurs when a bank's anticipated investment prospects and aspirations for future development and profitability impact its decision to be public or private, which in turn affects its capacity to produce growth and profitability. The study estimates and controls for the chance that a particular bank will be public or private by using proxies for the public/private decision determinants. To control this potential reverse causality (i.e., endogeneity) problem, the study follows prior literature (Barry et al., 2011; Nichols et al., 2009; Samet et al., 2018). The study uses Heckman (1979) two-stage approach to correct biased estimates resulting from a non-random treatment effect.

5. Results and Discussion

The statistical summary percentage for countries:

Table 1 shows the dominance of some countries. The sample contains 47 public banks and 86 private banks. The table shows that the Thailand bank is the furthest from LLR, with an average LLR of 13.2%; however, the lower banks that are closest to problem loans are in Thailand. Regarding the impaired loan, the bank in Kazakhstan shows no impaired loan issues; however, the Bahamas shows the highest impaired loan at 17%. The Philippines' bank is the furthest from default, with an average Z-SCORE of 5, followed by Qatar with a Z of 4.44. Conversely, Thailand's Islamic bank is the riskiest bank of the sample, with an average Z-SCORE of only 0.76 and -0.67 for Z.

The statistical summary percentage for the full sample

Table 2 presents descriptive statistics for the full sample and t-statistics for differences in the covariates for all sample years. T-tests are used to analyse the relationship between the public variable and the other variables. The study is divided into two risk proxies. The first proxy is the credit risk and consists of three indicators. The

first indicator is the LLR, which has a mean of 4.39%. This result is consistent with the previous study by (Abedifar et al., 2013). Also, PL, has an average of 6.13%; however, it has more than its reserve by 3.3%. The NPL indicator also has a higher percentage by its mean of 4.45%. This result is consistent with the previous study by Abedifar et al. (2013), as they reported 6.75% of the LLR by 118 IBs, while the NPL have 8.31, which suggests that the IBs have a higher NPL than the reserve.

On the other hand, Table 2 also shows that the mean of Z-score is 3.33. In contrast, the Z has a mean of 3.09. These proxies show the IBs are stable and not close to insolvency. Compare the findings with one of the extensive IBs sample studies by Mollah and Zaman (2015) in which they found the IBs have a Z-score of 2.77. Hence, these proxies show the IBs are stable and not close to insolvency. The Public is 35% of the sample. In comparison, the subsidies are higher, with a mean of 50%. The SOEs have a mean of 18%, which tends to indicate that the IBs have a considerable amount of state ownership. This result is consistent with Grassa et al. (2020), which found 71 IBs owned by state ownership with 16.3%. In contrast, the INS has a higher number of Islamic bank shareholders by 24%.

Table 1: Descriptive statistics by the country

Country	Obs	Public	Private	LLR	PL	NPL	Z-score	Z
Afghanistan	1	0	1	–	–	–	2.52	2.26
Algeria	2	0	2	3.62	3.86	–	3.33	3.82
Bahamas	1	0	1	12.7	14.9	17.1	2.55	2.80
Bahrain	15	5	10	6.43	9.39	8.84	3.27	2.68
Bangladesh	7	7	0	4.86	13.4	9.64	3.23	3.64
Brunei	1	0	1	4.58	5.79	9.49	4.30	4.06
Egypt	3	3	0	8.60	15.5	5.67	2.00	1.92
Germany	1	0	1	0.36	0.00	–	2.95	1.69
Indonesia	9	2	7	2.29	3.46	4.46	3.28	2.91
Iraq	4	0	4	8.33	18.7	3.35	3.78	2.73
Jordan	3	2	1	3.80	3.11	3.35	3.95	3.99
Kazakhstan	2	0	2	0.47	0.00	0.00	3.60	3.13
Kenya	1	0	1	0.99	4.81	4.81	3.02	3.24
Kuwait	5	5	0	3.53	2.51	3.44	3.95	3.84
Lebanon	2	0	2	2.82	12.9	–	2.64	2.85
Malaysia	15	0	15	2.22	2.47	2.40	3.86	3.72
Maldives	1	0	1	1.22	1.90	1.09	2.24	2.40
Mauritius	1	0	1	6.48	9.17	5.98	4.51	2.55
Nigeria	1	1	0	2.49	11.7	11.7	2.44	2.95
Oman	2	1	1	1.24	0.16	0.17	2.69	3.13
Pakistan	7	5	2	6.69	8.90	–	2.88	3.02
Philippines	1	0	1	2.67	–	0.17	5.00	1.94
Qatar	4	3	1	1.32	2.85	1.70	4.28	4.44
Saudi Arabia	4	4	0	2.71	1.84	1.54	3.45	3.26
South Africa	1	0	1	0.62	2.52	1.27	4.10	4.37
Sri Lanka	1	1	0	0.92	0.85	.845	2.39	2.83
Sudan	10	1	9	3.65	9.05	–	3.05	2.37
Syria	3	0	3	11.2	4.27	4.27	2.03	1.76
Tanzania	1	0	1	1.02	3.18	3.23	1.84	1.68
Thailand	1	0	1	13.2	28.0	–	0.76	–0.67
Tunisia	2	0	2	2.21	7.96	–	2.43	2.68
Turkey	4	1	3	3.42	3.12	3.69	3.08	3.46
UAE	9	6	3	5.36	7.38	6.81	3.68	3.53
UK	5	0	5	3.47	3.71	3.65	2.43	2.26
Yemen	3	0	3	11.9	18.2	–	3.22	3.18
Average	133[2]	47[3]	86[4]	4.34	7.14	4.56	3.11	2.87

[2] Total of the banks number for the entire countries' sample.
[3] Total of the public banks number for the entire countries' sample.
[4] Total of the private banks number for the entire countries' sample.

The non-interest income shows the importance of this by 29%, reflecting the importance of non-interest income business for IBs. For example, Abedifar et al. (2013) found that IBs have higher non-interest income than CBs. The cost inefficiency is lower than the income, with a mean of 66%. This result is consistent with Abedifar et al. (2013), which reported that the IBs' cost inefficiency is higher than that of CBs. They found that the IBs have a mean cost inefficiency of 59.8%.

The size's mean is $53.4 hundred million. The age of the IBs is presented here, with more than 94% of them being higher than eight years, while 5% are middle-age banks. This result is consistent with Grassa et al. (2020) who found the average age of 71 IBs is 18 years.

Moving to the country's indicators, 51% are common-law countries. In terms of inflation, mean inflation = 6.18%, Max = 63.3%, Min = -30.2%. The GDP per capita mean is $15.9 thousand, and the range is between $490 hundred and $85 thousand. The GDP mean is $38.4 billion.

Table 2: Descriptive statistics of the full sample by the public bank

Full Sample							
Variables	N	Std. Dev.	Min	Mean	Median	Max	t–test of diff. in mean
Panel A: Dependent level							
LLR	1021	4.49	0.23	4.39	2.76	17.6	–0.45
PL	813	5.45	0.06	5.25	3.35	20.9	–1.20
NPL	591	4.97	0.00	4.45	2.41	19.3	–3.85***
Z–score	1082	0.88	–0.51	3.33	3.34	5.61	–1.75*
Z	1080	0.96	–2.50	3.09	3.17	5.19	–6.85***
Panel B: Bank-level							
Public	1197	0.48	0.00	0.35	0.00	1.00	
Subsidiary	1197	0.50	0.00	0.50	0.00	1.00	11.5***
SOEs	1197	23.0	0.00	17.9	6.00	100	–3.25***
INS	1197	30.0	0.00	24.0	8.00	99.0	–1.85*
NII	1093	38.0	–462	38.0	29.0	230	5.55***
CI	1070	47.0	10.0	66.0	54.0	399	4.65***
Size	1110	7.32	0.08	5.34	1.98	26.7	–12.9***
Middle Age	1197	0.23	0.00	0.05	0.00	1.00	–1.05
Mature Age	1197	0.24	0.00	0.94	1.00	1.00	–8.95***
Panel C: Country-level data							
Common	1197	0.50	0.00	0.51	1.00	1.00	–1.05
Inflation (%)	1157	9.07	–30.2	6.18	3.30	63.3	–2.45***
GDP per capita	1161	17.4	0.49	15.9	9.80	85.1	–1.22
GDP	1170	61.8	0.26	38.4	21.0	395	–2.21**

The statistical summary percentage for the publicly traded versus privately owned banks sample

Table 3 provides summary statistics characteristics for the publicly traded and privately owned banks. The average value of the publicly traded LLR is 4.47%. Privately owned banks have an average LLR of 4.34%. The PL average of publicly traded banks is 7.17%, while it is 5.64% for privately owned banks. The average NPL for publicly traded banks is 5.29%, while it is lower for privately owned banks, at 3.74%.

Table 3: Descriptive statistics by publicly traded versus privately owned banks sample

Banks sample	Publicly traded Banks						Privately owned Banks					
Variables	N	Std. Dev.	Min	Mean	Median	Max	N	Std. Dev.	Min	Mean	Median	Max
Panel A: Dependent level												
LLR	400	3.81	0.23	4.47	3.32	17.6	621	4.88	0.23	4.34	2.33	17.6
PL	365	5.26	0.06	5.51	3.91	20.9	448	5.60	0.06	5.05	2.90	20.9
NPL	270	5.41	0.00	5.29	3.32	19.3	321	4.45	0.00	3.74	2.06	19.2
Z-SCORE	394	0.87	0.52	3.40	3.37	5.61	688	0.89	–0.51	3.30	3.30	5.53
Z	388	0.88	0.33	3.35	3.38	4.94	692	0.98	–2.50	2.94	2.90	5.19
Panel B: Bank-level												
Public	423	0.00	1.00	1.00	1.00	1.00	774	0.00	0.00	0.00	0.00	0.00
Subsidiary	423	0.45	0.00	0.28	0.00	1.00	774	0.49	0.00	0.62	1.00	1.00
SOEs	423	22.9	0.00	20.9	12.0	100	774	23.4	0.00	16.4	0.00	100
INS	423	28.0	0.00	27.0	17.0	95.0	774	32.0	0.00	23.0	0.00	99.0

NII	404	37.0	–462	29.0	28.0	170	689	39.0	–336	43.0	30.0	230
CI	396	35.0	12.0	57.0	49.0	302	674	52.0	10.0	71.0	58.0	399
Size	406	86.3	0.76	82.1	43.5	267	704	58.4	0.76	3.69	0.88	267
Middle Age	423	0.25	0.00	0.06	0.00	1.00	774	0.22	0.00	0.05	0.00	1.00
Mature Age	423	0.24	0.00	0.93	1.00	1.00	774	0.23	0.00	0.94	0.00	1.00
Panel C: Country-level												
Common	423	0.50	0.00	0.53	1.00	1.00	774	0.50	0.00	0.47	0.50	1.00
Inflation	423	5.88	–2.40	5.31	3.80	63.3	734	10.4	–30.2	6.67	3.20	63.3
GDP per capita	423	20.9	0.62	19.9	18.7	85.1	738	14.5	0.49	13.7	9.61	85.1
GDP	423	24.2	2.57	27.9	21.4	104	747	74.5	0.26	44.4	20.9	395

As presented in Table 3 there is no high variation in the Z-score across publicly traded and privately owned banks; the averages are 3.40 and 3.30, respectively. Compare the findings of the Z-score with one of the studies with a large sample study by Samet et al. (2018), which found that publicly traded banks have a higher Z-score than their privately-owned peer, which the publicly traded banks have 3.11 while the privately-owned peers have 2.86. The Z for the publicly traded banks is 3.35 and for the privately owned banks is 2.94.

On the other hand, the publicly traded banks also have higher subsidiaries, state ownership and institutional ownership. Hence, the publicly traded subsidiaries may increase the risk because the subsidiary's loan portfolio may be constructed as a risky portfolio to account for failed problems that are not viewed as a parent bank's failure (Abedifar et al., 2013). In addition, the table shows that publicly traded banks have lower non-interest income and cost inefficiency values. These results present the importance of the requirements by the regulatory of the stock market (Samet et al., 2018). The higher non-interest income for the privately owned banks may explain their hedging from lower loans by increasing the non-interest income to preserve profit.

Table 3 also shows that the publicly traded banks are greater in size and older than privately owned banks. The larger banks may be riskier due to the fact of too-Big-To-Fail (Kane, 2010). Hence, due to the result findings that the publicly traded banks are larger banks than the privately owned banks so, they will be riskier. In addition, older banks are more likely to have long-term partnerships and other benefits (e.g., experience in new regions and product markets) reflected in their efficiency and risk advantages (Abedifar et al., 2013). It could be the case that publicly traded banks have more efficiency but the potential to take more risk and therefore operate less cautiously.

Table 4: Spearman's rank correlation coefficients of dependent and public variables

Variables	LLR	PL	NPL	Z-SCORE	Z	Public
LLR	1.000					
PL	0.778	1.000				
NPL	0.812	0.963	1.000			
Z-SCORE	–0.186	–0.176	–0.208	1.000		
Z	–0.143	–0.104	–0.134	0.815	1.000	
Public	0.223	0.116	0.122	–0.094	0.025	1.000

Spearman rho = 0.153

The Pearson product-moment correlation coefficient was used in Table 4 to determine the relationship between Public and the dependent variables. The correlation between the credit risk and the Public shows positive correlations that convey that publicly traded banks are taking more risk. For the first indicator, the LLR is 0.22%. The other indicators have a positive correlation of 0.11% and 0.12%, respectively. On the other hand, the insolvency risk exhibits a discordant pattern where the Z-score tends to have a negative relationship by -0.09% while the Z is positive by 0.02%.

Empirical results: Bank status and credit risk

Table 4 presents the of the empirical results for bank status and credit risk. As presented the equation is estimated using OLS with a robust estimation technique. The study uses the robust technique to lower weights to observations with large residuals. Hence, the models will be less sensitive to outliers. In specification 1, the first credit risk indicator is regressed simply on the particular study variable of interest, Public. Specification 2 represents the second credit risk indicator. Specification 3 represents the third credit risk indicator. The regressions include different control variables, ownership structures, financial structures, ages, and macroeconomic indicators. The models with R-squared are at suitable levels. Also, the VIF is applied to the

result.

Overall, the study finds that credit risk is positive and statistically significant at the 1% level. The LLP is t (3.08) = 0.95, p<0.01, while the PL is t (2.59) = 1.14, p<0.01 and the t of NPL is (2.32) = 1.38, p<0.05. Therefore, it can be concluded that IBs publicly traded banks take more risk than their private peers. In all specifications, publicly traded banks, on average, exhibit higher credit risk than privately owned banks. The study expects the publicly traded banks to associate positively with the LLR due to extensive risky loans, which are higher for the publicly traded banks than for their privately owned peers. This finding is consistent with the study hypothesis H1; the publicly traded banks will be encouraged to take more risks than their privately owned bank counterparts. Additionally, the study discovers that publicly traded banks are positively associated with PL and NPLs, owing to the high risk-taking nature of IBs. The higher LLR will represent the higher risk-taking by the publicly traded IBs. The NPL variable's outcome demonstrates a distinct pattern of risk-taking dissection on the part of the publicly traded bank. The publicly traded bank has a statistically significant positive correlation with NPLs. Interestingly, in Table 3, the publicly traded banks' LLR mean is 4.47% and lower than the two conditions, the PL mean at 7.17% and the NPL at 5.29%. The mean of the loan loss reserve held by the publicly traded banks is 0.13% more than that of their privately owned counterparts, as represented in Table 3.

Table 5: The effect of the publicly traded status on credit risk

Dependent variable:	LLR	PL	NPL
Public	.958***	1.14***	1.38**
	(3.08)	(2.59)	(2.32)
Subsidiary	.068	.883**	1.15*
	(.207)	(2.01)	(1.89)
SOEs	–.005	.001	.045***
	(–.859)	(–.060)	(4.24)
INS	.006	.005	.009
	(1.35)	(.768)	(1.07)
NII	3.76***	2.27**	4.90***
	(4.48)	(2.01)	(3.61)
CI	2.08***	3.03***	2.48***
	(3.88)	(3.35)	(3.28)
Size	.080	–.317*	–.325
	(.569)	(–1.78)	(–1.60)
Middle Age	–3.06***	–6.66***	–4.08***
	(–4.42)	(–5.79)	(–3.36)
Mature Age	.547**	1.07***	2.09***
	(2.14)	(2.97)	(5.87)
Common	.977***	1.78***	1.811***
	(3.46)	(4.52)	(3.79)
Inflation	–.033*	.016	.231**
	(–1.90)	(.296)	(2.24)
GDP per capita	–.221*	–.176	.688**
	(–1.68)	(–.918)	(2.54)
GDP	–.462***	–1.13***	–1.45***
	(–4.21)	(–6.89)	(–5.84)
Constant	13.2***	35.7***	31.1***
	(3.63)	(6.94)	(5.01)
Year dummies	Yes	Yes	Yes
Observations	948	777	569
R^2	.152	.193	.276
Adjusted R^2	.140	.179	.285
Mean VIF	1.54	1.50	1.62

t-values are in parentheses; *** p<.01, ** p<.05, * p<.1

This interpretation has already been provided by the agency theory. The separation of agents and principals under a dispersed ownership structure influences the risk-taking behaviour of publicly traded banks. Additionally, agents may take a more open attitude toward risk-taking in order to retain advantages such as bonuses and stock options as a result of easy access to capital markets with higher potential growth (Beatty et al., 2002; Burgstahler and Dichev, 1997). The more dispersed owners' control governance mechanisms become separated, increasing the likelihood of information asymmetry, which exacerbates the agency problem theory

(Beatty and Harris, 1999; Gropp and Köhler, 2010).

The findings are consistent with the study by Tran et al. (2019), in which they found that the asymmetry in information and agency problems substantially differ in terms of the banks' stability. They found that publicly traded banks became riskier than their privately owned bank peers during the last crisis in 2008. In addition, Nichols et al. (2009) found that publicly traded banks earn lower returns per unit of risk than privately owned banks; hence, for a publicly traded bank to fulfil faster growth, the bank must take on more risk.

This point will raise the distance to higher credit risk, leading to insolvency. Consequently, the study finds that publicly traded banks' LLR has an unsuitable stage that may negatively affect the Z-score; as presented in Table 4, the higher problem loan and the impaired loan require a higher reserve loss from the banks' assets. This matter will influence the return on assets and equity by extending the amount of the loan loss reserve from the banks' assets. A clear benefit of credit risk in risk-taking prevention could not be identified in this analysis, and hence, the study has further analysis of the insolvency risk.

Control Variables and Credit Risk

Turning to the control variables, the study finds that the results are consistent with some of the previous studies (Abedifar et al., 2013; Barry et al., 2011; Kwan, 2004; Mascarenhas, 1989; Vining and Boardman, 1992). The subsidiary shows a positive sign for the credit risk; however, it does not significantly impact the LLR, while it is significant at the 5% level with the PL and 10% for the NPL. Comparing the three specifications reveals that the subsidiary bank is riskier than its parent in terms of the low quality of loans. Conversely, the LLR brings no evidence that multiplies the credit risk by having higher risk with lower reserve. The subsidiary bank is exposed to risk-taking mechanisms, allowing the bank to adopt higher risk strategies compared to its parent (Abedifar et al., 2013).

On the other hand, comparing the two results between the SOEs and INS shows no statistically significant difference between SOE or INS scores among the credit risk scores. However, the SOE cells were stimulated with NPL. This result is significant at the p<01% level. The result is consistent with previous studies (Berger et al., 2005; Iannotta et al., 2007) where they found that state ownership has poor loan quality and a positive relationship to credit risk. There are higher percentages of NPL in state-owned IBs. One of the reasons behind this relationship with the SOEs is clarified by the soft budget constraint (Kornai, 1986; Maskin, 1996). In general, banks are essential to the economy, and when the government owns a portion of the bank, it is prepared to support it. Governments' guarantee support systems may fail as a result of bank runs triggered by significant un-booked losses (Shleifer, 1998). Hence, the result of the NPL supports the null hypothesis of H1, where the state ownership shows more risk-taking for IBs. In contrast, H1 has no evidence of the outcome. The evidence shows no significant relationship between institutional ownership and credit risk-taking, where the institutional investors are more likely to monitor the management (Heflin and Shaw, 2000; Rubin, 2007). As a result, management will maintain efficiency to prevent credit risk and meet ownership requirements.

Additional data analysis demonstrates that non-interest income has a significant positive level set at the 1% level. This analysis indicates that banks' stability will deteriorate when bank portfolio volatility increases, cutting average profits and margins (Lepetit et al., 2008; Valverde and Fernández, 2007). Thus, banks will seek to maximise profits from non-interest businesses. The cost inefficiency has a significant positive relationship with credit risk, which requires higher net interest margins to compensate for the losses from inefficiency (Angbazo, 1997; Valverde and Fernández, 2007). In addition, this result may tend to be riskier for the banks as they are less likely to cover their costs (Cihak and Hesse, 2007).

Moreover, as demonstrated by this data, the bank size result is not statistically significant in terms of credit risk, except for the PL. Thus, when the banks grow, the issue of PL grows as well (Antão and Lacerda, 2011). Additionally, the study demonstrates a negative correlation between middle-aged banks and credit risk. When comparing the outcomes of middle-aged and mature banks, the middle-aged banks are more conservative than the mature banks; however, mature banks face greater risk due to their more considerable expertise in operating in a variety of different markets.

The next section of the results is concerned with the control country-level variables. The result shows that the common-law tradition countries have statistically significant positive relationships with credit risk. Hence, these countries take risks more than the others in terms of credit risk, which supports Qian and Strahan (2007) findings that common-law tradition countries have a higher loan demand and more highly developed economies. The higher demand may tend to have higher credit risk, as demonstrated by the result.

Credit defaults and credit spreads often move in lockstep with macroeconomic indicators. The inflation rate has diverse results concerning credit risk. However, these results are statistically significant and negative with the LLR, while the NPL has a statistically positive relationship with inflation. This result confirms that the higher inflation rate tends to lower the quality of loans and also limits the ability to hedge against poor loans by the banks in the same period of loss (Thiagarajan et al., 2011). An increase in inflation tends to decrease the loan quality, affecting the whole loan sector (Dailami and Leipziger, 1998). The basic premise is that low-interest rates give more power to consumer purchases. The greater the amount of money that is spent in the economy the more the price increases, creating inflation. Inflation will be lower when interest rates are higher (Masson et al., 1998).

Similarly, the study expects a negative relationship between the credit risk and the GDP per capita and the PL and NPL. The relationships between LLP and GDP per capita are statistically negative due to higher GDP per capita, which indicates that the loan will be repaid on time. Hence, higher GDP per capita will reduce the risk of non-payment problems (Dailami and Leipziger, 1998; Sainz-Fernandez et al., 2015). However, the result shows no relationship between higher GDP per capita and PL; conversely, higher GDP per capita tends to result in higher NPL. Interestingly, the higher GDP tends to lower the IBs' credit risk-taking, which may cause a negative relationship with the LLP (Koopman and Lucas, 2005).

Empirical results: Bank status and insolvency risk

The study investigates whether publicly traded banks are prepared to take on additional risks associated with insolvency in Table 5. The insolvency risk equation computed using OLS is shown in Table 5. The current analysis regresses the insolvency risk proxy on publicly traded banks (Public) across all models while also using the same control variables in Table 4. As stated, the models with R-squares are appropriate. Nonetheless, to ensure robustness, the study employs robust standard errors. In general, this analysis discovers a positive and statistically significant association between publicly traded banks and insolvency risk at the 5% and 10% levels. This outcome is consistent with the study hypothesis H1: Publicly traded banks are incentivised to take on more risk than privately held banks. The table's findings show that the Z-score is negative and statistically significant at the 1% level. The Z-score has t (-2.32) = -0.165, while the Z has a negative and statistically significant at the 10% level is t (-2.40) = -0.161.

According to the hypothesis, a publicly traded bank faces more risk-taking mechanisms that adopt higher-risk strategies compared to their privately owned bank counterparts. For the insolvency risk proxies, publicly traded banks maintain the advantage of having a better ability to grow and make acquisitions. The conclusion is compatible with agency theory, according to which managers may be able to take more risks in order to increase their rewards (Beatty et al., 2002; Burgstahler and Dichev, 1997). Further, public equity is more liquid and offers greater options for risk-taking to grow and enhance institutions. Banks will engage in high-risk ventures in order to get a better rate of return (Dewatripont and Legros, 2005). Also, their degree of independence increases their capacity to invest in high-risk ventures with a larger projected return. Additionally, the capital's flexibility enables them to seek funding more swiftly than a privately held bank could (Dewatripont and Legros, 2005).

As a result of these two tables (Table 4 and Table 5), with a dispensation relationship between the ownership, the information asymmetry increased, and the divergence of the incentives appeared. This point may increase risk-taking by encouraging the managers to take the higher risk, which causes the agency problem. In addition, the market forces might impose a higher risk-adjusted return and the more diffuse ownership required to take on more risk and thereby achieve a higher return and access to capital markets (Barry et al., 2011; Kwan, 2004; Lassoued et al., 2016).

The findings are consistent with the Tran et al. (2019) study where they found that the asymmetry in information and agency problems substantially differ in terms of the banks' stability. In addition, the study by Nichols et al. (2009) found that publicly traded banks earn lower returns per unit of risk than privately owned banks; hence, for a publicly traded bank to fulfil faster growth, the bank must take on more risk.

Control Variables and Insolvency Risk

Turning to the control variables, the study finds that the results are consistent with previous studies (Abedifar et al., 2013; Barry et al., 2011; Kwan, 2004; Mascarenhas, 1989; Samet et al., 2018; Vining & Boardman, 1992). The results indicate that the subsidiary bank increases the instability of the IBs by taking more risk. The subsidiary bank's portfolio may be risker due to the nature of its contribution, considering the diversification

of the parent bank's portfolio (Abedifar et al., 2013). The results are negative and significant at 5% and 1%, respectively. In addition, the study discovers that SOEs in IBs have a significant negative correlation with insolvency risk, implying that the SOE is willing to take on additional risk. The instability of state ownership is consistent with (La Porta et al., 2002). They found that the higher SOE reduces the bank's efficiency. Non-conservative strategies for the benefit of the state may increase the bank's risk of failure. Comparing the previous tables (Table 4) and Table 5, Table 5 demonstrated that SOE and impaired loans have a positive association. This result lends credence to a theoretical view where the soft budget constraint may compatible with the implicit bailout guarantee wanted by banks when the government has a stake (Boubakri et al., 2020).

On the other hand, INS has a significant negative relationship with insolvency risk. However, it is insignificant for the Z. Higher institutional ownership tends to lower stability for IBs. Institutional investors diversify their portfolios to maximise their profits. Consequently, they may take risks to maximise their profit in order to have higher expected returns (Barry et al., 2011). However, the rustle in Table 4 and the Z result in Table 5 are against taking risks by institutional ownership; hence, the result is partly against the null hypothesis of H1.

Table 6: The effect of the publicly traded status on the distance to default

	Z-SCORE	Z
Public	–.156**	–.161*
	(–2.32)	(–2.40)
Subsidiary	–.142**	–.174***
	(–2.29)	(–2.73)
SOEs	–.003**	–.002*
	(–2.51)	(–1.73)
INS	–.004***	.001
	(–4.56)	(–.172)
NII	–.573***	–.738***
	(–4.93)	(–6.59)
CI	–.261**	–.399***
	(–2.57)	(–5.69)
Size	.011	.125***
	(.419)	(4.99)
Middle Age	–.518***	.057
	(–3.08)	(.349)
Mature Age	–.117**	.129**
	(–2.00)	(2.16)
Common	–.119*	–.099
	(–1.76)	(–1.55)
Inflation	–.009***	–.016***
	(–2.64)	(–4.35)
GDP per capita	.126***	.053*
	(4.55)	(1.93)
GDP	–.082***	–.059**
	(–2.88)	(–2.47)
Constant	5.11***	3.18***
	(6.65)	(4.54)
Year dummies	Yes	Yes
Observations	990	1002
R^2	.136	.241
Adjusted R^2	.125	.231
Mean VIF	1.60	1.62

t-values are in parentheses; *** p<.01, ** p<.05, * p<.1

On the other hand, the statistical analysis of the bank-level indicators and the non-interest income is significantly negatively associated with the IBs' stability. This result presents less stability as consistent with the previous results (Lepetit et al., 2008; Valverde and Fernández, 2007). Hence, the result of this table confirms the previous table (Table 4) where the banks should increase the non-interest income when the banks are in danger; however, the non-interest income shows lower when it is insolvency risk, thus increasing the risk where the bank may face some challenging due to higher non-interest income. From the same perspective, a weaker stability case existing in the IB enhances the cost of inefficiency. The result is consistent with (Kwan and Eisenbeis, 1997); the banks need higher net interest margins to support the losses incurred due to inefficiency (Angbazo, 1997; Valverde and Fernández, 2007).

Furthermore, the empirical findings indicate that bank size has no effect on the Z-score, which is consistent with previous studies (Bertay et al., 2013; Samet et al., 2018). However, the size positively affects the probability of failure of Z. The sign indicates that the larger banks tend to have less risk-taking, and they have a lower risk of running out of capital (Cihak and Hesse, 2007). Hence, the result shows that size impacts positively reducing risk-taking by IBs, where it is shown in Table 4 that the larger banks tend to have lower credit risk. The study results also show that middle-aged banks are less stable than their more mature-age bank counterparts. As a result, the younger banks and less experienced have stricter regulations to support their operations to be more cautious (Abedifar et al., 2013). The result indicates that the mature-age bank is less risky than the younger bank.

The last specification includes a set of country-level variables. The result shows that inflation tends to higher insolvency risk, which is the source of lower stability for the banks. The result is consistent with (Samet et al., 2018). The result shows that GDP per capita has a positive impact on insolvency risk. The higher GDP per capita tends to promote the higher stability of banks, a result consistent with Houston et al. (2010); however, the GDP, a proxy of the economic impact size, increases instability. This result is caused by higher opportunities for investing that may impact the stability of the banks.

Alternative estimation methods

Heckman test

The study follows estimations of previous studies (Barry et al., 2011; Nichols et al., 2009; Samet et al., 2018), which estimate in the first stage a probit model with Public as the dependent variable to determine the variables that influence the bank's decision to go public. The variables specified to determine whether the dependent variable is observed the explanatory variables of the probit model, which are net loans over total assets, total customer deposits over total assets, equity over total assets, net interest income over total assets, net income over total equity, and net income over total assets.

Table 7: Heckman test

Model	(1)	(2)	(3)	(4)	(5)
Dependent variable	LLR	PL	NPL	Z-SCORE	Z
Public	.681**	.745***	.489***	–.355**	–.334**
	(2.17)	(4.61)	(3.40)	(–2.43)	(–2.29)
Subsidiary	–.272	.737***	.062	–.053	–.039
	(–1.04)	(4.84)	(.413)	(–.363)	(–.269)
SOEs	–.014**	.01***	.008***	.002	.002
	(–2.28)	(2.77)	(2.83)	(.69)	(.816)
INS	–.018***	–.001	–.006***	.002	.003
	(–4.36)	(–.633)	(–2.82)	(.202)	(.184)
NII	–1.04**	.125	–.706**	–.657**	–.687**
	(–2.19)	(.425)	(–2.12)	(–2.21)	(–2.32)
CI	–.154	–.126	.067	–.138	–.249
	(–.631)	(–.821)	(.369)	(–.761)	(–1.40)
Size	.466***	.269***	.106**	.084	.061
	(4.72)	(4.72)	(1.96)	(1.43)	(1.039)
Middle Age	1.52**	.357	.603**	1.39***	1.41***
	(2.43)	(1.11)	(1.99)	(2.86)	(2.89)
Mature Age	–.771***	–.771***	–.274*	.066	.107
	(–2.61)	(–5.06)	(–1.86)	(.483)	(.781)
Common	.081	–.355**	.096	–.201	–.220
	(.299)	(–2.54)	(.659)	(–1.36)	(–1.49)
Inflation	.009	–.042***	–.005	.027**	.026**
	(.663)	(–4.28)	(–.454)	(2.27)	(2.25)
GDP per capita	.138	–.210***	.865***	.089	.082
	(.945)	(–2.76)	(10.4)	(1.21)	(1.11)
GDP	.404***	.064	.124**	.141**	.138**
	(4.30)	(1.21)	(2.46)	(2.51)	(2.46)
LAMBDA	–7.79***	–4.41***	–6.64***	–1.12**	–.463
	(–3.05)	(–3.32)	(–5.10)	(–2.36)	(–1.15)
Constant	–13.1***	–3.47**	–11.3***	–3.35**	–2.89*
	(–4.33)	(–2.36)	(–7.62)	(–2.11)	(–1.83)
Observations	867	867	867	867	867

t-values are in parentheses; *** p<.01, ** p<.05, * p<.1

The second step is the regressions of risk-taking indicators on other explanatory variables, which is in the second stage and includes the inverse Mills ratio (LAMBDA). The model controls the correlation between Public and second-stage errors to obtain consistent estimators. As presented in Table 7 the specifications report the second-stage regression results, including the inverse Mills ratio (LAMBDA), the result obtains the same as previous results after LAMBDA is included, and the results of LAMBDA are significant. However, the 5th specification has insignificant LAMBDA. The primary variable (Public) remains statistically significant at the 1% level in the three regressions, while it is at the 5% level for the last two specifications. Hence, the result confirms the risk-taking by publicly traded Islamic banks.

6. Conclusion and Recommendation

Islamic banking has been developed around the world. It has a fundamentally different structure that impacts access to equity capital markets. The difference between Islamic banking and other banking is based on the *Fiqh Al-Mu'amalat*, which has unique leases. To date, the limitation of the Islamic banking public and private status literature and their impact on risk-taking propose the need for this result for the Islamic banking sector. I investigate the influence of risk-taking based on the listed status of the comprehensive Islamic banks' sample. The sample contains 133 banks from 35 countries. I gather credit and insolvency risk data to examine the differences between public and private Islamic banks' risk-taking. The paper revises and constructs a control for differences across banks in legal countries. I investigate whether there is a potential endogeneity bias throughout my tests. I run my regression approach to compare the suitability with which public and private banks exhibit more risk-taking. I predict and find that public banks exhibit greater risk-taking than do their private bank peers. I extend this analysis by discovering the impact of risk-taking proxies' components individually.

The results confirm that public banks approve more risk-taking for credit and insolvency risk. I predict and find that public banks reserve a higher amount of loan loss than private banks. The credit risk is persistent and more significant for the public bank problem loan and impaired loan indicators than for private banks. Regarding the other aspect, I go deep to explore the reason behind that, and I investigate insolvency risk components individually through the standard deviation of the ROA and ROE. The result indicates that public banks tend to have more risk than their private counterparts.

Theoretically, the agency perspective supports the result. The risk-taking behaviour of publicly traded banks is affected by the separation between the agents and principals where the ownerships are dispersed (Barry et al., 2011). In addition, the publicly traded banks' aptitude to drive an easier finance access path of their growth opportunities is through the capital markets. The fact that public equity is more liquid and less expensive to issue than private equity enables them to engage in riskier projects with a greater projected return. Additionally, the capital's flexibility enables them to seek funding more swiftly than a privately held bank could (Dewatripont and Legros, 2005). These factors also allow the banks' managers to support more risk in to gain bonuses and stock options. Conversely, a small group of shareholders oversees privately held banks. Also, owing to their small shareholder base, privately held banks are more likely to exercise greater care and closely scrutinise bank management (Iannotta et al., 2007).

The findings show evidence that regarding the fact that the IBs arising from the specific features of Islamic contracts (Iqbal and Llewellyn, 2002), financial reforms in this region related to the convergence and harmonisation of regulations and products are needed to facilitate an efficient and sustainable growth of this sector.

The present study has implications for the market discipline and agency theory. These findings support the theoretical expectation that separation between the agents and principals where the ownerships are dispersed will impact the risk-taking by the agents. In addition, the easy access to the capital market may lower the agents' conservative approach to risk-taking to maintain their benefits, such as bonuses and stock options. Therefore, IB banks must prioritise the management of these two bank-specific features. Therefore, bank-specific policies should concentrate on enhancing credit risk management to enhance banks' asset quality. In addition, policy should limit the danger of insolvency or bankruptcy by lowering investments in very unstable enterprises, which would reduce the Z-scores of the banks.

Academic researchers, policymakers, rating agencies, bank shareholders, and bondholders generally benefit from the results of this result, which emphasise the need to keep up with changes in CG regulations and focus on how these changes and innovations affect banks' financial performance and management. To help

shareholders, bondholders and depositors should evaluate if the bank's listing status warrants an additional risk premium. In addition, credit rating agencies, regulators, and politicians will also benefit from these findings, which will help them better evaluate the risk of publicly traded and privately owned IBs and their ability to discipline them in their risk-taking behaviour.

The findings contribute to a limited body of research on whether listed status banks vary in risk-taking and represent unique findings on whether and how the listing status affected IBs globally. The results indicate that institutional ownership is essential in explaining risk differences between publicly traded and privately owned IBs. Consequently, the research assessed that financial system stability should estimate banks' stability. In addition, the IBs should be under solid financial systems to maintain the banks' stability from different ownership objectives.

Acknowledgement
I would like to thank the Saudi Arabian government and Shaqra University for funding the research.

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