Cogent Economics & Finance

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/oaef20

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To cite this article: Hasan Mukhibad, Prabowo Yudo Jayanto, Risanda Alirastra Budiantoro, Bayu Bagas Hapsoro, Aas Nurasyiah & Ayatulloh Michael Musyaffi (2023) Equity-based financing and risk in Islamic banks: A cross-country analysis, Cogent Economics & Finance, 11:2, 2235117, DOI: 10.1080/23322039.2023.2235117

To link to this article: https://doi.org/10.1080/23322039.2023.2235117

Published online: 11 Jul 2023.

Mukhibad et al., *Cogent Economics & Finance* (2023), 11: 2235117
https://doi.org/10.1080/23322039.2023.2235117

cogent economics & finance

FINANCIAL ECONOMICS | RESEARCH ARTICLE

Equity-based financing and risk in Islamic banks: A cross-country analysis

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Received: 14 November 2022
Accepted: 06 July 2023

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Reviewing editor:
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Abstract: Equity-based financing (EBF) is an Islamic bank (IB) financing type that promotes justice, spirituality, and Islamic values. However, data shows that IBs still have low EBF. The researcher noted that with EBF, there is information asymmetry, agency problems and the potential for moral hazards, meaning EBF may be a risky type of transaction. This study aims to empirically show whether EBF is a risky transaction by looking at the role of EBF in non-performing financing (NPF), the z-score, and the return on average assets (ROAA). The research sample consisted of 54 IBs from 19 countries, with an observation period of 11 years (2009 to 2019). This study finds that EBF has a positive effect on NPF and does not affect the z-score and ROAA. The subsample test shows that EBF is riskier for large IBs than for small IBs. EBF has a positive effect on NPF and a negative one on ROAA for large IBs. In

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PUBLIC INTEREST STATEMENT

The profit and loss sharing (PLS) transaction is a unique transaction in Islamic banks (IB) and the main differentiator between IB and conventional banks (CB). IBs implement the PLS transactions based on *mudharabah* and *musyarakah* contracts. The implementation of these two contracts is an equity-based financing (EBF) product. EBF promotes justice, consistent with the spirit of Islam and the unique characteristics of the IB. However, recently, IB has a lower EBF product than Debt-based financing (DBF), and this causes IB operations to be similar to CBs. This study explains why IB has a lower EBF product than DBF. This study provides evidence that EBF is a risky financing, which may be why IBs provide limited EBF. Large IBs have a higher risk impact in channeling EBF than small IBs.

contrast, EBF has a negative effect on the z-score of small IBs. This research examines the robustness of these findings by employing other models as well as the generalised method of moment (GMM) to address any endogeneity problems.

Subjects: Corporate Finance; Accounting; Risk Management

Keywords: fairness; risk sharing; risky transactions; monitoring costs

1. Introduction

Shariah as the main principle for the operation of Islamic banks, causes them to have significant differences from conventional banks (CBs) (Antonio et al., 2012). IBs use a profit-and-loss sharing system in their banking operations. This is known as equity-based financing (EBF). The main characteristic of EBF is profit sharing between the IB and the customer, where any business losses are the responsibility of the bank, except for losses due to the customer's negligence. With these characteristics, EBF is regarded as financing that promotes justice and is consistent with the Islamic spirit (Fianto et al., 2018; Rahman et al., 2014) and it is the primary distinction between IBs and CBs (Chong & Liu, 2009). This is due to EBF's risk sharing and profit sharing based on profits from the customer's business. Fianto et al. (2018) demonstrate that EBF has a greater impact than debt-based financing (DBF) in increasing the income of micro, small, and medium enterprise (MSME) business actors.

However, the data shows that EBF is still need to be maximally implemented by IBs due to the small amount of EBF contracts distributed by the IBs (Chong & Liu, 2009; Salman & Nawaz, 2018). The *murabaha* syndrome describes how IBs currently use a plethora of DBF, rather than EBF (Mergaliyev et al., 2019). Saraç and Zeren (2015) and Shinsuke (2007) report that IBs have an EBF rate of 10% of all financing. Meanwhile, Mahmood and Rahman (2017) report an EBF percentage of 8.32% for Middle Eastern IBs, 5.01% for Asian IBs, 4.19% for African IBs, and 0.73% for European IBs. Scholars have concluded that IB operations are like CB operations due to the lack of EBF financing and the dominance of DBF financing.

The causes of low EBF by IBs have been identified by researchers. EBF is a riskier financing option than other financing options (Mohd Ariffin et al., 2009). The profit-sharing system implemented for EBF creates an opportunity for customers to report a lower than actual business performance to reduce the income that is due to the bank (Dar & Presley, 2000). This is because customers must periodically report their performance which forms the basis for calculating the profit sharing between the customer and the bank. Thus there is the issue of information asymmetry between customers and IBs (Muda & Ismail, 2010; Warninda et al., 2019), as well as the moral hazard present in EBF transactions (Mahmood & Rahman, 2017; Nuddin & Azhar, 2017). Furthermore, the EBF system allows customers to use EBF funds to finance risky projects that create moral hazards (Mahmood & Rahman, 2017). This is because the customer has the right to share the risk of the project's failure with the IB. Essentially, this EBF risk can be reduced by effective bank monitoring to reduce information asymmetry (Rahman et al., 2014). However, this monitoring is costly (Hidayah et al., 2019; Rahman et al., 2014).

Previous studies have described EBF using two approaches: survey research and document analysis. Fianto et al. (2018) explain the impact of EBF on customers' welfare using a survey approach. Mahmood and Rahman (2017) distributed questionnaires to bankers so they could document the challenges of EBF's implementation and discover the moral hazard that made bankers hesitant to provide EBF. Meanwhile, Ismal (2010) examines the EBF's return rate and concludes that EBF and DBF generate sustainable returns both during and outside of crises. Misman et al. (2020) and Mukhibad and Khafid (2018) find that EBF has a positive effect on credit risk. Rahman et al. (2014) and Dar and Presley (2000) conducted an EBF conceptual study and found that the Islamic banking environment and agency conflicts are the root causes of the poor

EBF. Furthermore, Risfandy et al. (2019) report that market competition, profitability and stability influence the distribution of EBF. To the best of the author's knowledge, there has been no previous study that can prove whether EBF is a risky form of financing using panel data from a cross-country analysis.

This study contributes in two ways. First, the study empirically demonstrates the impact of EBF on credit risk, insolvency risk, profitability, and return rate risk. This study adds to the existing literature by emphasizing the impact of EBF on credit risk (Misman et al., 2020; Mukhibad & Khafid, 2018; Warninda et al., 2019) and bank income from EBF (Ismal, 2010).

Secondly, this research investigates EBF using cross-country data. This study selected IBs that supplied EBF products during the period of observation, although this study found that only a small number of IBs did offer such products. This paper excluded IBs who offered no EBF products during the observation period. This study complements Risfandy et al. (2019), which looked at EBF in the context of a specific country, Indonesia.

The remainder of this paper is as follows: The second section is about the literature review. The third section describes the hypotheses' development. The fourth section describes the sample, variable measurement, and data analysis methods. The fifth section contains descriptive analysis, data test results and research findings. The final section presents the study's conclusions, recommendations, and limitations.

2. Literature review

2.1. Financing contracts in Islamic banks

Islamic banks use Shariah as the main template for their banking operations. Shariah prohibits interest (*riba*), uncertainty (*gharar*) and gambling (*maysir*). These transactions are prohibited because *riba, gharar*, and *maysir* are unfair transactions (Kettell, 2011) and are not directly related to productivity (Shanmugam & Zahari, 2009). The prohibition of interest causes Islamic banks to have alternative contracts, namely *mudharaba, musharaka*, *murabaha, istishna'a, salam* and *ijara*. In general, there are two types of financing contracts: profit and loss sharing (PLS) and non-PLS financing (Risfandy et al., 2019). PLS is often referred to as EBF, while non-PLS is called DBF.

For a DBF contract, a bank has four contracts that can be applied to financing products: *murabaha, salam, istishna'a* and *ijara* (Kettell, 2011). In *murabaha, salam*, and *istishna'a* transactions, the bank acts as the seller. The bank is earning some profit from the mark-up applied to the cost of purchasing the goods. In this sort of transaction, the bank will earn a fixed income and will not be affected by the customer's business performance. On the other hand, in an *ijara* transaction, the bank is leasing physical assets or property and receives a fixed rental income and is also not affected by the customer's business performance. The point is, with a DBF contract, the bank does not suffer any loss if the customer's business makes a loss.

With an EBF contract, there are two contracts that can be applied: *mudharaba* and *musharaka*. In a *mudharaba* financing contract, the bank acts as the provider of funds (*shohibulmaal*) for customers that are entrepreneurs and who are willing to use the funds for their businesses. Profits from a business will be shared between the bank and the customer based on the profit-sharing ratio agreed by the bank and the customer. Business losses are the responsibility of the bank unless the loss is due to the negligence of the customer. The main point of *mudharabah* financing is that Islamic banks fully entrust the use of their money to the customers. Based on this perspective, EBF, both through *mudharaba* and *musharaka*, is very risky for Islamic banks. They bear all the losses (*mudharaba*) or partial (*musharaka*) losses when customers fail to run their businesses properly. This characteristic causes Islamic banks to face a greater risk than conventional banks (Mohd Ariffin et al., 2009).

In addition to the risk of bearing their customers' losses, with an EBF, the Islamic banks face risks if customers report operating profits that are lower than the real profits. This event may occur because the customer has the power to run the business and periodically report the results to the bank. This report is the only basis for the banks and customers to calculate each one's share of the profit from the business. In addition, the customers have the power to use EBF to fund high-risk projects since they prefer that losses from their projects are the responsibility of the bank. Although the bank can minimise this risk by reviewing the type of business the customer will run, the customer is more aware of the risks from the proposed business than the bank. Thus, there is information asymmetry in EBF transactions (Muda & Ismail, 2010; Warninda et al., 2019), allowing for a moral hazard (Mahmood & Rahman, 2017).

2.2. Agency theory and equity-based financing product

The characteristic of EBF transactions is that the IBs act as the provider of funds (*shohibulmaal*) for customers that are entrepreneurs. Customers are willing to use the funds for their businesses and profits from a business will be shared between the bank and the customer. Customers will report their business performance as lower than real business performance. In addition, customers can also report less profit as compared to the self-financing owner-customers. This action is to reduce the profit sharing given to the bank. With these characteristics, customers may report lower business profits. This is due to information asymmetry between banks and customers in EBF transactions (Muda & Ismail, 2010; Warninda et al., 2019). This contract is like agency conflicts between agents and principles in agency theory. The EBF transactions cause agency problems (Dar & Presley, 2000).

Evidence of an agency problem in EBF products is that customers use EBF funds to finance risky projects (Mahmood & Rahman, 2017). This policymaking is based on the argument that the customer prefers that in an EBF contract, business losses are the responsibility of the bank. So that EBF allows moral hazard to occur (Mahmood & Rahman, 2017; Nuddin & Azhar, 2017). Furthermore, the EBF system allows customers to use EBF funds to finance risky projects that create moral hazards (Mahmood & Rahman, 2017). Using EBF funds to finance risky projects also creates credit risk. So EBF has the potential to increase NPF (Mukhibad & Khafid, 2018).

3. Hypothesis

Insolvency risk is measured by the z-score, which describes the risk of bankruptcy due to the bank not being able to meet its debts. This risk arises due to decreased bank financing efficiency (Duho et al., 2019; Liu & Wilson, 2013). Čihák and Hesse (2008) studied the strength of IBs' z-scores to predict bank failures and it has now become one of the tools to measure IB stability. In this case, the IB only needs to keep its z-score in the safe area category to indicate that the IB is managed well.

The unique characteristic of EBF is that the revenue sharing paid by a customer to the bank is influenced by the performance of the customer's business (Risfandy et al., 2019). This means that the bank has no guarantee of obtaining a fixed income (Warninda et al., 2019). Banks can accept losses if customers fail to manage their businesses properly. Based on these characteristics and agency problems, EBF is a riskier transaction than the other types of financing (Alam & Parinduri, 2017; Suzuki et al., 2019; Warninda et al., 2019). Abusharbeh (2014) and Mukhibad and Khafid (2018) use credit risk to prove whether EBF is a risky type of financing. Their results show that EBF has a positive effect on credit risk.

H1: EBF positively and significantly affects credit risk.

EBF is one type of bank financing, so how effectively EBF is managed will affect an IB's income. Furthermore, Ascarya (2014) stated that a lack of understanding of the essence of Islamic banking

for conducting business and the business's orientation cause EBF to reduce IBs' incomes because EBF consists of sharing profits and losses. The characteristics of EBF are high risk, as evidenced by the increase in NPF (Abusharbeh, 2014; Mukhibad & Khafid, 2018) and can cause a bank's income to decrease. Financing is the primary source of a bank's income and changes to its credit risk can cause a decrease in the income of an IB (Abusharbeh, 2022; Laryea et al., 2016; Rathnayake et al., 2022; Thornton & DiTommaso, 2021).

In addition, the agency theory approach states there is the existence of information asymmetry between banks and customers in EBF transactions (Muda & Ismail, 2010; Warninda et al., 2019) causes agency problems (Dar & Presley, 2000) and moral hazards (Mahmood & Rahman, 2017; Nuddin & Azhar, 2017). IBs can conduct direct supervision of their customers' businesses to reduce this information asymmetry. This supervision causes banks to have more complete information on the customers' business operations, reduces the potential for customers to report lower business performance, and from using them using EBF to fund high-risk projects. However, this bank supervision adds to the bank's operating costs and can further reduce the bank's profitability (Hidayah et al., 2019; Rahman et al., 2014). With this framework in mind, this study develops a second hypothesis:

H2: EBF negatively and significantly affects bank profitability.

IBs offer EBF instruments through *mudharaba* (partnership) and *musharaka* (joint venture partnership) financing (Akkizidis & Khandelwal, 2008). The credit risk from EBF transactions arises due to a decrease in the value of the bank's equity position against the customer's business; the IB has the potential to lose the rate of return on its investment and in the end it may lose the funds invested in the EBF transactions (Adawiyah, 2015). To have sufficient confidence that the business to be financed through EBF has good prospects, the IB must carefully assess the credit risk that will arise. However, this has costs (both operational and non-operational) that are costly (Ascarya, 2014). A bank's failure to identify an EBF credit risk will increase the bank's credit risk in addition to the natural risk from EBF products. The agency conflict approach that creates information asymmetry between the bank as the principal and the customer as the agent can create a moral hazard where the customer uses EBF funds to finance high-risk projects.

The insolvency risk is related to the stability of the bank's income and costs, where a stable income indicates the bank has a low insolvency risk and vice versa. One source of a bank's financial stability is profitability, and the main source of profitability is financing. Thus, profitability affects the insolvency risk (Djebali & Zaghdoudi, 2020). Kabir et al. (2015), using 142 Islamic banks and 302 conventional banks around the world, found that non-performing loans (NPL) have a positive influence on the risk of bankruptcy. Ghenimi et al. (2017), using 49 banks operating in the MENA region, also found credit risk could influence bank stability as high NPLs reduce bank stability.

H3: EBF positively and significantly affects insolvency risk.

4. Method

This study employs all IBs in the world as a population. Only 54 IBs reported using EBF in 19 countries (Bahrain, Egypt, Indonesia, Iraq, Islamic Republic of Iran, Kuwait, Malaysia, Oman, Pakistan, Palestine, Philippines, Qatar, Saudi Arabia, Seychelles, Sri Lanka, Sudan, Thailand, Tunisia, and the United Kingdom). We use a sample consisting of an unbalanced panel data from 2009 to 2019, resulting in 361 bank-years.

This study used the return on average assets (ROAA) to measure the IBs' profitability and non-performing financing (NPF) and the z-score to measure their risk. The z-score was used as an

indicator of the risk of insolvency, where a higher value z-score represented a greater risk for the bank (Jabari & Muhamad, 2021). Following Louhichi et al. (2020), the z- score was calculated as follows:

$$Z\text{-}SCORE = (ROAAi_{,t,} + CARi_{,t})/\sigma ROAA_{i,t}$$

To reduce the variance in the z-score's data and mitigate skewness, this study followed Jabari and Muhamad (2021) by taking the natural logarithm of the z-score.

The second risk measure was credit risk. Following Louhichi et al. (2019), Alandejani and Asutay (2017), and Akram and Rahman (2018), this study used non-performing financing (NPF) as the credit risk. A higher value for the NPF represents a greater bank credit risk. The NPF was calculated as impaired financing divided by gross financing (Louhichi et al., 2019). The return on average assets (ROAA) was used as a profitability indicator. Following Noman et al. (2017), this study measured the ROAA as profit after tax divided by average total assets.

The main objective of this study was to provide evidence of whether EBF was a riskier form of financing than DBF. For this reason, this study used one independent variable, namely the equity-based financing (EBF) ratio. Islamic banks have two types of contracts that are categorized as EBF: *mudharaba* and *musharaka* financing. This study measures the EBF ratio by dividing the total EBF by the total number of financing methods.

Following prior studies and to determine the partial effect of EBF on risk and profitability, this study considered several control variables as follows. The first was the corporate governance (CG) variables, namely the board of directors (BOD) index and the sharia supervisory board (SSB) index. This decision was because CG studies were not this study's focus. Jabari and Muhamad (2021), Nguyen (2021), Isa and Lee (2020), Basiruddin and Ahmed (2019), and Zeineb and Mensi (2018) have provided evidence that each attribute of a BOD and SSB influence IBs' risk-taking, including determining the type of low-risk financing (Najwa et al., 2019). This study used four attributes of a BOD and SSB, namely the members' gender, level of education, experience, and cross-membership. Following Ajili and Bouri (2018) and Abdel-Baki and Sciabolazza (2014), these study used the four indicators to measure the BOD index as well as the SSB. Each of this study attributes was dichotomous. Score 1 for banks with attribute scores of 50% or more and zero otherwise. The BOD or SSB index was measured by the total score of all the attributes in the bank year divided by the maximum score.

The second are bank-specific variables, namely financing (LOAN) (Abedifar et al., 2013), investment account (deposit) holders (DEPOSIT) (Aljughaiman & Salama, 2019), the capital adequacy ratio (CAR) (Iqbal, 2012), diversity income (DIV_INCOME) (Safiullah & Shamsuddin, 2018), bank size (SIZE), and public listing (Jabari & Muhamad, 2021). LOAN was measured by dividing the total financing by the total assets (Dhar & Bakshi, 2015). DEPOSIT was measured by dividing the total number of investment account (deposit) holders by the total assets (Abdul Karim et al., 2014). CAR was measured by dividing the total equity by the risk-weighted assets (Azmat et al., 2021). DIV_INCOME was measured by dividing the non-financing income by the total operating income (Safiullah & Shamsuddin, 2018). Bank size (SIZE) was measured by the natural logarithm of total assets (Louhichi et al., 2019). Public listing was measured by a dummy score of 1 if the IB was listed and zero otherwise.

The third was country-level variables, namely the growth in the gross domestic product (GDP) and the Muslim population (MUSLIM). GDP was measured by the GDP growth of a country in a year to the total GDP of a country in a year (Srairi, 2019). MUSLIM was measured by the total Muslim population divided by the total population (Bilgin et al., 2021).

This study used financial data and CG data were hand collected from the Islamic banks' annual reports. GDP data came from the World Bank. The Pew Research Center and worldpopulationreview.com supplied data on the Muslim population. We winsorise all variables used in our research models. See Appendix for variables' measurements.

To investigate the effects of EBF on NPF, ROAA, and the z-score, this study constructed the following equation:

$$NPF_{i,t}=\beta_0+\beta_1 EBF_{i,t}+\beta_2 BODINDEX_{i,t}+\beta_3 SSBINDEX_{i,t}+\beta_4 LOAN_{i,t}+\beta_5 DEPOSIT_{i,t}+\beta_6 CAR_{i,t}+\beta_7 DIV\_INCOME_{i,t}+\beta_8 SIZE_{i,t}+\beta_9 MOSLEM_{i,t}+\beta_{10} GDP_{i,t}+\beta_{11} PUBLIC_{i,t}+\varepsilon \quad \text{(Model1)}$$

$$ROAA_{i,t}=\beta_0+\beta_1 EBF_{i,t}+\beta_2 BODINDEX_{i,t}+\beta_3 SSBINDEX_{i,t}+ \beta_4 LOAN_{i,t}+ \beta_5 DEPOSIT_{i,t}+ \beta_6 CAR_{i,t}+\beta_7 DIV\_INCOME_{i,t}+\beta_8 SIZE_{i,t}+ \beta_9 MOSLEM_{i,t}+ \beta_{10} GDP_{i,t}+ \beta_{11} PUBLIC_{i,t} +\varepsilon \quad \text{(Model 2)}$$

$$Z\text{-}SCORE_{I,t}= \beta_0+\beta_1 EBF_{i,t}+\beta_2 BODINDEX_{i,t}+\beta_3 SSBINDEX_{i,t}+ \beta_4 LOAN_{i,t}+ \beta_5 DEPOSIT_{i,t}+ \beta_6 CAR_{i,t}+\beta_7 DIV\_INCOME_{i,t}+\beta_8 SIZE_{i,t}+ \beta_9 MOSLEM_{i,t}+ \beta_{10} GDP_{i,t}+ \beta_{11} PUBLIC_{i,t} +\varepsilon \quad \text{(Model 3)}$$

Panel data regression was used to analyse the data. The Breusch and Pagan LM test resulted in a p-value of 0.000 (see Table 1 and 3) and advised against using ordinary least squares (OLS). The fixed effect (FE) model and the random effect (RE) model were two alternative data analysis models. Following Rashid and Karim (2018), this study chose between FE and RE based on the Hausman test, where a p-value of more than 0.05 would recommend using RE and vice versa. The model's feasibility test included the following components: (1) multicollinearity using variance inflation factors (VIF), (2) autocorrelation using the Wooldridge test, and (3) heteroscedasticity using the modified Wald test.

5. Results

Table 1 describes the variables in detail. The mean of the z-score variable was 3.197, with a standard deviation of 1.516. A z-score of −1.240 or less would indicate the presence of IBs with negative ROAA and CAR. This result was supported by the ROAA variable, which resulted in an average score of 0.452. The lowest ROAA was −31.142, and the highest was 28.486. The average NPF score was 5.777 and the standard deviation was 9.922. Because there were IBs with NPF scores of 76.589, the high standard deviation of the NPF indicated that the sample had heterogeneous NPF. Meanwhile, some IBs had NPF of zero.

Descriptive statistics among the larger IBs, rather than the smaller ones, showed that small IBs had a higher NPF (6.911) than the large IBs (2.958). On the other hand, Table 1 shows that large IBs had a higher ROAA (1.362) and a z-score (3.586) than the small IBs had. Small IBs had a ROAA score of 0.081 and z-score of 3.033. This data showed that small IBs had a higher credit risk and lower profitability than large IBs. However, larger IBs had a greater risk of insolvency than small IBs.

The sample provided an average EBF of 20.296. The standard deviation was 2.804. This study excluded from the sample the Islamic banks that did not offer EBF during the observation period and used a sample of Islamic banks that had EBF for at least one year during the years of observation. A minimum EBF of zero indicated that the sample had an EBF of zero during the years of observation. However, there were samples with an EBF of 66.576% in certain years. This study data showed that most Islamic banks from Indonesia had higher EBF scores than those from other countries. Large IBs had a greater EBF (17.242) than small IBs (14.058).

5.1. Regression analysis test

Table 2 shows the highest correlation score between the independent variables was 0.430 (correlation between SIZE and DEPOSIT). A correlation score of less than 0.8 indicated that there was no

Table 1. Variable descriptive analysis

Variable	Full Samples				Large IBs Subsample		Small IBs Subsample		T-Statistic
	Mean	Std. Dev.	Min.	Max.	Mean	Std. Dev.	Mean	Std. Dev.	
NPF	5.777	9.922	0.000	76.589	2.958	4.860	6.911	11.143	5.035***
ROAA	0.452	3.259	−31.142	28.486	1.362	1.504	0.081	3.683	−3.937***
ZSCORE	3.197	1.516	−1.240	6.641	3.586	1.446	3.033	1.516	−2.879***
EBF	20.296	12.024	0.000	66.576	17.242	12.839	14.058	11.427	2.128**
LOAN	54.202	19.962	1.065	99.545	63.552	10.304	50.393	21.630	−7.739***
DEPOSIT	60.296	28.043	0.011	158.658	70.218	18.376	56.235	30.239	−6.681***
BOD	0.451	0.219	0.000	1.000	0.475	0.204	0.441	0.224	−1.921*
SSB	0.546	0.221	0.000	1.000	0.461	0.190	0.580	0.223	4.622***
CAR	21.886	17.231	−73.330	97.070	17.223	4.713	21.886	17.231	2.810***
DIV_INCOME	24.834	23.183	−6.871	108.333	21.859	26.746	24.834	23.183	2.948***
SIZE	14.488	1.936	7.528	18.444	16.495	0.593	13.666	1.677	−27.026***
MUSLIM	69.989	26.690	1.059	99.800	74.588	13.631	68.104	30.278	−3.837***
GDP	3.762	3.243	−17.005	19.592	3.636	3.932	3.810	2.944	−0.084
PUBLIC	0.435	0.496	0.000	1.000	0.588	0.493	0.378	0.485	−3.837***

***, **, * significant at 1%, 5%, and 10%, respectively.

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Table 2. Matrix correlation

		1	2	3	4	5	6	7	8	9	10	11
EBF	1	1										
LOAN	2	−0.054	1									
DEPOSIT	3	0.089	0.250	1								
BOD	4	−0.054	−0.012	0.217	1							
SSB	5	0.003	−0.111	−0.164	0.008	1						
CAR	6	−0.020	−0.039	−0.384	−0.004	0.056	1					
DIV_INCOME	7	0.223	−0.180	0.012	−0.055	0.050	0.037	1				
SIZE	8	−0.037	0.244	0.430	0.030	−0.333	−0.143	0.031	1			
MUSLIM	9	0.251	0.106	0.349	0.212	0.101	−0.027	0.076	0.005	1		
GDP	10	−0.045	0.123	0.049	−0.050	0.036	−0.001	0.033	0.029	−0.072	1	
PUBLIC	11	0.200	−0.058	0.202	0.310	0.193	−0.248	−0.020	0.067	0.396	−0.082	1

serious correlation between the independent variables (Harun et al., 2020). The results of the VIF tests (Table 3) resulted in scores of 1.620 (Model 1), 1.290 (Model 2) and 1.290 (Model 3). The results of the VIF test on all the models resulted in a VIF score of less than 10.00 and confirmed no serious correlation between the independent variables (Abdullah & Sapiei, 2018).

Table 3 displays the results of the regression test on the three models, as well as the models' feasibility tests. P-values for the autocorrelation test with the Wooldridge test were 0.000 (Model 1), 0.052 (Model 2), and 0.160 (Model 3). The Wooldridge test p-values were less than 0.05, indicating that the model had autocorrelation. Table 3 shows that autocorrelation existed in Model 1. However, there was no autocorrelation in Models 2 and 3. The heteroscedasticity test with the modified Wald test yielded p-values of 0.697 for all the models. The modified Wald test p-values were less than 0.05, indicating heteroscedasticity. This study used a robust standard of error to solve violated assumptions (autocorrelation, heteroscedasticity) in the regression model, as recommended by Hoechle (2007). Choosing option "vce (robust)" for most of the estimations in stata consistently solved heteroscedasticity.

As a data analysis method, the Hausman test can be used to determine the best model between FE and RE models (Rashid & Karim, 2018). The p-value of the Hausman test was less than 0.05, indicating FE should be used. Table 3 shows the Hausman test p-values were 0.086 (Model 1),

Table 3. Regression analysis test

	NPF (Model 1)		ROAA (Model 2)		Z-SCORE (Model 3)	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
EBF	0.003	0.001***	−0.002	0.003	−0.001	0.002
BOD	−0.128	0.297	−0.314	1.189	0.113	0.239
SSB	0.579	0.560	−2.058	1.917	−0.005	0.371
LOAN	0.000	0.006	0.007	0.009	0.002	0.003
DEPOSIT	0.003	0.005	0.003	0.013	−0.002	0.005
CAR	−0.019	0.008**	0.090***	0.025	0.013***	0.004
DIV_INCOME	−0.058	0.060	0.072	0.193	−0.009	0.056
SIZE	0.009	0.117	1.324**	0.576	0.177**	0.096
MUSLIM	0.003	0.006	−0.001	0.013	0.002	0.006
GDP	−0.018	0.021	0.047	0.032	0.025	0.019
PUBLIC	−0.249	0.413	-	-	0.296	0.323
_cons	−0.249	0.413	−20.331**	8.660	0.094	1.492
Breusch & Pagan LM Test	0.000		0.000		0.000	
VIF	1.620		1.290		1.290	
Wooldridge test	0.000		0.052		0.160	
Modified Wald test	0.000		0.000		0.000	
Hausman (P-Value)	0.086		0.001		0.512	
R-Square	0.064		0.140		0.047	
Prob > F	0. 030		0.000		0.031	

***, **, * significant at 1%, 5%, and 10%, respectively. This study uses RE regression methods as the analytical method for Models 1 and 3 and FE regression methods for Model 2.

0.001 (Model 2) and 0.512 (Model 3). This test suggested using RE to analyze Models 1 and 3. Furthermore, the Hausman test results recommended FE as the data analysis method for Model 2.

According to the Model 1 test, EBF had a coefficient of 0.003, a robust standard error (RSE) of 0.001, and a p-value below 0.01. These findings suggested that EBF had a positive effect on NPF. These findings showed that EBF transactions increased NPF. This result supported the findings of a study by Mukhibad and Khafid (2018). Using NPF, this study's results provided empirical evidence that EBF is a risky transaction (Mohd Ariffin et al., 2009).

According to Table 3, EBF had a coefficient of −0.002, RSE was 0.003, and the p-value was more than 0.10. According to the results of the tests, EBF had no effect on ROAA. This study showed that EBF had no effect on bank profitability. EBF and DBF are the banks' primary profit-generating investments. EBF and DBF had the same income potential, implying that EBF did not reduce bank profitability. Profitability was reduced because of the high NPF (Abusharbeh, 2014, 2022; Laryea et al., 2016; Mukhibad & Khafid, 2018; Rathnayake et al., 2022; Thornton & DiTommaso, 2021). EBF caused an increase in NPF. IBs have many alternative contracts they could use, so the increase in NPF caused by EBF could be covered by DBF products to maintain bank profitability. In addition, EBF is a form of financing that generates a greater income than DBF does (Ernawati & Ernawati, 2016). This caused EBF to have no effect on profitability.

The Model 3 test revealed that EBF had a coefficient of −0.001, RSE of 0.002, and a p-value greater than 0.10. The test results also showed that EBF had no effect on the insolvency risk. The characteristics of EBF allowed IBs to suffer losses due to the potential loss of financing and the potential failure to obtain any income from financing, putting IBs at risk of insolvency (Adawiyah, 2015). When this financing can be controlled through strict customer selection, customer assistance in managing the bank should cause EBF to have no impact on the bank's risk of insolvency. Assistance for IBs in managing EBF is costly (Ascarya, 2014). However, because EBF generates more income than the other types of financing (Ernawati & Ernawati, 2016), these costs can be proportional to the income gained from EBF.

5.2. Additional test

This study divided the sample into two subsamples based on an IB's total assets. Panel A (large IBs) had IBs with more assets than the median assets for all of the samples. Panel B (small IBs) consisted of IBs with assets that were less than or equal to the median assets for the full sample. The distribution of the subsamples based on assets was based on a study by Afonso and Traina (2014), who found that large banks might have a greater appetite for risk than small banks. Phan et al. (2020) found that large banks took more operational risks to be more profitable than small banks.

Table 4 shows the results of testing this subsample using the same steps used for testing the main model. Panel A's results showed that EBF had a positive effect on NPF and a negative effect on ROAA. On the other hand, Panel A also showed that EBF had no effect on the z-score. IBs with large assets have more customers and are therefore held to a higher standard of accountability. Furthermore, a bank's size draws the attention of the public, religious experts and regulators. Because this type of financing promotes justice and the spirit of Islam, these banks are required to have a higher EBF (Fianto et al., 2018; Rahman et al., 2014). Due to the high level of pressure, IBs provide EBF without conducting adequate feasibility analyses, and their distribution had a positive impact on NPF and further decreased the ROAA.

Panel B's analysis demonstrated that EBF had no effect on NPF and ROAA. However, EBF had a negative effect on the z-score. Small banks had fewer customers, less accountability requirements, and less demand from society to have more EBF products than DBF ones. Due to the low demand, IBs are channeling EBF and being more selective in choosing customers by evaluating the feasibility of the projects proposed by the customers. This policy promotes more effective EBF to control the NPF and reduce the bank's risk of insolvency. Because EBF has a high income potential

Table 4. Regression analysis test

	PANEL A (Large IBs Subsample)						PANEL B (Small IBs Subsample)					
	NPF (Model 4)		ROAA (Model 5)		Z-Score (Model 6)		NPF (Model 7)		ROAA (Model 8)		Z-SCORE (Model 9)	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
EBF	0.003*	0.002	−0.161***	0.049	0.053	0.045	0.003	0.002	−0.003	0.006	−0.075***	0.023
LOAN	−0.011	0.015	0.034*	0.017	0.025	0.021	0.001	0.006	0.006	0.009	−0.002	0.003
DEPOSIT	−0.007*	0.004	0.006	0.006	0.000	0.011	0.005	0.006	0.006	0.016	0.001	0.004
BOD	−0.181	0.414	1.125**	0.562	−0.796	0.749	−0.186	0.390	−0.206	1.714	0.108	0.266
SSB	0.172	0.604	−1.580*	0.899	−1.666	1.298	0.850	0.763	−2.866	2.594	0.796*	0.433
CAR	−0.055**	0.027	0.122***	0.041	0.038	0.044	−0.018**	0.008	0.094***	0.025	0.016***	0.004
DIV_INCOME	−0.078	0.062	−0.015	0.044	0.150	0.113	−0.026	0.089	−0.094	0.245	−0.075	0.066
SIZE	−0.102	0.357	−0.282	0.294	0.944**	0.391	0.039	0.158	1.424**	0.618	0.310***	0.100
MUSLIM	0.005	0.010	0.031***	0.008	−0.020	0.016	0.002	0.008	−0.005	0.030	0.004	0.005
GDP	−0.031	0.020	0.044*	0.024	0.010*	0.035	−0.004	0.039	0.061	0.062	0.019	0.013
PUBLIC	−0.403	0.574	−0.746***	0.268	0.859	0.553	−0.033	0.558	-	-	0.578	0.397
_cons	4.489	5.232	0.284	4.516	−12.268	6.430	−0.102	2.320	−20.235**	9.391	−2.311*	1.379
Breusch & Pagan LM Test	0.000		0.000		0.000		0.000		0.000		0.000	
VIF	2.160		2.22		2.35		1.45		1.55		1.55	
Wooldridge test	0.160		0.686		0.900		0.000		0.002		0.00	
Modified Wald test	0.000		0.000		0.000		0.000		0.000		0.000	
Hausman (P-Value)	0.000		0.842		0.001		0.977		0.216		0.001	
R-Square	0.056		0.209		0.067		0.071		0.226		0.226	
Prob > F	0.000		0.000		0.000		0.068		0.000		0.000	

***, **, * significant at 1%, 5%, and 10%, respectively. This study uses RE regression methods as the analytical method for all models and FE regression methods for model 8. Panel A: IBs have assets greater than the median for IB assets of all the samples. Panel B: IBs have assets less than/equal to the median IB assets of all the samples.

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Table 5. Regression analysis test for robustness check

	NPF (Model 10)		ROAA (Model 11)		Z-Score (Model 12)	
	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.	Coef.	Robust Std. Err.
EBF Lag.1	0.010***	0.003	−0.006	0.004	−0.001	0.001
LOAN	0.003	0.006	0.006	0.009	0.002	0.003
DEPOSIT	−0.001	0.007	0.002	0.012	0.000	0.005
BOD	0.272	0.355	−0.192	1.149	0.094	0.256
SSB	0.250	0.817	−1.724	2.091	−0.342	0.397
CAR	−0.023	0.015	0.094***	0.023	0.012***	0.003
DIV_INCOME	−0.050	0.086	0.141	0.181	−0.090*	0.050
SIZE	−0.017	0.138	1.495**	0.648	0.113	0.093
MUSLIM	0.008	0.007	−1.745	2.126	−0.003	0.007
GDP	−0.040*	0.021	0.064*	0.035	0.024	0.026
PUBLIC	−0.460	0.527	-	-	0.487	0.326
_cons	0.898	2.135	100.713	145.360	1.588	1.430
Breusch & Pagan LM Test	0.000		0.000		0.000	
VIF	1.370		1.310		1.320	
Wooldridge test	0.000		0.000		0.160	
Modified Wald test	0.000		0.000		0.000	
Hausman (P-Value)	0.195		0.000		0.315	
R-Square	0.097		0.222		0.038	
Prob > F	0.000		0.000		0.004	

***, **, * significant at 1%, 5%, and 10%, respectively. This study uses RE regression methods as the analytical method for Models 10 and 12 and FE regression methods for Model 11.

(Ernawati & Ernawati, 2016), its distribution increases a bank's income. However, EBF entails significant costs (Ascarya, 2014; Hidayah et al., 2019; Rahman et al., 2014), so an increase in revenue would be followed by an increase in costs, but this would not affect the ROAA.

5.3. Robustness test

Table 5 shows the result of the model test with a lag of 1 for the variable EBF. Following Ghenimi et al. (2017), this method was used to understand the impact of past EBF on the risk and performance of the IBs in the current year (Peric & Konjusak, 2017). The test results of this model showed that the past year's EBF had a positive effect on the NPF in the current year. Tables 3 and 5 also show that EBF had a positive influence on the NPF for the current and future years. These results confirmed that EBF is a risky form of financing (Mohd Ariffin et al., 2009; Mukhibad & Khafid, 2018). In addition, Table 4 shows the test results for the robustness of the results displayed in Table 3, proving that EBF had no effect on the ROAA and z-score.

5.4. Endogeneity and sensitivity analysis

Endogeneity is one of the issues that need to be addressed by corporate finance research. Endogeneity causes biased research results, inconsistent estimates and incorrect conclusions and theoretical interpretations (Ullah et al., 2018). One of the causes of endogeneity is that the dependent variable is influenced by the dependent variable at lag 1. This study solved the

Table 6. System GMM estimator

	NPF (Model 13)		ROAA (Model 14)		Z-SCORE (Model 15)	
	Coef.	**Std. Err.**	**Coef.**	**Std. Err.**	**Coef.**	**Std. Err.**
Dependent Var. Lag.1	0.637***	0.073	0.178***	0.048	0.008	0.060
EBF	0.091***	0.030	0.003	0.007	0.002	0.002
LOAN	0.009**	0.004	0.004	0.015	−0.002	0.005
DEPOSIT	−0.010**	0.004	−0.002	0.023	0.011	0.008
BOD	−0.065	0.300	0.870	1.174	−0.390	0.398
SSB	1.106**	0.433	0.134	1.675	−0.039	0.555
CAR	0.003	0.007	0.092***	0.010	0.010*	0.005
DIV_INCOME	0.077	0.057	0.146	0.278	−0.021	0.090
SIZE	0.014	0.010	−0.150	0.029	−0.330*	0.185
MUSLIM	0.023	0.020	0.052***	0.073	−0.034	0.025
GDP	−1.185	0.737	8.634	2.031	0.028	0.026
PUBLIC	−1.107	0.743	4.167***	2.531	5.093***	1.806
_cons	0.091	0.030	0.178	0.048	7.605**	3.130
Sargan or Hansen (Prob.)	0.135		0.126		0.851	
Arellano-Bond test for AR (1) (Prob.)	0.064		0.176		0.004	
Arellano-Bond test for AR (2) (Prob.)	0.210		0.294		0.626	
Prob > chi2	0.000		0.126		0.001	

***, **, * significant at 1%, 5%, and 10%, respectively

endogeneity problem using the general method of moments (GMM) estimator proposed by Wintoki et al. (2012). Table 6 displays the results of the GMM test.

Table 6 shows that Sargan or Hansen produced p-values of 0.135 (Model 13), 0.126 (Model 14), and 0.851 (Model 15). The results of the testing of these three models resulted in p-values of more than 0.05, hence the decision to accept the null hypothesis and the conclusion that the instrument was valid (Gujarati & Porter, 2009). Arellano and Bond (AR) tested for auto-correlation in their model. Accepting the null hypothesis indicated that the model was without autocorrelation, and this was applied to the different residuals. Table 6 shows that the p-values of AR (1) in the models varied between 0.064 (Model 13), 0.176 (Model 14), and 0.004 (Model 15). The p-values in AR (2), on the other hand, were 0.210 (Model 13), 0.294 (Model 14), and 0.626 (Model 15). The AR test (2) on all the models produced p-values that were greater than 0.05, indicating that the models were consistent. The GMM estimation results showed that NPF and ROAA were influenced by the previous year's data. The GMM estimator demonstrated that EBF had a positive effect on NPF and no effect on ROAA and the z-score.

6. Conclusion and policy recommendations

6.1. Conclusion

The purpose of this study is to provide empirical evidence that EBF is a risky product that reduces profitability and increases the risk for IBs. This study uses NPF and the z-score as the indicators of risk and ROAA as a measure of profitability. The object of this study was 54 banks from 19 countries over an 11-year period (2009 to 2019). This study finds that EBF has a positive effect on NPF. However, EBF has no effect on ROAA and the z-score. These findings indicate that EBF is a riskier product than the other products. EBF transactions are risky, based on the transactions' characteristics, such as information asymmetry between the customer and the IB, high monitoring costs and the potential for a moral hazard. However, products based on EBF have the potential for the issuing banks to earn greater returns from them than they can from other products. The high potential income, along with the high costs, causes EBF to have no effect on ROA and the z-score. However, NPF can be minimized by tightening the selection of the customers approved as EBF recipients, improved monitoring and providing customers with consultations about managing businesses financed by EBF.

The subsample test results show that EBF has a positive effect on NPF and a negative effect on ROAA in the subsample of large IBs. On the other hand, in the subsample of small IBs, this study finds that EBF has a negative effect on the z-score and no effect on NPF and ROAA. The results of the subsample test based on the total assets of the IBs show that EBF undertaken by large IBs has a higher risk impact, increases their NPF and reduces their ROAA. However, for small IBs, EBF is a profitable product because it has a negative impact on reducing the insolvency risk. Small IBs have less complex operations so they can carry out more effective monitoring of EBF and can further reduce their insolvency risk. There is pressure from the public for large IBs to provide EBF because it priorities the principles of justice, Islamic values and spirituality. Due to this public pressure, large IBs have become less careful when channeling EBF. The highly complex operations of large IBs cause decreased effectiveness in their monitoring of EBF. Thus, the EBF products of large IBs have a negative impact on the bank's profitability and increase the credit risk of those IBs.

6.2. Research implication and limitations

EBF is a fair transaction, and it is ideal for IBs to implement because banks and customers share the risks and profits. However, the disbursement of EBF must be selective in choosing the prospective customers, using business feasibility evaluations as well as monitoring and consulting with the customers on how they manage their businesses. Prudence in the distribution of EBF is highly emphasized for large IBs because the complexity of the operations of large IBs causes them to be less careful in distributing and monitoring EBF.

Based on research findings, bank management is encouraged to have operational standards for distributing EBF products that differ from DBF. The bank determines the criteria for customers and types of business projects that are eligible for EBF funds. IBs can also provide customer assistance services in managing their business to reduce the potential for moral hazard. Regulators are more effective in overseeing the distribution of EBF funds by IBs, by issuing regulations so that EBF transactions can be applied according to standards and as profitable transactions for customers and IBs

The limitation of this study is that the sample is limited to IBs who have EBF products; not all the IBs in the world have these products. So, this study does not use IB data from around the whole world. Moreover, we only check for EBF products and ignore DBF products. This study also does not check the risk from each contract made by an IB (such as *mudharaba, musharaka, murabaha*, etc.). Future researchers can supplement this study by examining the risks of different types of bank financing contracts.

Acknowledgments
The authors gratefully acknowledge the Faculty of Economics and Business, Universitas Negeri Semarang, Indonesia, for funding this research.

Funding
This work was funded during the research phase and for the publication of this article by the Faculty of Economics and Business, Universitas Negeri Semarang, Indonesia.

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Disclosure statement
No potential conflict of interest was reported by the author(s).

Citation information
Cite this article as: Equity-based financing and risk in Islamic banks: A cross-country analysis, Hasan Mukhibad, Prabowo Yudo Jayanto, Risanda Alirastra Budiantoro, Bayu Bagas Hapsoro, Aas Nurasyiah & Ayatulloh Michael Musyaffi, *Cogent Economics & Finance* (2023), 11: 2235117.

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APPENDIX

Table A1. Operational variables

Variables	Abbreviation	Formulation
Credit risk/non-performing financing	NPF	Impaired financings$_{i,t}$/Gross financings$_{i,t}$
Profitability	ROAA	Profit after tax$_{i,t}$/average total asset$_{i,t}$
Insolvency risk	Z-score	(ROAAi$_{,t,}$ + CARi$_{,t}$)/standard deviation of ROAA$_{i,t}$
Equity-based financing	EBF	Equity-based financing$_{i,t}$/all financing$_{i,t}$
Loan	LOAN	Total financing$_{i,t}$/total asset$_{i,t}$
Investment Deposit Account	DEPOSIT	Total investment account holders$_{i,t}$ /total asset$_{i,t}$
Capital adequacy ratio	CAR	Total capital$_{i,t}$/risk-weighted assets$_{i,t}$
Income diversity	DIV_INCOME	Non-financing income$_{i,t}$/total operating income$_{i,t}$
Board of directors' index	BOD	BOD index was constructed based on four sub-indices which are: (1) Percentage of women on the board (2) Education level of all members. (3) Experience of all members (4) Cross-membership of all members Dichotomous: 1 for banks with 50% or more of the sub-indices and zero if otherwise.
Syariah supervisory boards' index	SSB	SSB index was constructed based on four sub-indices which are: 1. Percentage of women on the board 2. Education level of all members. 3. Experience of all members 4. Cross-membership of all members Dichotomous: 1 for banks with 50% or more of the sub- indices and zero if otherwise.
Total Assets	SIZE	Logarithm of total assets
Ownership status	PUBLIC	Dichotomous: 1 for listed banks and zero if otherwise.
Muslim population	MUSLIM	The percentage of Muslims in a country
Gross Domestic Product	GDP	(GDP$_{t-1,}$ - GDP$_{t}$)/GDP$_{,t}$