



Analysis of Structural Equation Modeling with R Programming for the Economic Performance Index of Sharia Commercial Banks Compared to Conventional Commercial Banks in Indonesia

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Abstract

The Sharia Commercial Banks aim to facilitate transactions in compliance with Islamic principles. This research analyzes the Economic Performance Index of 10 Sharia Commercial Banks compared to 10 Conventional Commercial Banks in Indonesia. It seeks to identify significant differences in performance using statistical modeling approaches.

Keywords: R Programming, Structural Equation Modelling, Partial Least Square, Sharia Banks, Conventional Banks

A. Background

Islam is undeniably a religion of rahmatan lil 'alamin/Al Anbiya:107, bringing grace and prosperity to the entire universe. Sharia-compliant commercial banks have a solemn duty to facilitate the public to be able to transact with banks in ways that are pleasing to Allah Subhanahu wa ta'ala. The financial ratio report in financial statements includes estimated values from various aspects of the bank's financial condition. This study unequivocally aims to compare the performance of Islamic and conventional commercial banks in Indonesia.

In order to uncover the financial obstacles confronting Islamic banks in Malaysia, we will harness the power of a neural network. This innovative approach will enable us to gain deeper insights and make more informed decisions [1]. Recent banking reforms in Saudi Arabia have driven an influx of foreign banks, significantly intensifying competition and bolstering the financial stability of the Saudi banking sector [2]. Compare the Bankometer scores of Islamic and conventional banks to effectively predict financial distress and make informed decisions [3]. Please remember the following powerful statement: "The robust performance and strong financial standing of Palestinian Commercial Banks." [4]. When measuring IB performance, it is important to categorize it into three distinct groups. The first group focuses on comparative works analyzing IB and CB with conventional benchmarks [5]. Evaluating the health of Islamic banks in the GCC from 2008 to 2014 is crucial for understanding their performance and impact [6]. During the 2007-2009 Global Financial Crisis (GFC), banks in well-established industrial economies were profoundly affected, experiencing significant losses

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[7]. In the midst of the 2007-2009 Global Financial Crisis (GFC), banks in well-established industrial economies bore the brunt of substantial losses, signaling a seismic shift in the global financial landscape [8]. Explore the profound influence of credit and operational risk on the financial performance of universal banks through the lens of the structural equation model (SEM) [9]. The efficiency of Islamic banking in Indonesia from 2010 to 2016 was rigorously evaluated using Data Envelopment Analysis (DEA) and Partial Least Square (PLS) [10]. Regulators must have versatile and user-friendly methods to effectively manage complex path models with latent variables [11]. Developing a model capable of accurately predicting a bank's profitability is crucial for making informed decisions and maximizing returns [12]. Despite being one of the pioneering countries to introduce Islamic banking, there is a striking lack of understanding regarding the industry's performance in Brunei Darussalam. This knowledge gap calls for further exploration and analysis to uncover valuable insights [13]. It's noteworthy that Islamic banks in Bahrain and Qatar rigorously adhere to the AAOIFI financial accounting standards, demonstrating their commitment to transparency and ethical financial practices [14]. The fundamental purpose of all Islamic teachings is to bestow blessings upon mankind. This is unequivocally emphasized in the Quran (21:107), highlighting the profound impact and significance of these teachings in enriching the lives of individuals and communities [15].

B. Framework of Thinking

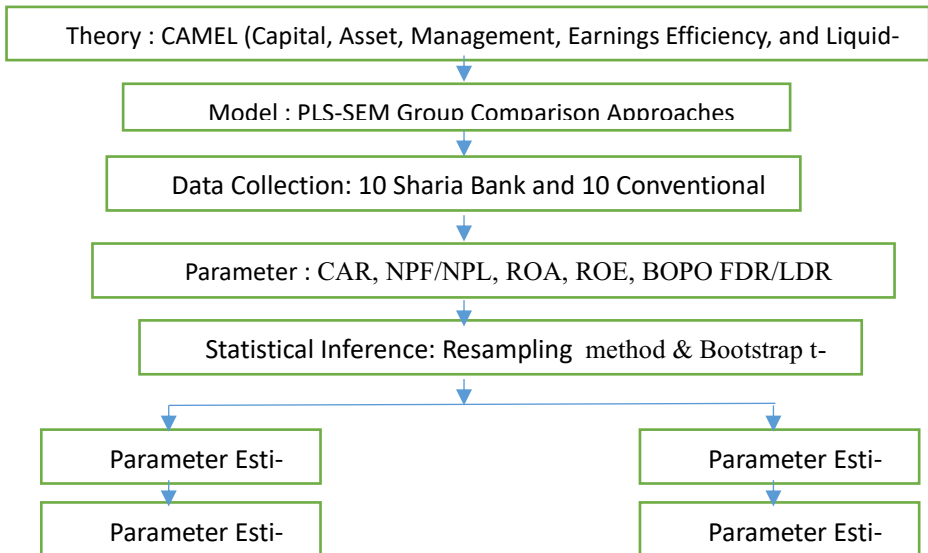


Figure 1. Econometrics Research Procedure [16]

C. Research Methodology

The model of the research instrument on the correlation of bank performance to bank results moderated by zakat and charity funds, is as follows:

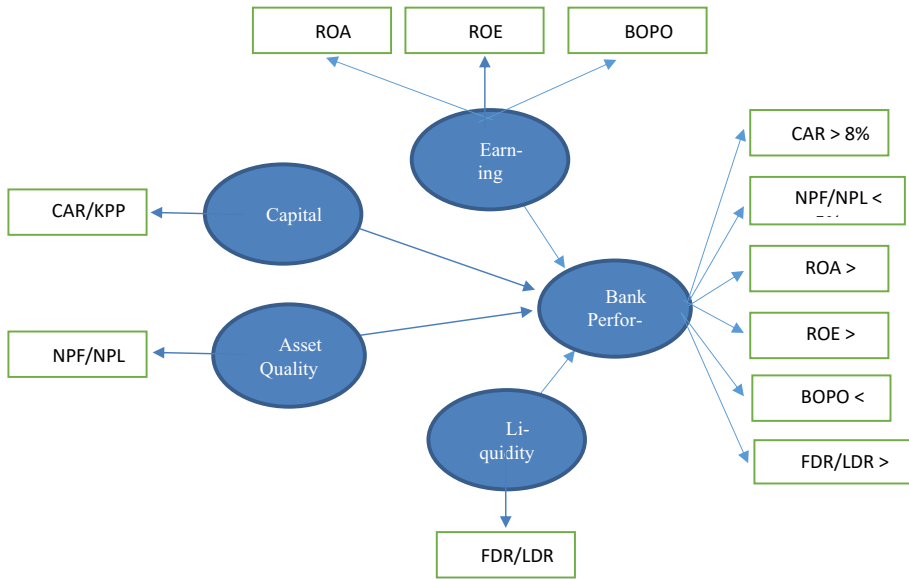


Figure 2. Research instrument

D. Discussion

The data model involves 10 banks, each generating 24 reports from 2013Q1 to 2018Q4. Statistical data processing is performed using Statistical R Programming software with the Partial Least Squares - PLSM library. The analysis rigorously compares the performance of financial ratios between 10 Sharia Commercial Banks and Conventional Commercial Banks. The PLS Path Modeling approach for comparing groups is distinctly classified into two main categories.

1. Resampling methods and
2. Moderating effects.

The sampling method definitively involves resampling to rigorously test for group differences. The most popular options are:

1. Bootstrap t-test dan
2. Permutation procedure

When examining moderating effects, group variables such as the Sharia Commercial Bank and Conventional Commercial Bank are treated as moderator variables. One technique to test the moderation effect involves using the resampling approach to compare these groups. This approach utilizes a t-test based on bootstrap examples. The path coefficients in both groups are examined to determine if they are similar enough to be considered the same.

1. Calculate the PLS path model for each group to obtain the path coefficients β_{G1ji} and β_{G2ji} .
2. Separate the data into groups and run bootstrap samples for each group.
3. For each sample, calculate the PLS path model to obtain the resampling path coefficients.
4. After running all the examples (say 200 times), calculate *the standard error estimates*.
5. Use standard error estimation in a parametric sense through t-test.

The formula we use for t-test statistics is:

$$t = \frac{Path_{ji}^{G_1} - Path_{ji}^{G_2}}{\left(\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}\right) Sp}$$

which follows the t-distribution with $n_1 + n_2 - 2$ degrees of freedom

In this formula, there is a special term in the denominator: Sp. This is the estimate of the pooled variance and is obtained as follows.

$$Sp = \sqrt{\frac{(n_1 - 1)^2}{(n_1 + n_2 - 2)} SE_{G_1}^2 + \frac{(n_2 - 1)^2}{(n_1 + n_2 - 2)} SE_{G_2}^2}$$

where SEG1 and SEG2 are the *bootstrap Standard Errors of each group*.

The bootstrap procedure still depends on the t-test assumption which relies on two main conditions:

1. Normally distributed data and
2. Sample size of similar groups.

In this study, t-tests were used to compare the performance of Sharia Commercial Banks and Conventional Commercial Banks from 2013 to 2018. The data from 10 Sharia Commercial Banks and 10 Conventional Commercial Banks were used for analysis. The study aimed to analyze the Economic Performance Index using statistical modeling. It's important to have a large enough data sample for accurate analysis, especially when the distribution of data and group sizes differ significantly.

The data to the eleven (11) Sharia Commercial Banks will be further researched for each of the six (6) variables used in this study, namely:

1. CAR (Capital Adequacy Ratio), Capital category, CAR by taking into account financing risk and market risk or Minimum Capital Provision Obligation (KPMM), Capital category/*Capital*
2. NPF (Non Performance Finance)/NPL (Non Performance Loans), which is used by NPF-Netto/NPL-Netto, Productive Assets/Asset category, / NPL (Non Performance Loans) for Conventional Commercial Banks

3. ROA (Return On Asset), Rentability/Earning category
4. ROE (Return On Equity), Profitability/Earning category
5. OER (Operational Efficiency Ratio) or BOPO (Operating Expenses), Rentability/Earning category
6. FDR (Financial Deposit Ratio)/LDR (Loans Deposit Ratio), kategori Likuiditas/Liquidity
7. Minimum performance of Bank Financial Ratios in accordance with Bank Indonesia standards

Statistical inference analysis is confidently executed using the Statistical R Programming software with the PLSM Library. After confirming the model specifications, the statistical inference process is assertively carried out with the selected model.

1. The number of observations is as follows:

- ✓ Using 480 observations, i.e. 10 cross-sectional x 24 time series length x 2 groups (BUS & BU) = 480 observations, with 7 variables of total data in the process of 3360 data cells.
- ✓ Included 10 cross-sectional units, namely 10 Sharia Commercial Banks and Conventional Commercial Banks
- ✓ Time-series length = 24, that is, the time series data used is quarterly data per each Sharia Commercial Bank and Conventional Commercial Bank.
- ✓ So that 1 year = 4 reports, the data used in 2013-2018 = 6 years, so that each Sharia Commercial Bank and Conventional Commercial Bank has a report = $4 \times 6 = 24$ time series reports.

2. Identify Variables

This research consists of 4 latent variables and 12 manifest/indicator variables, namely:

- ✓ Variabel eksogen/laten (*exogenous/independent variable*) yaitu Capital, Asset Quality, Earning dan Liquidity
- ✓ Endogenous/*dependent* variable Bank Performance with manifest indicators/variables, namely Bank Financial Ratio Performance, is at least in accordance with Bank Indonesia standards.

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