Analysis of Strategic Group of State-Owned Banks VS Private-Owned Banks: Application of Game Theory

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Abstract. The two largest strategic groups of Indonesia Banking show an intense competition recently. While BCA is the largest market capitalization in Indonesian stock market, state-owned banks should set the appropriate strategies to capture larger market. The aim of this study is to analyze the strategies from the banking strategic groups in Indonesia, particularly strategy in improving the third party funds and total credit, and in which state-owned banks is proxied by BRI, and private-owned banks is represented by BCA. The method applied in this study is by implementing game theory approach to identify the best strategies based on other players' movement. The findings suggest that Pure Strategy Nash Equilibrium 1 of Game 1 is to increase the deposit segment for each bank and Pure Strategy Nash Equilibrium 2 in Game 2 suggests to focus more on increasing credits on the sector of micro business.

Keywords: State-owned banks, Game theory, Banking strategy, Firm Performance

1   Introduction

The banking industry is currently one of the industries that shows intense competition. Competition between bank groups in Indonesia is evident in State-Owned Enterprises Bank (Bank BUMN) and National Private Commercial Banks (BUSND). Of the total market share of the Indonesian banking industry, state-owned banks and BUSND are able to dominate with a total of 87%. Meanwhile, Third Party Funds (DPK) are the main source of bank funding, reaching 88.42% of bank funds [1] and financing is one of the sources of income for banks through interest income [2].

The dynamics of competition in the banking industry in Indonesia are increasingly open and sharp or what D'Aveni & Gunther (1994) calls as Hypercompetitive, so research through the application of the application Game Theory is important to see the business dynamics of two strategic groups of banks in Indonesia. This emphasizes on which strategic decisions provide optimal results from the steps taken by each party.

Some previous studies related to the application of game theory in banking have been carried out. Wijanarko & Cahyono (2019) in their research related to game theory on two Islamic banks in Indonesia found that Nash Equilibrium (NE) and Prisoner's Dilemma were not found in the game. Meanwhile, the dominant strategy producing the largest payoff for each Islamic bank in the game was strategy by increasing promotion and marketing of cheap hajj more aggressively in order to increase deposits. Dincer et al. (2014) examines the interaction between customer and competitor behavior in the sector through applications game theory. His empirical study found that if a zero sum game is adopted, then the profit of one party will have an impact on the loss of the other, so if both parties are an oligopolistic structure, banks will be in big trouble because of the tight and perfect competition.

Therefore, the aim of this study is to analyze the extent to which the strategy implementation of the BUMN Bank group in responding to the BUSND strategy from the perspective of implementing game theory in order to win the competition in the Indonesian banking industry.

2   Literature Review

State-owned Banks is a banking business entity, which is wholly, or most of its capital is owned by the state through direct participation originating from separated state assets [1]. The list of state-owned banks according to

the Indonesia Stock Exchange (IDX) is Bank Rakyat Indonesia (BRI), Bank Negara Indonesia (BNI), Bank Mandiri, and Bank Tabungan Negara (BTN).

The Financial Services Authority (OJK) defines the functions and roles of state-owned banks together with other commercial banks are as collectors, distributors, and service providers in payment traffic and money circulation in society aimed at supporting the implementation of national development, in the context of increasing equity, economic growth and national stability towards improving the welfare of the people [1].

BUSND is a bank that has obtained a letter of appointment from Bank Indonesia to conduct banking business activities in foreign currencies. Based on [6], the requirements that must be met before a non-foreign exchange bank can be granted a license to become a foreign exchange bank include:

a. Meet the Capital Adequacy Ratio (KPMM) of at least 10% (ten percent);

b. The health level for the last 18 consecutive months was classified as healthy;

c. Have a core capital of at least Rp1,000,000,000,000.00 (one trillion rupiah).

Third party funds (DPK) are funds obtained from the public, companies, government, households, cooperatives, and others, both in rupiah and foreign currencies. In each bank that acts as a collector, funds obtained from the public are the largest source of funds that banks rely on most [7]. DPK is entrusted by the public to banks through a fund deposit agreement in the form of demand deposits, savings and time deposits. Based on the Banking Law no. 10 of 1998 [8] , the DPK calculation is as follows.

$$DPK = Giro + Deposits + Savings \qquad (1)$$

Furthermore, Game theory deals with the actions of decision makers who are aware that their actions will influence each other [9]. Watson (2013) argues that several important elements of the game from a game are players, actions, payoffs, and information. The purpose of describing a game is to describe a situation in terms of the rules of the game to explain what will happen in that situation. The combination of strategies chosen by each player will determine the utility of the payoff and determine the equilibrium. By looking at the balance of the model, we can see what action is selected from all possible plans for the players.

3   Research Method

The variables analysed in this study are the annual financial statements of state-owned banks which are proxied through Bank Rakyat Indonesia (BRI) and BUSND proxied through Bank Central Asia (BCA) for the last 2 years 2018 - 2019. Financial statement data instruments that will be used as data is data on the growth of Third Party Funds (DPK), growth in total credit and growth in company performance. The three combinations of these instruments will be used as research samples as input of information both as perfect information and imperfect information as a strategy in the game. The stages in analysing banking strategy through the application of game theory are as follows:

a) The Formation of Basic Assumptions for the Game

Before the game starts, basic assumptions are made for determining payoffs game. This basic assumption will later be transformed into numbers as payoffs, which determine each step that will be taken by each player.

b) Game Completion

1. Nash Equilibrium in Pure Strategy (PSNE)

   Watson (2013) states that a strategy profile can become a Nash Equilibrium if the strategy correspondence of the payoffs of the two players is the best response to each other.

2. Dominant Strategy

   A strategy that can dominate whatever steps other players choose to take is called a dominant strategy [10]. In order to know a pure strategy is dominated, we must first pay attention to pure strategy from the opposing player and whether it has a bigger payoff than whatever the opponent's strategy is, then see mixed strategy whether provides a higher payoff or not.

4   Result and Discussion

4.1 Game Assumptions

In the early stages of the game, analysing game strategy through game theory is to build basic assumptions related to the game, such as player determination, the strategy of each player, and the payoff of each strategy [11]. This study will analyse the two largest banking strategic groups in Indonesia which will be proxied through banks that have the largest market capitalization of each banking strategic group, so that the players of this game are:

- P1 = Bank Rakyat Indonesia (BRI) which has a market capitalization of IDR 512.8 trillion, which holds the first position on the list of shares of BUMN companies with the largest share capitalization [1].

- P2 = Bank Central Asia (BCA), which has a market capitalization of IDR732.8 trillion, which occupies the first position on the list of shares of non-BUMN companies with the largest share capitalization [1].

Three games will be compared between players in this game including the growth of Third Party Funds, and credit growth with each game having its own strategy space. The first game will compare the strategy to increase the DPK for each player with the following strategy room:

S1 = {Current, Savings, Deposit}

S2 = {Current, Savings, Deposit}

While the second game will compare the strategy to increase the total credit for each player with the strategy room as following:

S1 = {Individual, Micro, Corporation}

S2 = {Individual, Micro, Corporation}

The further step is to determine the payoff of each strategy in each game, where in this case the payoff is measured through the growth of each component in the strategy space in each game that is obtained through the financial statements of each player's company. The following is a tabulation of strategy room in each game that refers to research conducted by [4].

Table 1. Strategy Indicators on Each Player

Game	BRI		BCA	
	Strategy	Payoff indicator	Strategy	Payoff Indicator
Game 1 (DPK)	S1	Growth of Current (Cur)	S1	Growth of Current (Cur)
	S2	Growth of Saving (Sav)	S2	Growth of Saving (Sav)
	S3	Growth of Deposit (Dep)	S3	Growth of Deposit (Dep)
Game 2 (Credit)	S1	Growth of individual credit (Ind)	S1	Growth of individual credit (Ind)
	S2	Growth of micro credit (Mic)	S2	Growth of micro credit (Mic)
	S3	Growth of corporation credit (Corp)	S3	Growth of corporation credit (Corp)

Source: Data analysed, 2020

4.2 Solving the Game

4.2.1.   Game 1 (Growth of DPK)

In this first game, an analysis will be carried out related to the banking strategy in funding through its function as a public fund-raising institution or what is known as third party funds. In general, in collecting deposits, banks have three sources of funding, including Current Deposits, Savings and Deposits, where Current Deposits and Savings are also referred to as *Current Assets and Saving Accounts* (CASA), which are used as indicators of cheap savings for the public. Figure 1 is a game tree for game 1 which can then be transformed into extensive normal form.

From the game tree in Figure 1, it can then be transformed to Table 2 which is the extensive normal form of Game 1. Pure Strategy Nash Equilibrium (PSNE) and strategies that dominate this game then can be found.

Table 2. Extensive Normal Form for Game 1

		BCA		
		Current	Saving	Deposit
BRI	Current	9.31% ; 10.85%	9.31% ; 9.29%	9..31% : 14.71%
	Saving	4.04% ; 10.85%	4.04% ; 9.29%	4.04% ; 14.71%
	Deposit	16.32% ; 10.85%	16.32% ; 9.29%	16.32% ; 14.71%

From Table 2, it can be concluded that the deposit strategy dominates the current and savings strategy for both players, which is indicated by the payoff in red, because both players can guarantee that they will get a larger payoff by focusing more on increasing the deposit growth. Hence, PSNE formed in Game 1 is PSNE1 = {Deposit, Deposit}.

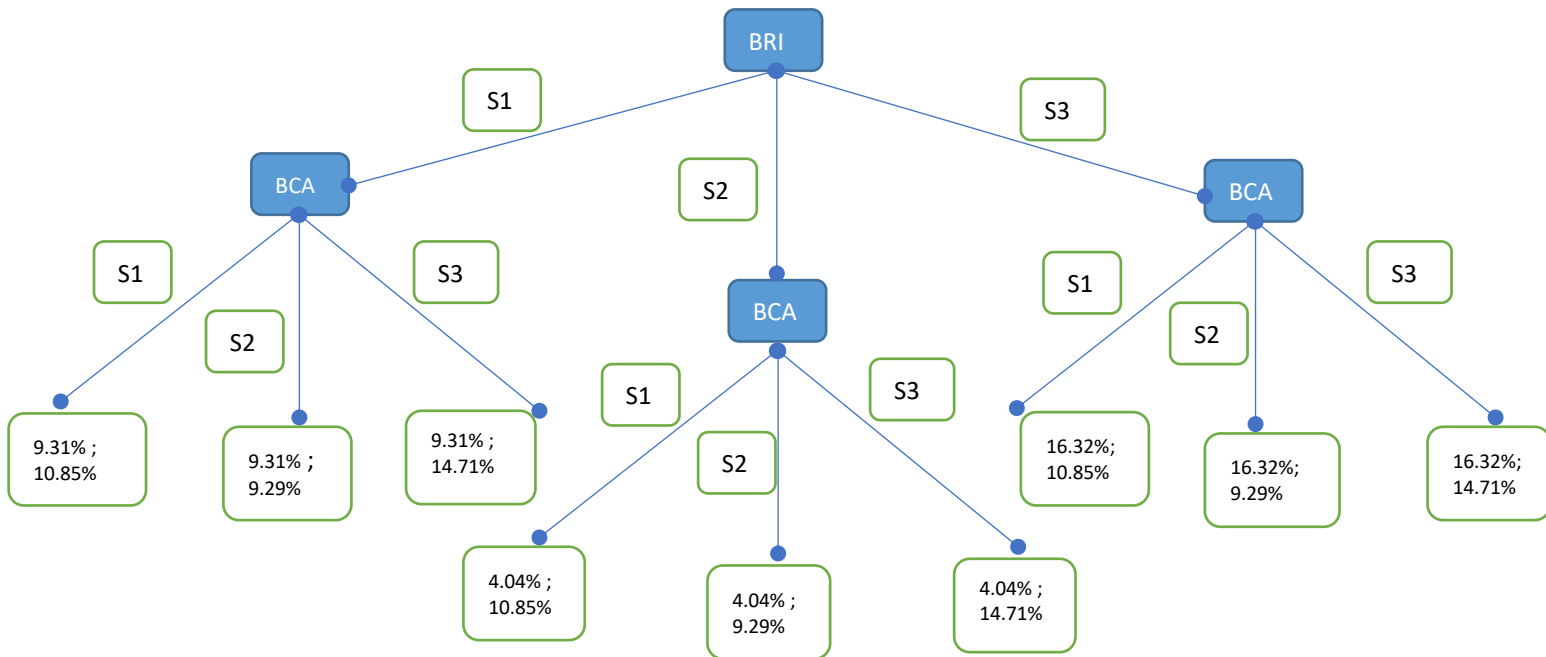**Figure 1.** Game Tree for Game 1
Source: Data analysed, 2020

4.2.2.   Game 2 (Growth of Credit)

The second game will analyse the strategy of the two players in terms of banking credit extension strategies. There are differences in credit financing instruments for the two players, but the authors conclude that in general there are three categories of bank credit recipients, which consists of individual, micro, and corporate groups presented in the game tree in Figure 2.

Figure 2 shows a game tree from Game 2 where there are three strategic spaces for each player, which can then be transformed into extensive normal form as follows.

Table 3. Extensive Normal Form for Game 2

		BCA		
		Individual	Micro	Corporation
BRI	**Individual**	7.42% ; 0.7%	7.42% ; 12.8%	7.42% ; 11.8%
	Micro	9.94% ; 0.7%	9.94% ; 12.8%	9.94% ; 11.8%
	Corporation	-0.57% ; 0.7%	-0.57% ; 12.8%	-0.57% ; 11.8%

Source: Data analysed, 2020

Table 3 shows that the strategy of providing credit to micro businesses dominates the strategy of providing credit to the individual sector and the corporation for the two players indicated by the payoff in red. It is because both players can guarantee that they will get payoff a bigger by focusing more on extending credit to the micro business sector. Thereby, PSNE formed in Game 2 is PSNE2 = {Micro, Micro}.

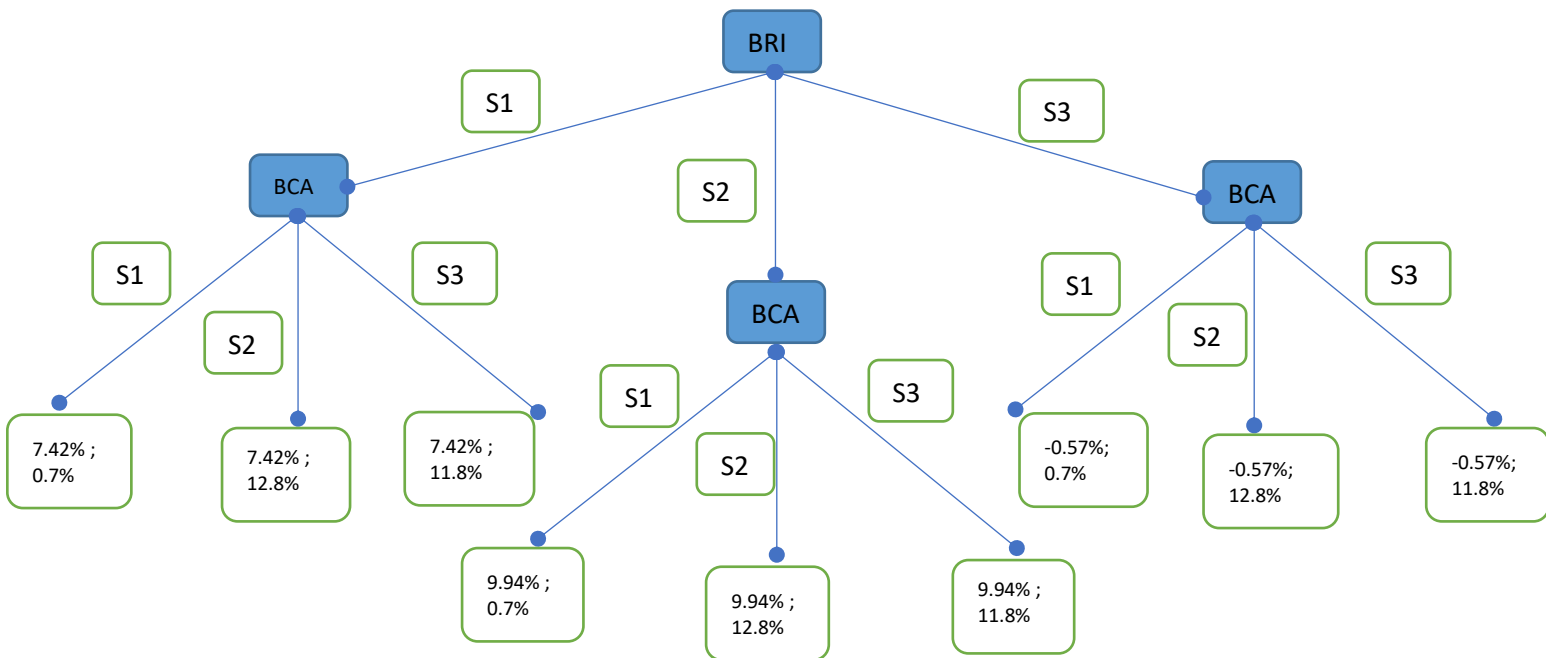**Figure 2.** Game Tree for Game 2
Source: Data analysed, 2020

4.3. Analysis of Firm Performance

From the results of the games, it can be concluded that it is to increase more the amount of DPK for the two banks that leads in each strategic group. Thereby, the focus of DPK segmentation can be more directed at increasing the amount of deposits. Meanwhile, the focus of lending by banks to micro businesses is the Nash Equilibrium strategy, which means that credit growth in this sector is greater than that of other segments, thus providing greater returns.

Table 4. Firm Performance in 2019

Bank	NPL	CASA contribution on DPK	Market Capitalization (billion Rupiah)	EPS	SP	ROE	ROA
BRI	2.62%	58.57%	542,720	281.31	4,400	19.41%	3.5%
BCA	1.3%	75.9%	824,094	731	34,000	18%	4%

Source: Data analysed, 2020

Table 4 provides information on a summary of the company's performance in 2019. In general, BCA has an advantage over BRI in almost every indicator of company performance in 2019. BRI is only superior to BCA in the ROE indicator. Furthermore, although BRI's deposit growth was greater than that of BCA (see Table 2), CASA's contribution to total deposits was smaller, 58.57% and 75.9%, respectively. While the gross NPLs for the two banks showed a fair value of below 5%, with BCA's NPL were relatively smaller than those of BRI. Meanwhile, BCA's market capitalization outperformed BRI where BCA was leading at a value of Rp824.094 billion.

5. Conclusion

This study aims to analyse the strategies of the two largest banking strategic groups in Indonesia, including state-owned Banks and BUSND groups by applying game theory. State-owned banks are represented by BRI while BUSND is represented by BCA, where the two banks have the largest market shares in their respective groups.

From the research results, in Game 1 the Pure Nash Equilibrium Strategy (PSNE) is a strategy to increase DPK through deposit instruments at each bank. Meanwhile, micro business credit becomes PSNE in the second game (Game 2), which shows that micro business credit is a financing segment that has developed more dominantly compared to other segments for the two bank groups.

BCA's company performance looks superior to BRI where the NPL of the two banks is 2.62% for BRI and 1.3% for BCA, respectively, but this value is still in the fair category. Although BCA's deposit growth was smaller than BRI's, CASA's contribution to BCA's total deposits was higher than that of BRI. Furthermore, BCA has occupied the top position in market capitalization on the Indonesian stock exchange (IDX), so that in this analysis it can be said that BCA's market share is larger than BRI.

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