

Model for Alliance Partners Selection Based on the Grey Model and DEA Application-Case by Vietnamese Bank Industry

Chia- Nan Wang, Van- Thanh Phan*

Department of Industrial Engineering and Management,
National Kaohsiung University of Applied Sciences, Taiwan

*Corresponding author email: thanhkem2710@gmail.com

Abstract

Facing the operational inefficiency situation during a long time, the sharply blooming of small domestically banks and the banking bad debt situation increase year by year, all elements have reduced their competitiveness. Therefore, how enhancing their competitiveness? This study based on the Grey forecasting modeling (GM) and Data Envelopment Analysis (DEA) as foundation proposes an effective approach for helping manager find out the best partner when formed alliance. Realistic data of 21 banks were collected from the Vietnam stock exchange, the state bank of Vietnam and their official website, the empirical study indicates that there are 6 the best combinations in the total of 210 virtual alliances. These results are good sound for helping organization to select the best candidates when implementing alliance. This issue can be extended and applied in many fields by considering lots of different factors in the future.

Keywords: banks, alliance strategy, Grey forecasting modeling, data envelopment analysis

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1. Introduction

Like other countries, banking system is lifeblood of Vietnam's economy. It plays an important role in the economy stability and development of country. Especially, it is very important for developing countries like Vietnam. Banks plays a vital role to repel and control the inflation, step by step keep stable of money value and rate of exchange, and improve macroeconomic, investment and business environment. It also contributes to promote investment, production and export activities.

In the recently years, especially since Vietnam had normalization relationship with organizations as: World Bank (WB), International Monetary Fund (IMF), Asian Development Bank (ADB), and World Trade Organization (WTO), banking system re-affirmed critical role as well as position in the support and promotion of economy. According to the state bank of Vietnam [1], each year banking system has contributed over 10% in the overall economic growth of the country, solving and generating job for thousand workers, spending thousands billion VND capital credits invests with the development of economic- social infrastructure, agricultural lending, rurality, export, small and medium-sized- enterprises. Banking services are not only limited in the scope of raising capital and grantable credit, but also many kinds of modern services was applied and became popular as debit cards, banking electronic services, forex trading. Banking network was expanded across the country. This has enabling convenient for people and businesses with easy access to banking services

Besides the achievements of banking system has gained, it also facing many problems and revealing some shortcomings. More specification as follows:

Firstly is the majority of commercial banks operational inefficiency for a long time. The research's result in the reference [2] indicated that among 31 commercial banks have chosen to analyze; 80% responded inefficient in banking activities, but just only 19% absolutely efficiency and nearly efficiency. These issues indicate that the operational inefficiency for years of commercial banks.

Secondly is the sharply blooming of small domestically banks in the short time period. According to the state bank of Vietnam at the end of 2012, the system includes 5 state-owned commercial banks, one bank for social policies, one development bank, 35 Joint- stock

commercial banks, 48 branches of foreign banks, 5 joint-venture banks, 5 wholly foreign-owned banks, 49 representative foreign banks, 18 finance companies, 12 leasing companies, one central people's credit fund with more than 24 branches spread of country, and more than 1000 credit funds. Although the system appears more and more banks with variety forms about ownership and business types but most of them still have a small-scale. According to the reference [3], the authorized capital of larger commercial banks in Vietnam like Agribank, Vietcombank, Vietinbank or BIDV is too small; just have nearly 800 million USD less much than small and medium-sized commercial banks in the same areas. For instants DBS Bank (9,623 million USD); United overseas Bank (6,297 million USD) in Singapore, Maybank (4,102 million USD) in Malaysia, Bangkok Bank (3,178 million USD) in Thailand Bank Mandiri (2,122 million USD); Bank BNI (1,499 million USD) in Indonesia.

Finally is the banking bad debt situation increases year by year. According to the monitoring results of state bank [1], the bad debt of system increased nearly 5 times in the short time, Especially, in the mid of 2012, the bad debt of system is 202.099 thousand billion VND "increased 2.5 times in 6 months compare with year of 2011", accounting for 8.6% total loans in which the bad debt of state-owned commercial banks is 125.8 thousand billion VND, accounting for 10.37 % total loans of state-owned banks group. The bad debt of commercial banks is 60.9 thousand billion VND, accounting for 5.8% total loans of their group.

All above issues and shortcomings have reduced their competitiveness. So, how enhancing their competitiveness? This paper provides an effective approach for helping manager to find out the best partner when formed alliance based on the GM and DEA. First, we use the grey model predicts the input and output factors in the future rely on the previous data aim to know the performance of DMUs in the future. After that, using data envelopment analysis and heuristic technique evaluates operational efficiency before and after formed an alliance. Then, we based on the characteristic of DEA to find out the best partners.

The rest of this paper is organized as follows. Section 2 provides proposed approach. The research results were show in section 3. The last section illustrates some conclusion and suggestion of research in the future.

2. Proposed Approaches

Realized the power as well as usability of GM and DEA in the real case [3, 4], this paper combined the GM and the DEA proposes a new systematic approach to find out the best alliance members when implementing strategy. For finding partner processing is implementing through eight steps. They are DMUs collection, Input/ output variables selection, Input/ output variables forecast by Grey prediction, error checking, Correlation analysis, DEA model choosing, Analysis before Strategic Alliance, Analysis virtual DMUs after Strategic Alliance, and Partner Selection which show in Figure 1.

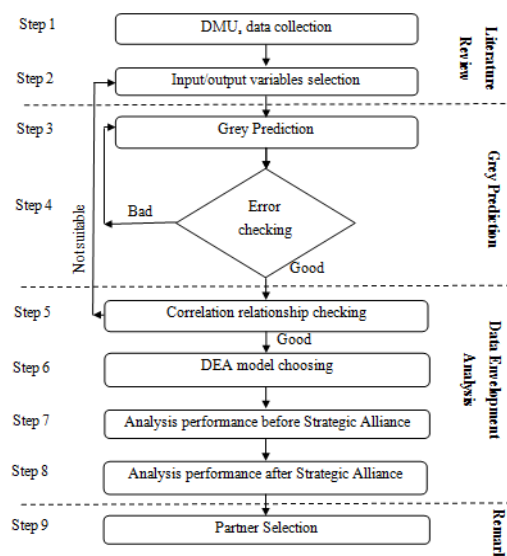


Figure 1. Producer Approach

Explanations of Figure 1 are shown below.

Step1: DMUs Selection

Searching entire banks in Vietnam to find all potential candidates to be our DMU list
collect history data on candidate's banks

Step2: Input and Output Variables Selection

Read some previous papers and lists popular variables in this field.

Use correlation analysis to analyze positive relationship between each variable of inputs and outputs.

Verify positive relationship between each variable negative coefficient between inputs and outputs, they need to be removed for following DEA's basic assumption

Step 3: Variables Forecast by Grey Prediction

Choose the grey prediction model

Based on the previous data during 2008 -2011 to forecasts the inputs and outputs

Step 4: Accuracy Checking:

List common indexes to measure the accuracy of forecast model

Step 5: Pearson Correlation

As above mention, Pearson correlation in DEA is an index to test the relationship between inputs and outputs.

Step 6: DEA Model Choosing

Based on the characteristic of each DEA model to choose model

Step7: Evaluate performance before Strategic Alliance.

We used DEA-Solver Pro software to get the performance of all DMU_s before Alliance.

Step8: Firmed and Evaluate performance after Strategic Alliance.

The first, we combine each bank with the rest of ones to be many virtual alliance.

And then we use DEA-Solver Pro software run again of total DMU_s

Based on the rank and the score of DEA to group potential efficiency of the virtual alliances

Step9: Partner Selection

Based on the rank and the score of virtual alliances, the analyses of empirical results split into three groups and interpret as below:

Group 1: The banks who get better result after strategic alliance and also make their partnership more efficient are the first priority candidate. These candidates have the good characteristic and necessarily match with candidates' desire in doing business.

Group 2: Which DMU increasing performance after strategic alliances while other DMU will get a worst performance is the second priority.

Group 3: DMUs which get worst or no any improvement after strategic alliances are not recommended in this research. No need to put in any effort for alliance because no any benefits for both candidates and target candidates.

3. Research Results

After survey from entire banking system in Vietnam, 21 banks with complete data are selected to be our DMUs. All information is collected from Vietnam stock exchange, website of the state bank of Vietnam [1, 2] and [5, 6]. For data set is primarily drawn from annual financial reports on their official website during 2008 - 2011.

Input and output variables selection process was selected carefulness. Based on some previous papers such as [7, 8], we listed common variables was used in this field and after that we also use the Pearson correlation by DEA "see Pearson Correlation" to check again then we choose input and outputs variables. Hence, outputs in this paper will then include total loans (TL includes total customer loans and totals other lending) and the net profits (NP, the amount of income money earning after tax). The main inputs will then include total deposits (TD, includes deposits from customers and other banks), fixed assets (FA, composed of land, property equipments...etc) and the operating expenses (OE, personnel expenses, depreciation and aromatization charges and other operating expenses).

After finished DMUs collection and variables setting process, all original data of 21 banks in 2011 was shown in Table 1. Because of the convenient of Grey prediction only requires a small number of data to process a problem (at least 4 previous times) and easy

using. Moreover, the historical data of some banks in Vietnam are incomplete. Therefore, Grey model is suitable to establish the forecast model. Based on the previous data during 2008-2011, we use Grey prediction forecasts the input and output variables in the future.

Table1. Original Data of All DMU_s in 2011

DMUs	TD	Inputs (Billion VND)		Outputs (Billion VND)	
		FA	OE	TL	NP
DMU ₁	176,932	1,237	3,147	184,093	3,208
DMU ₂	41,799	1,224	1,296	47,555	947
DMU ₃	56,110	232	615	43,173	488
DMU ₄	29,810	715	866	29,810	314
DMU ₅	136,781	1,191	2,099	105,753	4,114
DMU ₆	12,001	827	248	10,009	241
DMU ₇	18,298	140	394	15,814	166
DMU ₈	55,000	371	1,302	55,000	800
DMU ₉	30,774	328	595	22,837	426
DMU ₁₀	30,310	241	516	30,310	234
DMU ₁₁	16,484	381	424	16,825	303
DMU ₁₂	116,221	1,551	1,881	99,619	1,915
DMU ₁₃	72,846	293	1,696	71,475	639
DMU ₁₄	87,916	3,708	3,589	90,161	1,996
DMU ₁₅	12,571	340	331	13,451	248
DMU ₁₆	274,979	2,606	5,700	309,095	4,217
DMU ₁₇	14,283	267	453	13,332	446
DMU ₁₈	125,512	1,913	1,910	138,574	3,039
DMU ₁₉	331,682	3,746	9,078	355,850	6,244
DMU ₂₀	36,356	1,089	938	34,408	84
DMU ₂₁	16,661	345	270	20,616	408

The checking error result of forecast model is very important aim to know in which the fit forecast model. Nowadays, there are lots of index to measure the error forecast like: Mean squared error (MSE), Mean absolute deviation (MAD), Means absolute percentage error (MAPE). This study uses the MAPE (Means absolute percentage error) to evaluate the accuracy of forecast. All result was showed as follows:

Table 2. Average MAPE Error of DMU_s

DMUs	Average MAPE
DMU ₁	2.74%
DMU ₂	1.89%
DMU ₃	9.23%
DMU ₄	6.01%
DMU ₅	4.07%
DMU ₆	4.00%
DMU ₇	1.86%
DMU ₈	2.90%
DMU ₉	3.23%
DMU ₁₀	4.45%
DMU ₁₁	3.63%
DMU ₁₂	4.14%
DMU ₁₃	5.94%
DMU ₁₄	5.10%
DMU ₁₅	5.41%
DMU ₁₆	3.06%
DMU ₁₇	5.97%
DMU ₁₈	7.09%
DMU ₁₉	5.35%
DMU ₂₀	3.87%
DMU ₂₁	5.05%
Average MAPE of 21 DMU _s	4.52%

This table indicated that the error value of forecast is very low less than 10% [9], which confirm that GM model is fit model in this case study. Therefore, this means the results of forecast in table 4 have a high reliability. The super- SBM model has more advantages than

traditional DEA model [11-13], Tone et al. [11, 13] show that super- SBM model could ranks extreme DEA efficient DMUs, is able to eliminate the drawback of earlier model. Furthermore, the characteristic of commercial banks in Vietnam are small, the quite different among banks related to authorized capital. Therefore, super- SBM model is suitable in this case study.

As above mention, Pearson correlation in DEA is an index to test the relationship between inputs and outputs. The results show that correlation coefficient between input and output variables are highly positive "more than 0.7", which exhibits good correlation and well complies with the prerequisite condition of the DEA model.

For the alliance implementation, the first, we combine each bank with the rest of ones to be many virtual alliances. The totals have 210 virtual alliances. Then, we use the super-SBM model to measure the efficiency of all the virtual banks. According to the result, in total 210 virtual alliances, there are 6 the best combinations. These were show in below table.

Table 3. The First Priority Group for Strategic Alliance Based on the Rank

Virtual rank	Virtual alliance	Virtual score alliance	Group
4	DMU ₅ +DMU ₁₈	1.177427	1
9	DMU ₁₆ +DMU ₁₈	1.087724	1
10	DMU ₁ +DMU ₁₉	1.081508	1
11	DMU ₁ +DMU ₁₈	1.079189	1
12	DMU ₁ +DMU ₁₆	1.076974	1
13	DMU ₁ +DMU ₅	1.071406	1

For this group, alliance strategy not only helps target DMU improve the performance but also make their partnership improve performance. This means they would have strong desire to form alliance. So, for this group this study strongly recommends to corporate.

The rest of combinations belong to the group 2 and the group 3, respectively. With these combinations belong in these groups, this study suggests that no need put in any effort for alliance because when carry out alliance strategy, these combinations could make for them or their partners or both of them meet a risk.

4. Conclusion

Based on foundation theory of DEA and GM, this study proposed an effective approach for guiding managers to find out the best partners when forming strategic alliance aim to enhance their competitiveness in the future. Especially, it will become the golden key guide for top policymaker in which solving restructuring economy in Vietnam.

By ours proposed effective approach, this research found that have 6 combinations are the best allied in the total of 210 virtual alliances. These results are good sound for helping organization to select the best candidates when implementing alliance.

The accomplishment of this study can lead to future research with more input and output variables, more ways to combine together in alliance was analysis such as combining three or four DMU together, and more different industries can be assessed by this proposed approach. Furthermore, different forecasting method and DEA models can be used to explore and develop important issues.

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