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A Suitable Business Model for Bank Branches: Combining Business Model and Malmquist Productivity Index (MPI)

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Abstract

In the recent years, more competitive business area has been used in various industries. According to the researches in the business fields, to achieve a competitive position for the company, it is necessary to use a suitable business model with high performance quality. Using a successful business model is a better choice in comparison with the other available options. But using an unsuitable business model may due to damage for the company. To identify a suitable business model, we use Malmquist productivity index (MPI), which is an economic indicator. To do this, we first propose a business model for commercial bank branches in Iran. We then calculate the productivity progress of each branch after carrying out our proposed business model using MPI. This index will be obtained using data envelopment analysis. This method is the first method to combine business model and MPI for developing an assessment model in business, which is stronger than other existent models. Finally, this method is implemented on a sample of statistical population including 40 bank branches in Iran.

Keywords: Business model; Total factor productivity (TFP); Malmquist productivity index (MPI); Data envelopment analysis

Introduction

In the economy, banks as the base of the financial institutions have important tasks such as mobilizing the savings, intermediation, facilitating flow of payments, allocation of credits, restoring order, and so on. Specially, in developing countries with less developed financial markets and assets, banks are powerful institutions that are able to implement intermediation and help to reduce the risk of investments by doing their tasks. This means that bank has the main task in providing funds of long-term and medium-term economic programs of these communities because of the intermediation role in money market and due to the lack of adequate development of the capital market. On the other hand, according to the process of liberalization of markets, relation with global market, and also importance of improve financial standards in these communities, we need to use precise criteria for evaluating the effectiveness of the banks.

The term business model has almost entered in management literature since four decades ago. The first people who used the term business models are Konczal [1] and Dottore [2]. They used this word about the concept of modeling processes and data.

By reviewing the literature of the business model, one can be found many definitions of this concept. Business model includes the general words about the choice of customers, job outsourcing, combining resources, going to market, creating utility for customers and gaining profit [3]. In other definition by Petrovic et al. [4] business model is consistent with creating real value that supports the real processes of the company. Faber et al., considered business model as a network of companies that their aim is create value through the deployment of technology opportunities [5]. They have balanced and reconciled based on differences in technical choices, user, organization and financial requirements [6]. Chesbrough and Rosenbloom [7] also believed that successful business models link the technological capabilities with their real economic value by creating innovative logic. Teece considered business model as a good which reflects management's hypothesis about what customers need, and how a company can best meet and provide these needs [8].

In this paper, we first propose a business model for commercial bank branches. Then, we use an economic indicator in order to measure the validity of our proposed model. This indicator in the economy is known as Malmquist productivity index (MPI) and it is one of the leading indicators in the economy [9]. In fact, we use this economic indicator to know how the productivity progress of the branches after carrying out our proposed business model. To do this, the indexes of our proposed model are first divided into two input and output variables. We then use data envelopment analysis (DEA) to calculate MIP index for assessing the productivity progress of each branch after carrying out our business model [10].

DEA is a mathematical technique to evaluate the performance of decision making units (DMUs) with multiple inputs and multiple outputs [11]. DMUs can include bank branches, hospitals and etc. [12]. Many articles are done about bank performance assessment by DEA [13-16].

The rest of this manuscript is organized as follows. In Section 2 we propose business model of bank branches. We propose a method to measure the productivity enhancement of each branch after implementing our proposed business model in section 3. In the next section, our proposed method is implemented on a sample of 40 branches of the commercial bank. The conclusion and future directions for research are summarized in the last section.

Proposing a Business Model for Branches of Bank

The concept of a business model facilitates analysis of the way in which a firm derives economic value from a newly developed technology. Indeed Chesbrough and Rosenbloom have argued that it is

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the business model adopted, more so than the technology itself, which is critical to the success of the commercialization of new technology [7]. These business models are used with different approaches in small and large companies, for example Google Company.

We here introduce a business model for bank branches. In line with unification of performance appraisal indexes of branches using the presented model, we can monitor and measure the performance of the branches in the field of variable payments (market development and remuneration); and consequently, we can lead bank to develop profitability.

In this model, profitability is the main focus. That is, the cost on one side and revenue of branch has been considered on the other side (shared and non-shared revenue). For comprehensiveness and completeness of all aspects of bank's activities as an economic institution, qualitative criteria including credit quality has been considered in this model. The business model has been presented in Figure 1. The definitions of each indicator and its preferred weight have been provided as follows. In fact, business model provides an index for comparing and classifying branches based on their performance. For each branch, this index is calculated by sum of the multiplications of indicators to their preferred weight.

Credit Quality

This indicator is composed of two categories of indicators, the ratio of deferred to loans and shared revenues. The assigned preferred weight of this indicator is 25 scores.

The ratio of deferred to loans (5 Score)

With the increase in lending we can achieve profitability, but if the quality of loans not considered, the lack of repayments leads banks to have difficulties. Therefore, the ratio of deferred to loans can monitor a part of risk associated with credit quality of loans as an index.

Shared revenues (20 Score)

This indicator is composed of two parts, loans and surplus resources revenues. Branch loans revenues are extracted through the relevant heading in the balance of branches. Surplus resources are calculated by multiplication of subtracting resources of branches (including legal deposit) and the balance of the loan to the rate of the profitability of the branch. The branch profitability ratio is also extracted from the difference between the base rate and the rate of equipment (cost to resources), where the base rate is the highest rate in terms of the bank which can be profitable.

Services Quality

Service quality has the highest preferred weight, 50 scores. This indicator includes the ratio of e-banking transaction to total transactions and non-shared revenues.

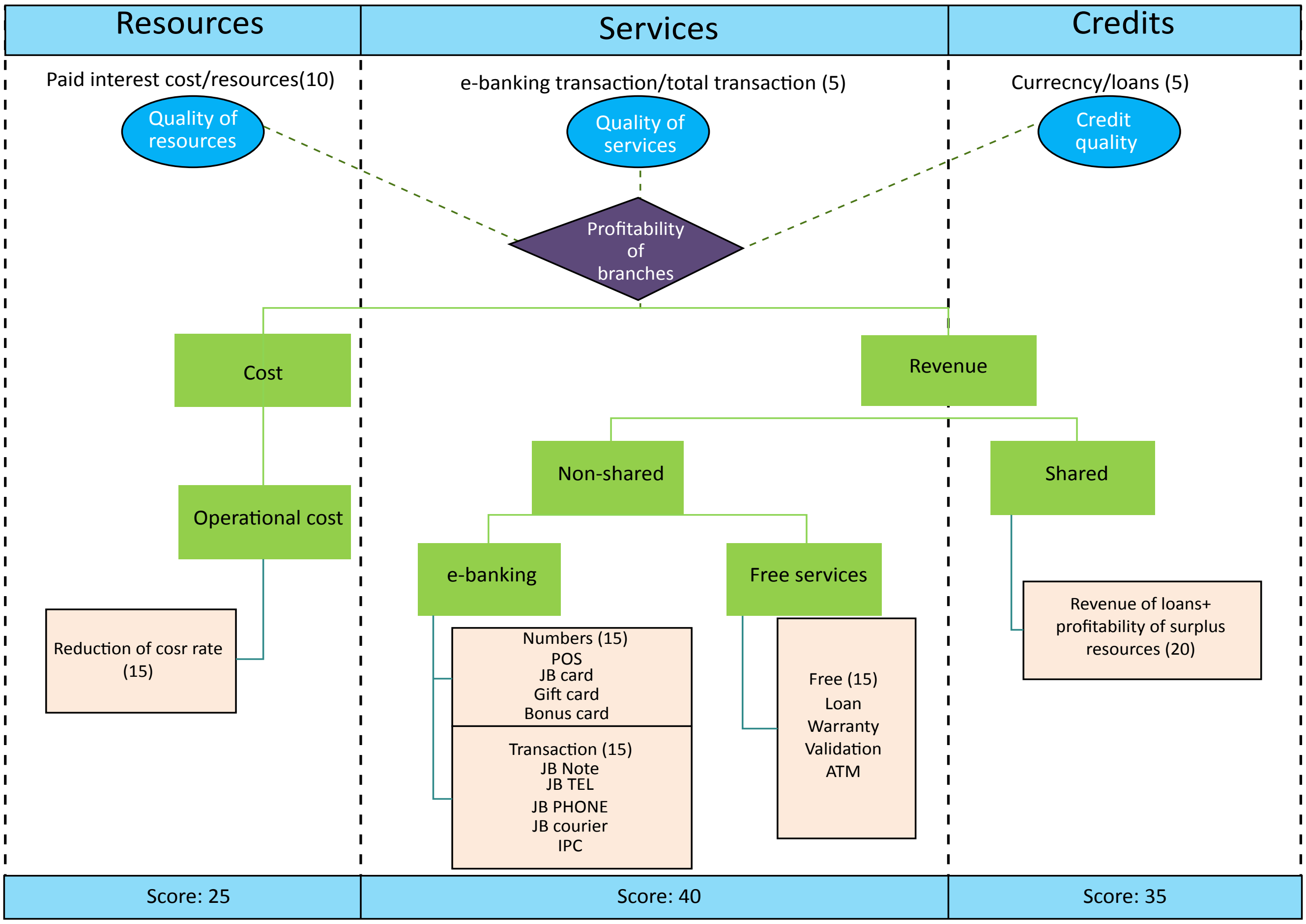

Figure 1: Business model of bank branches.

The ratio of e-banking transaction to total transactions (5 score)

With the increase in service fees, non-shared revenues of bank will increase; but if the quality of service -the usage of new services and new platforms to serve - is less used the gradually make clients to approach rivals. Moreover, manual transactions that require physical activities by users can lead to increase the clients of traditional banking which results in burnout of personnel. Also the costs of electronic transactions are far less than traditional banking transactions.

Non-shared revenues (45 score)

Non-shared revenue includes three below indicators.

Fee indices (15 score): These indices are composed of the loan, warranty, validation, Performance of ATM and etc. Note that service fees, including loan, warrant can be recognized in headings of fees and miscellaneous revenue in balance of branches.

Number indices (15 score): These indices include gift cards, bonus cards, JB card, and POS devices. These mentioned indices provide the service to customers. Therefore, branches should identify customer needs and increase the ability of persuasion and sales. Thus, the number of successful marketing can be considered as an indicator of the assessment.

Transaction indicators (15 score): These indices include internet bank, mobile bank, telephone bank, and IPG. These mentioned indicators are the important tools to increase the number of electronic transactions that leads to increase the fees and non- shared revenues. Thus, branches should encourage customers to use bank websites to do banking by introducing the above mentioned products.

Quality of Resource

The assigned preferred weight of quality of resource is 25 scores, which the scores of cost of paid interest to resources and operating costs are 10 and 15, respectively.

Cost of paid interest to resources (10 score)

If the quality of resources is not considered and resources are attracted with high rates, the last price of money increases. Therefore, the rate of resource mobilization that is the rate of cost (average cost of interest paid by subsidiaries to depositors until the end of the calculation period) to resources (average resources of subsidiaries by the end of the calculation period) can display the resource quality of the branch.

Operating costs (15 score)

It is calculated as reducing rate of cost compared to the previous period. The bank's profitability margin of the shared revenues depends on the rate of resource mobilization. This margin is about 2% in the banking industry. Therefore, given the very high volume of bank resources and given the law of large numbers, the less reduction of resource mobilization can enhance the profitability of banks. So mobilization rate changes (how to calculate the rate of mobilization, is "the quality of resources" in paragraph "1-3") compared to the previous period can be considered as an index for assessing bank's performance.

Measuring the Validity of our proposed Business Model

In this section, we introduce MPI index in order to test the validity of our proposed business model. In fact, we measure the productivity enhancements for each branch after the implementation of our business model.

Malmquist Productivity Index (MPI)

To measure productivity, determining output changes and production factors are very important. Changes are easily calculable at firms with single input and single output. But in firms with multiple inputs and outputs, measuring productivity indicators is not definitely easy.

In order to measure changes in productivity, numerical indexes are used to measure the amount of produced output and production factor used in two time periods for a firm. In pairwise comparison, when the two time periods are compared, the index of total factor productivity (TFP) is used. TFP index is calculated for two time periods of t and t+1.

One can use the Tronqvist and Fisher technique to calculate TFP. These methods require the prices for all inputs and outputs in the calculation of TFP. Since it is often difficult or impossible to access this information, these methods are limited. But when calculating a TFP index, namely MPI (distance function) was introduced to rectify the weakness of previous indicators. This index does not also need any price information of inputs and outputs [9]. It is worth noting that these distance functions are inverse functions of profitability values based on the Farrell theory (1957).

Fare et al. showed that TFP can be obtained using DEA, which is called MPI [10]. In this index unlike other main indexes of productivity evaluation such as Tronqvist, there is no need to have input and output prices. Also, changes of productivity of total production factors can be separated to technological changes (efficiency frontier-shift) and changes in technical efficiency (catching up the efficient frontier) in MPI.

MPI measures changes in productivity of total factors using two sets of data based on calculating the distance of each set of data in comparison with common technology. To measure MPI, we use the following approach which has been proposed by Fare et al. [10].

$$MPI=\frac{\delta^{t+1}((x_0,y_0)^{t+1})}{\delta^{t}((x_0,y_0)^{t})}\times\left[\frac{\delta^{t}((x_0,y_0)^{t})}{\delta^{t+1}((x_0,y_0)^{t})}\times\frac{\delta^{t}((x_0,y_0)^{t+1})}{\delta^{t+1}((x_0,y_0)^{t+1})}\right]^{\frac{1}{2}}$$

$$=\left[\frac{\delta^{t}((x_0,y_0)^{t+1})}{\delta^{t}((x_0,y_0)^{t})}\times\frac{\delta^{t+1}((x_0,y_0)^{t+1})}{\delta^{t+1}((x_0,y_0)^{t})}\right]^{\frac{1}{2}}$$

Based on the value of MPI, we have three cases:

1. If MPI>1, it represents the progress in trend of productivity.
2. If MPI=1, it represents the productivity remains unchanged.
3. If MPI<1, it represents the declining in trend of productivity.

MPI consists of two components, catch-up and frontier-shift effects. That is,

MPI=C*F Where

$$C=\frac{\delta^{t+1}((x_0,y_0)^{t+1})}{\delta^{t}((x_0,y_0)^{t})} \qquad \text{(Catch Up)}$$

$$F=\left[\frac{\delta^{t}((x_0,y_0)^{t})}{\delta^{t+1}((x_0,y_0)^{t})}\times\frac{\delta^{t}((x_0,y_0)^{t+1})}{\delta^{t+1}((x_0,y_0)^{t+1})}\right]^{\frac{1}{2}} \qquad \text{(Frontier-Shift)}$$

Catch-up effect is the ratio of technical efficiency in period t+1 to technical efficiency in period t. Frontier-shift effect includes the geometric mean ratio of performance per unit with respect to the frontier of both technologies [17,18].

For calculation $\delta^p((x_0,y_0)^K)$ (p,k=t,t+1) we use input-oriented CCR model. To do this, we assume that we have n DMU_s (x_j,y_j), j=1,…,n in two times t and t+1. We also suppose that $DMU_j=(x_j,y_j)$ use inputs x_j ε R^m to produce q output y_j ε R^q, and $x_j,y_j>0$, j=1,….,n. Symbol of $(x_0,y_0)^t=(x_o^t,y_o^t)$ and $(x_0,y_0)^{t+1}=(x_0^{t+1},y_0^{t+1})$ are used to show DMU0 (0=1,….,m) in periods t and t+1, respectively. In order to calculate productivity of $DMU_0=(x_0,y_0)^k$ in period k according to p technology we use the following model:

$\delta^p((x_0,y_0)^k)=\min\theta$

s.t.

$$\sum_{j=1}^{n}\lambda_j x_{ij}^p \le \theta x_{io}^k$$

$$\sum_{j=1}^{n}\lambda_j x_{rj}^p \le \theta x_{ro}^k$$

$$\lambda_j \ge 0$$

Where k,p=t,t+1. Note that when k=p, the value of technical performance achieved in each stage. We should solve four different models for different p and k.

Experimental Sample

The purpose of this section is to apply our proposed approach for a commercial bank in Iran. The population of the study includes all branches of this bank. But only 40 bank branches in 2 provinces in Iran are used as statistical sample. As introduced in the previous section, we consider six indicators in our proposed business model. By consulting with experts, we divide these indicators into two groups, inputs and outputs. In fact, we consider an indicator as output (input) if its increase (reduction) leads to increase the bank's profits. Therefore, we consider operating costs and non-operating costs as inputs; and shared revenues, non-shared revenue, electronic banking ratio and reduction ratio of operating costs as outputs.

At this stage the Bank was asked to provide information about the 40 branches for two periods before and after the implementation of business model. Information after implementing business model of branches is related to three months after implementing this model. Descriptive statistics (including mean, standard deviation, minimum and maximum), inputs and outputs of these 40 branches for both periods are given in Table 1 below.

As explained in the previous section, in order to calculate MPI we must solve four linear programming models. To solve these models, Lingo 11 is used. The results of the implementation of the four linear programming models for each branch are provided in the second to fifth columns of Table 2, respectively. The MPI is also provided in the sixth column of Table 2 for each branch.

The remarkable thing in Table 2 is that the MPI is more than 1 for all bank branches. This indicates that the productivity index of all branches has grown. Therefore, all branches will have higher productivity after implementing business model. This means that our proposed business model has a positive outcome for all bank branches. Accordingly, our proposed business model is an appropriate model in banking area, and so other banks can use it as a perfect scientific model for their branches.

Conclusion

In this paper, a business model for bank branches is first proposed, which it is applied in a commercial bank in Iran. Then, in order to measure the credibility of our proposed model, an economic index is used to calculate bank productivity known as MPI. The results of the implementation of the MPI show the productivity progress in a sample of branches of this bank. This means that any bank branches in the sample have progress of productivity after implementing our proposed business model. This indicates that the implementation of the business model has been useful for this bank, and consequently, other banks and financial institutions would be able to increase their efficiency using our proposed business model. It should be noted that improving or changing business model according to the type of company or organization and changing in used economic models can be considered as the future researches.

	Mean	SD.	Min.	Max.
Inputs before implementing model				
Operating Costs	0/333	0/074702	0/131	0/463
Non-Operating Costs	33/975	9/447527	15	40
Outputs before implementing model				
Shared Revenues	32,20,13,43,739	21373077665	4,90,26,50,345	1,01,34,67,03,074
non-Shared Revenues	4,89,54,884	24305531/78	90,80,870	11,70,53,451
E-banking ratio	0/363	0/107747	0/129	0/632
Reduction ratio of operating costs	0/447	0/078189	0/279	0/576
Inputs after implementing model				
Operating Costs	0/549	0/136264	0/198	0/813
Non-Operating Costs	25/85	11/37823	15	40
Outputs after implementing model				
Shared Revenues	4,52,85,64,213	2350709924	1,06,49,65,552	10,06,10,15,112
non-Shared Revenues	13,32,84,249	359132602/6	1,49,28,750	2,33,76,87,441
E-banking ratio	0/795	0/065148	0/600	0/905
Reduction ratio of operating costs	0/379	0/094277	0/241	0/647

Table 1: Descriptive statistics about the inputs and outputs before and after the implementation of the business model of branches.

Branches	$\delta^1((x_0, y_0)^2)$	$\delta^2((x_0, y_0)^2)$	$\delta^1((x_0, y_0)^1)$	$\delta^2((x_0, y_0)^1)$	MPI
1	2.53	1	1	1.07	1.537689
2	3.1	0.88	0.84	0.48	2.601129
3	5.09	0.87	0.91	0.61	2.824444
4	3.09	0.91	0.92	0.51	2.448054
5	1.98	0.89	0.8	0.6	1.916051
6	4.4	1	0.87	0.62	2.856083
7	2.67	1	0.75	0.45	2.81267
8	2.38	0.97	0.77	0.48	2.499242
9	11.52	1	0.99	0.49	4.873159
10	2.5	1	0.87	0.6	2.188441
11	3.06	0.94	0.8	0.46	2.795765
12	2.67	1	0.9	0.5	2.435844
13	3.09	0.92	0.79	0.42	2.927083
14	2.17	0.97	0.75	0.42	2.585
15	1.77	0.83	0.88	0.57	1.711382
16	2.65	0.94	0.7	0.38	3.060174
17	3.15	0.99	0.79	0.43	3.029878
18	3.3	0.95	0.82	0.48	2.822222
19	2.83	0.94	0.77	0.46	2.740519
20	3.09	1	0.71	0.39	3.340548
21	1.48	0.84	0.75	0.45	1.919259
22	2.65	0.85	0.8	0.45	2.501389
23	4.71	1	1	0.59	2.825429
24	2.22	92	0.63	0.46	2.654735
25	2.36	0.97	0.75	0.43	2.664263
26	2.66	0.99	0.79	0.41	2.851366
27	2.39	1	0.86	0.61	2.134444
28	1.98	1	1	0.69	1.693979
29	1.53	0.76	1	0.73	1.262092
30	2.23	0.94	0.94	0.61	1.911998
31	5.96	1	0.98	0.74	2.866779
32	3.98	0.94	0.91	0.95	2.080286
33	5.11	1	0.76	0.42	4.001096
34	3.26	0.92	1	1.02	1.714757
35	5.68	0.96	1	0.82	2.578712
36	5.88	1	1	0.62	3.079589
37	4.37	1	0.65	0.39	4.151946
38	4.46	1	0.96	0.59	2.806117
39	3.94	0.93	0.82	0.45	3.151203
40	5.17	1	0.8	0.47	3.708099

Table 2: Measured productivity index for the 40 branches of the studied bank.

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