The Ar-Rahnu Efficiency and Its Determinants

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Abstract

Ar-Rahnu plays an important role in providing funds for micro and small enterprises. However, these enterprises could not be reached if ar-hanu is not efficient. Therefore, the aim of this paper is to measure the efficiency of ar-rahnu and identify the factors affecting the efficiency. This study uses Data Envelopment Analysis (DEA) method to estimate ar-rahnu efficiency and Tobit model to determine the efficiency of Islamic Pawnshop (ar-rahnu). We use three different types of DEA model which are technical efficiency (TE), pure technical efficiency (PTE) and scale efficiency (SE) Model. The efficiency of ar-rahnu is measured from the secondary data for 2006 across several ar-rahnu operators including Bank Rakyat, Permodalan Kelantan Berhad (PKB), Muasasah Gadaian Islam Terengganu (MGIT) and Co-operatives under Yayasan Pembangunan Ekonomi Islam Malaysia (YaPEIM). Based on the efficiency score, we find that the highest average efficiency score among categories of ar-ahnu used is Bank Rakyat. Furthermore, most of the ar-rahnu branches operate in increasing return to scale which imply that most of them can improve their performance by increasing their inputs. While, variables that affect ar-rahnu efficiency found from this empirical study are size, financial self-sufficiency, subsidy and group of business positively affect ar-rahnu efficiency.

Keywords: microfinance institutions, efficiency score, data envelopment analysis (DEA), Tobit Model, subsidized program

1. Introduction

As an informal financial institution, pawnshops play an important role in providing funds especially for those who have difficulties in obtaining funds from the formal financial institutions[3]. The establishment of the two types of pawnshop (i.e., conventional and Islamic pawnshop) in Malaysia contributes benefit to the society and potential for micro-enterprises development. Ar-rahnu has been established in Malaysia since 1992 and has shown a rapid growth. Fourteen years (1992-2004) in operation, there were 155 ar-rahnu outlets in Malaysia. Loans granted by ar-rahnu use two agreements namely Qardhul Hassan – loan without interest and Yadh Dhamanah

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3 Pawnshops are financial institutions, which are found all over the world and provide quick and easy money to their customers who are short of cash. Customers offer their valuables as pawn to the pawnshop which usually exceed the value of the loan.

– guaranteed custody. It means that ar-rahnu offers alternative loans which confirms with syariah principles.

This study exclusively concentrates on Islamic pawnshop (ar-rahnu) operated by Yayasan Pembangunan Ekonomi Islam Malaysia (YaPEIM) co-operative, Mu'assasah Gadaian Islam Terengganu (MGIT), Permodalan Kelantan Berhad (PKB) and Bank Rakyat. It constitutes alternative providers of financing which also reduces the debt burden of society. Nevertheless, the competition from ar-rahnu in providing and distributing funds to the society cannot be avoided. Thus, it is an important issue for ar-rahnu to operate efficiently in order to serve the society.

Efficiency issue in ar-rahnu is very important to be highlighted because of three reasons. First, there are few study so far been done on relative efficiency of ar-rahnu have been done. Ar-rahnu was established more than 14 years ago as compared to conventional pawnshops that have existed for more than 100 years. In 2003, there were 147 ar-rahnu outlets to serve the 1.22 million cumulative customers, whereas there were 242 conventional pawnshop outlets in the same year (Mohd Arshad, 2004). The drastic increase in the number of ar-rahnu outlets has raised an interesting question on whether the increase was due to the sustainability issue or subsidized program issue. Since ar-rahnu is an alternative to conventional pawnshop and its operation follows the Islamic Shari'ah, a research should be done to see how efficient the ar-rahnu is. Ar-rahnu has to be efficient to ensure that it can be sustained. Ar-rahnu is one of the Islamic products and used by Muslim and non-Muslim in Malaysia. Ar-rahnu must maintain its reputation.

Second, in managing the ar-rahnu, subsidies were given by the federal and state governments to all ar-rahnu outlets to start up their businesses. Several earlier researches expected that subsidized businesses are not efficient. So, this gives us a reason to find out and evaluate the efficiency of ar-rahnu and to determine whether ar-rahnu is more efficient with or without subsidy.

Third, the study intends to look at the factors that affect the efficiency of ar-rahnu in this research. Ar-rahnu can be categorized into three which are state-linked company such as Mu'asasah Gadaian Islam Terengganu (MGIT) and Permodalan Kelantan Berhad (PKB), as cooperatives under foundation for example YaPEIM, or subsidiaries of banking institutions such as Bank Rakyat and Agro Bank. These categories produce different features in term of storage fees, rules, market strategies and management. These differentiations might lead to different relative efficiency resulting from the size, subsidized programme and regulation. It is very important to look at the factors because it will give us an idea and also to prove why some ar-rahnu outlets are more efficient than others. We consider several factors as explanatory variables such as competition which reflect the institutions' image, size, financial self-sufficiency and regulation. Hence, the level of ar-rahnu efficiency and the analysis of its determinants will be an interest to the stakeholders such as

customers-members, ar-rahnu outlet managers, local communities and ar-rahnu regulators (i.e.: Cooperative Development Department and YaPEIM).

Therefore, the aim of this study is to measure efficiency of every ar-rahnu by category and try to link with their ability in providing and distributing funds to the society. This study will extend the existing research in finding out the factors that affect the efficiency. Having measured the relative efficiencies, it is also of considerable interest to us to explain the DEA efficiency scores by investigating the determinants of the technical efficiency and hope that the result will guide policies aimed at improving performance. The remaining discussion will discuss on the empirical methods, results and conclusions.

2. The Empirical Method

To construct the efficiency model for ar-rahnu and it involves two steps. The first step is to estimate the efficiency by using DEA. The second step is to find the factors that affect the efficiency by using Tobit. In recent years, many studies employ both DEA and Tobit. For example, in health and public studies, Luoma et. al (1996) and Chilingerian (1995) conducted both the DEA and Tobit analyses in health sector application; Viitala and Hanninen (1998) for the public forestry organizations in Finland; Kirjavainen and Loikkanen (1998) for Finnish senior secondary schools. There are also studies in banking using both steps in early 2000, for example, by Jackson (2000) evaluated the technical efficiency of Turkish commercial banks; Souza et. al (2003) measured technical efficiency to assess the significance of technical effects for Brazilian banks; Stavarek (2003) estimated commercial banks' efficiency in Visegrad; Chang and Chiu (2006) investigated the bank efficiency index and efficiency effects incorporated into account credit and market risk for Taiwan's banking industry. The main objectives of this study are to measure efficiency and find out the determinants of ar-rahnu efficiency. We will use both, the DEA and Tobit model to achieve the objectives.

DEA is a piece-wise linear combination that connects the best practice observations and forms a convex production possibility set. It was developed by Charnes, Cooper and Rhodes (1978) and applied to non-profit organizations where the objectives of profit maximization and cost minimization may not be considered as the vital factor. DEA also had the advantage of working with a small sample size and that does not require price information.

Many studies have used DEA to evaluate the efficiency of financial institutions[4] due to several reasons. Among the reasons are: Park and De (2004) revealed that DEA is the most important approach to measure efficiency. Furthermore, according to Krivonoshko et al. (2002), DEA is a powerful approach to efficiency investigation of production units. Ar-rahnu is the financial institution which is defined as a producer of services for account holders that is to perform transactions on deposits accounts and process document such as loans application. Ar-rahnu is a production unit by producing small loans to the customers. Jemric and Vujcic (2002) revealed that the main advantage of DEA was that, unlike the regression analysis, it did not require a prior assumption about the analytical form of the production function. Instead, it constructed the best practice production function solely on the basis of observed data and therefore it was not possible to make mistake in specifying the production technology.

DEA also have the disadvantage Base on Matousek and Taci (2004), non-parametric techniques do not allow for measurement error and luck factors. However in Fiorentino et al. (2006), they found that non-parametric methods are particularly sensitive to measurement error and outliers. With those limitations in DEA where error could cause significant problems, Bassem (2008) still apply DEA to investigate efficiency of MFIs in the Mediterranean. Qayyum and Ahmad (2008) also use DEA to measure efficiency of MFIs in South ASIA. In this study, ar-rahnu as a MFIs which the objective is for service rather than profit, with three categories would affect different data collected, therefore DEA is suitable to apply to measure ar-rahnu efficiency.

2.1 Data Envelopment Analysis

In the following discussion, the study will discuss the standard estimation of efficiency. The standard estimation of efficiency can be divided into two; Charnes-Cooper-Rhodes Model (CCR model) and the Banker-Charnes-Cooper Model (BCC model). Both models allow the technical efficiency (TE) to be decomposed into two collectively exhaustive components: pure technical efficiency (PTE) and scale efficiency (SE) (see, Coelli, 1996)). The main difference between the two models is the treatment of return-to-scale. BCC allows for variable-return-to-scale (VRS); CCR assumes that each DMU operates with constant-return-to-scale (CRS). PTE refers to managers' capability to utilize firms' given resources, while SE refers to exploiting scale economies by operating at a point where the production frontier exhibits

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[4] For example; Luo (2003), Soteriou and Zenios (1999), Ataullah et al., (2004), Jemric and Vujcic (2002). Periera (2002) used DEA to evaluate the efficiency (financial and operational) of microfinance institutions and he concluded that DEA can be powerful instrument to operate in microfinance industry, whether in operation, deregulatory bodies or the financial institutions.

constant returns to scale (Ataullah et al., 2004). According to Luo (2003), SE can be used to determine how close a decision making unit (DMU) or operator is to the most productive scale size.

a) Charnes-Cooper–Rhodes Model (Technical Efficiency)

Charnes, Cooper and Rhodes introduced a measure of efficiency for each DMU, which is to obtain a maximum ratio of weighted output to weighted input. The weight for the ratio is determined by a restriction that similar ratio for every DMU has to be less than or equal to unity, thus reducing multiple inputs and outputs to a single virtual input and single virtual output without requiring pre-assigned weights. The efficiency measure is then a function of weights of the virtual input-output combination. Formally the efficiency measure for DMU can be calculated by solving the following mathematical programming problem:

$$\max_{u,v} h_o(u,v) = \sum_{r=1}^{s} u_r y_{ro} : \sum_{i=1}^{m} v_i x_{io}$$

Subject to:

$$\left(\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \right) \leq 1, j = 1, 2.3....., j, ..., n$$

$$u_r \geq 0, r = 1, 2...., s \quad \text{and} \quad v_i \geq 0, i = 1, 2...., m \qquad (1)$$

where x_{ij} is the observed amount of inputs of ith type of the jth DMU ($x_{ij} > 0$, i = 1,2, …,m, j = 1,2,…,n) and y_{rj} is observed amount of output of the rth type for the jth DMU ($y_{rj} > 0$, r = 1,2,…,s, j = 1,2,…,n).

The variable u_r and v_i are the weights to be determined by the above programming problem. However, this problem has an infinite number of solutions. If (u*, v*) is optimal, the for each scalar a, (au*, av*) is also optimal. Following the Charnes-Cooper transformation, one can select a representative solution (u, v) for which

$$\sum_{i=1}^{m} v_i x_{io} = 1 \qquad (2)$$

to obtain a linear programming problem that is equivalent to the linear fractional programming problem (1) – (2). The denominator in the above efficiency measure, h_o, is set to equal one and transformed linear problem for DMU_o and can be written as:

$$\max_{u} Z_0 = \sum_{r=1}^{s} u_r y_{ro}$$

Subject to:

$$\left(\sum_{r=1}^{s} u_r y_{rj} - \sum_{i=1}^{m} v_i x_{ij} \right) \leq 0, j = 1, 2.3....., n$$

$$\sum_{i=1}^{m} v_i x_{io} = 1$$

$$u_r \geq 0, r = 1, 2...., s \quad \text{and} \quad v_i \geq 0, i = 1, 2...., m \qquad (3)$$

For the above linear programming problem, the dual for DMU_o can be written as:

$$\min_{\lambda} Z_0 = \theta_0$$

Subject to:

$$\sum_{j=1}^{n} \lambda_j y_{rj} \geq y_{ro,} r = 1, 2.3....., s$$

$$\left(\theta_o x_{io} - \sum_{j=1}^{n} \lambda_j x_{ij} \right) \geq 0, i = 1, 2, ...m$$

$$\lambda_j \geq 0, j = 1, 2...., n \qquad (4)$$

Both linear problems yield the optimal solution θ*, which is the efficiency score (so-called technical efficiency) for the particular DMU_o. The value of θ is always less than or equal to unity, since when tested, each particular DMU_o is constrained by its own virtual input-output combination too. DMUs for which θ < 1 are relatively inefficient and those for which θ* = 1 are relatively efficient, having their virtual input-output combination points lying on the frontier. The frontier itself consist of linear facets spanned by efficient units of data, and the resulting frontier production function, obtain with implicit constant returns-to-scale assumption, has no unknown parameters.

b) Banker–Charnes–Cooper Model (Pure Technical Efficiency)

Since there are no constrains for the weights λj, other than the positively conditions in the problem (1) – (4), it implies constant returns-to-scale. To allow for variable returns-to-scale, it is necessary to add convexity condition for λ_j, i.e. to include in the model (4) the constraint:

$$\sum \lambda_j = 1 \qquad (5)$$

The resulting DEA model is called the BCC-model. Solving the model for each DMU, the BCC-efficiency scores are obtained, with a similar interpretation for its values as in the CCR-model. These scores are also called "pure technical efficiency

score", since they are obtained from a model that allows variable-returns-to-scale and hence eliminates the "scale part' from the analysis.

c) Scale Efficiency

According to Wang and Huang (2005), the scale efficiency score as defined by the ratio of CCR/BCC or (TE/PTE), exhibits large difference between the two groups. Then, a DMU_o found to be efficient with a CCR model will also be found to be efficient for the corresponding BCC model, and a constant return-to-scale means that DMU_o is the most productive scale size. When a DMU_o exhibits decreasing return-to-scale $\left(\sum_{j=1}^{n} \lambda \quad j > 1\right)$, it is likely that the DMU_o can improve its performance by decreasing its size. On the other hand, when a DMU_o exhibits increasing return-to-scale $\left(\sum_{j=1}^{n} \lambda \ j < 1\right)$, it is likely that a DMU_o can improve its performance by increasing its size.

2.2. Tobit Model

As defined in equations (1) to (5), the DEA score falls between the interval 0 and 1 $(0 \le h \le 1)$, making the dependent variable a limited dependent variable. A commonly held view in previous studies is that the use of Tobit model can handle the characteristics of the distribution of efficiency measures and thus provide results that can guide policies to improve performance. In this study, dependent variable in the Tobit model is the estimated efficiency using DEA approach. The Tobit model is suggested as an appropriate multivariate statistical model in the second step in order to consider the characteristics of the distribution of efficiency measure (Grosskopf, 1996).

Tobit Model is an extension of the Probit model developed by James Tobin. In the Tobit Model, there is an asymmetry between observations with positive values of Y and those with negative values. The standard Tobit model for ar-rahnu observations can be defined as follows:

$$Y_t = \begin{cases} \alpha + \beta X_t + u_t & if \ Y_t > 0 \quad or \quad u_t > -\alpha - \beta X_t \\ 0 & if \ Y_t \le 0 \quad or \quad u_t \le -\alpha - \beta X_t \end{cases} \qquad (6)$$

The basic assumption behind this model is that there exists an index function $Y_t = \alpha + \beta X_t + u_t$ for each economic agent being studied. For $Y_t \le 0$, the value of the dependent variable is set to zero. If $Y_t > 0$, the value of the dependent variable is

set to I_t. Suppose u has the normal distribution with mean zero and variance σ^2.[5] We note that $Z = u/\sigma$ is a standard normal random variable. Denote by f(z) the probability density of the standard normal variable Z, and by F(z) its cumulative density – that is $P[Z \le z]$. Then the joint probability density for those observations for which Y_t is positive is given by the following expression:

$$P_1 = \prod_{i=1}^{i=m} \frac{1}{\sigma} f\left[\frac{Y_i - \alpha - \beta X_i}{\sigma}\right] \tag{7}$$

Where $\prod$ denotes the product and m is the number of observations in the sub-sample for which Y is positive. For the second sub-sample (of size n) for which the observation Y is zero, the random variable $u \le -\alpha - \beta X$. The probability for this event is

$$\begin{aligned} P_2 &= \prod_{j=1}^{j=n} P\left[u_j \le -\alpha - \beta X_j\right] \\ &= \prod_{j=1}^{j=n} F\left[\frac{-\alpha - \beta X_j}{\sigma}\right] \end{aligned} \tag{8}$$

The joint probability or Maximum Likelihood (ML) for the entire sample is therefore given by:

$$L = P_1 P_2 \tag{9}$$

Since this equation (9) is nonlinear in α and β, and due to potential unbiased, the OLS procedure is inappropriate. The procedure for obtaining estimates of α and β is to maximize L with respect to the parameters.

With the efficiency measurement discussed above, it will provide efficiency index for every ar-rahnu branch. By measuring every ar-rahnu branch efficiency level, we have to find out what are the factors that affect their efficiency to ensure that those factors can help the branches in getting the right solution to improve their efficiency.

There are many factors that can affect efficiency based on the several case studies on the banking system. The factors mentioned in past studies are bank size (Rivas, Casu and Molyneux, 1998; Jackson and Fethi, 2000; Souza et al, 2003; Stavarek, 2003; Chang and Chiu, 2006), bank controlled by public or private (Souza et al, 2003; Jackson and Fethi, 2000, Stavarek, 2003; Chang and Chiu, 2006), market power or

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5 In a Tobit model, if assumption of u fail, then it is hard to know what the Tobit Maximum Likelihood Estimator (MLE) estimates.

competitive conditions (Rivas, Casu and Molyneux, 1998; Chang and Chiu, 2006), equity ratio adequacy (Casu and Molyneux, 1998; Rivas, Casu and Molyneux, 1998; Stavarek, 2003); bank origin (Souza et al, 2003; Stavarek, 2003); return on average equity and country origin (Casu and Molyneux, 1998; Stavarek, 2003). Other factors that affect efficiency such as non performing loan, capital adequacy ratio, bank type, experience and other factors are also listed in their research.

Business of ar-rahnu is similar to the banking business where they provide business services to the customers. In ar-rahnu business, there are many factors that affect ar-rahnu efficiency due to the special characteristic of ar-rahnu in Malaysia. As discussed earlier, Ar-rahnu can be categorized into three which are: (i) state-linked company such as Mu'asasah Gadaian Islam Terengganu (MGIT) and Permodalan Kelantan Berhad (PKB), (ii) as cooperatives under foundation for example YaPEIM, and (iii) subsidiaries of banking institutions such as Bank Rakyat and Agro Bank. The uniqueness of ar-rahnu influences the efficiency of ar-rahnu's operation. Furthermore, ar-rahnu production also has the same production process as banks. They provide services such as transactions on deposits and preparing documentations for providing loans. Based on the literature review on the determinants of the banking system efficiency with modification to ar-rahnu in Malaysia, we provide the potential determinants of ar-rahnu efficiency. Due to the availability of the data, this study will look at six (6) factors that might affect ar-rahnu efficiency as described below.

Competition of ar-rahnu outlet is one of the factors that will affect efficiency. Competition will arise when new players see the profitability and sustainability of microfinance market. The positive impact to the industry will occur if it is a healthy competition and it will increase operators' initiative to attract customers. According to Yafeh and Yosha (2001), increased competition might enhance the value of client relationship, inducing banks to invest more in private information acquisition. Operators will create good relationships with customers to ensure are repeat customers. Consequently, competition may actually strengthen relationship lending – an argument that also has some empirical support such as in Berger *et al*. (2001), Berger, Bonime *et al*. (2004) and Elsas (2005). On the other hand, many operators are good in the outreach program because it can reach the customers far and wide but at the same it will increase competition.

As discussed above, one of the important factors that affect efficiency is firm size (in this study it refers to size of ar-rahnu outlet). This factor mentioned in past studies for example in Casu and Molyneux, 1998; Jackson and Fethi, 2000; Rivas, Ozuna and Policastro (2002); Souza *et al*, 2003; Stavarek, 2003; Chang and Chiu, 2006. They found that outlet's size give positive impact to the efficiency in banking system. Outlet's size would bring brand name. The increase of outlet size means the large number of customers the outlet has (in this research' ar-rahnu outlets). The more customers the ar-rahnu outlets have, the greater their reputation become. In addition, the larger firms (outlet) have better market penetration and are better able exploit

economies of scale and scope. Larger firm also have greater funds and are able to employ better managers as stated by Kumar, 2003. Therefore, this study also will evaluate whether outlet's size will affect ar-rahnu efficiency positively.

The third factor that we consider in this research is financial self-sufficiency. Financial self-sufficiency is one of the measurements to ensure institutional sustainability (Brau and Woller, 2005). It was also agreed by Morduch (2000) and Woller (1999a) that MFIs could achieve sustainability by achieving financial self-sufficiency. Financial self-sufficiency can be measured by the number of customers per operating cost. Thus, self-sufficiency will affect efficiency positively and with sustainability, ar-rahnu outlets can disburse loans to more customers with minimum costs and yet will increase ar-rahnu outlets efficiency.

As discussed above, subsidy will affect efficiency which also supported by Hollis and Sweetman, 1998; Morduch, 2000; Aghion and Morduch, 2005; saiying that subsidy can affect efficiency negatively. But according to Muhammad Yunus (2003), subsidy is very important to achieved outreach. Ar-rahnu uses subsidy normally to start its business and will stop using subsidy after its business stabilizes. With subsidy, the operating cost can be reduced and it also minimizes the average costs. Based on the research done earlier, subsidized programs are not efficient. Subsidy given by government is an interest-rate subsidy where the ar-rahnu can pay back its loan with better flexibility and also with lower interest rate to the government. Thus, it can charge lower interest rates to its customers. As for ar-rahnu business, some outlets received subsidies from the central government through YaPEIM and some ar-rahnu outlets received subsidies from state governments.

Another important factor that will affect efficiency of ar-rahnu is regulation. Effective regulation can play an important role in contributing to higher efficiency of the firm under regulation as stated by Simanti, 2009. Regulation and supervision can be on activities (Gianfranco, 2004), institution's entry (Djankov, La Porta, Lopez-de-Silanes and Shleifer, 2001), capital adequacy (Berger, Herring and Szego, 1995; Kaufman, 1991; Stevens, 2000; Furlong and Keeley, 1989 and Keeley and Furlong, 1990) and deposit insurance design (Barth, 1991). The economic regulation of services is desirable and necessary where market are imperfect and competition takes place, though without fulfilling the required conditions (Crew and Kleindorfer,1996). When these exist in MFIs, they may lead to abuses by the operators, so inefficiencies are accompanied by high price and poor quality of services. However deregulation encourages MFIs to become more integrated both within their own industries (James, 2005). Deregulation will increase competition and resulting in enhances efficiency.

Furthermore, business group will also influence efficiency. Some ar-rahnu outlets are nationwide based while some are state based. If the ar-rahnu outlets are nationwide based, they will have better opportunity to expand their businesses. So, with the

opportunity to expand their businesses, it will help to strengthen the ar-rahnu outlets. As stated by Allen (2003), the universal financial system will bring about the efficiency gains. The ar-rahnu outlet which operates nationwide has additional funds for expansion from the headquarters. At the same time, they also have their own brand name and with that they are more confident and also can reduce the advertisement cost.

Based on the above discussions, we can write the function of ar-rahnu efficiency as follows:

$$EF = f\,(COMP,\ SIZE,\ FSS,\ SUB,\ REG,\ GROUP) \tag{10}$$

Where ***EF*** is the level of ar-rahnu outlet efficiency results obtained from DEA, which are; i) technical efficiency (TE),; ii) pure technical efficiency (PTE); iii) scale efficiency (SE). ***COMP*** is degree of competition using Herfindahl-Hirschman Index (HHI); ***SIZE*** is the size of an ar-rahnu outlet measure by the number of customers that the ar-rahnu outlet has served; ***FSS*** means financial self-sufficiency of an outlet measured by customers per operating cost; ***SUB*** is the ar-rahnu funded by government or with subsidized program. ***REG*** is the ar-rahnu outlet which has been regulated and supervised by Department of Cooperative Development (JPK) and ***GROUP*** means the business group where the ar-rahnu is on a nationwide based or state level based.

Equation (10) can be written in estimation function as follows:

$$\begin{aligned} EF_i = {} & \beta_0 + \beta_1 LCOMP + \beta_2 SIZE + \beta_3 FSS + \beta_4 SUB + \\ & \beta_5 REG + \beta_6 GROUP + u_i \end{aligned} \tag{11}$$

Where βi is coefficient where i = 1,2....7 and u_i is disturbance term.

The relationship of the dependent variable and various independent variables in Equation 11 are detailed as follow. The coefficient of ***LCOMP*** is log for Herfindahl-Hirschman Index (HHI) which measures the degree of competition among ar-ahnu outlet. HHI defined as the sum of squares of the market shares of all ar-rahnu outlets in ar-rahnu market. Market share is loan share. Increase in HHI generally indicates a decrease in competition and an increase of market share whereas decrease indicates the opposite. Therefore, ***LCOMP*** predicted to be negative in the regression.

Meanwhile, ***SIZE*** refers to the number of customers that the ar-rahnu has served in that year. Normally, the more the customers the outlets serve the more positive impact to the efficiency due to the reputation and profit that they receive. The financial self-sufficiency (***FSS***) of ar-rahnu outlets should have a positive impact on ar-rahnu outlets' efficiency.

In this study, subsidies (***SUB***) are divided into two types which are interest subsidy (fund with lower interest rate provided by capital provider) and premise subsidy (using available business premise to operate ar-rahnu). Variable ***SUB*** is expected to have either positive or negative impact on the efficiency score. As discussed earlier, non-subsidized programs will make MFIs more efficient to compete in the market. While, subsidized programs are less efficient because they are less motivated to ask for repayment and also due to the problem of moral hazard (Morduch, 1998).

Regulation and supervision, ***REG,*** is suspected to have positive coefficient. It means that if the regulator regulates and supervises ar-rahnu outlet wisely, it will ensure that the operators are running the business properly and efficiently.

Variable ***GROUP*** means the business group operating the ar-rahnu outlet. There are two types of business group, nationwide and state level. In this study, this variable will focus on nationwide level where it is expected to have positive impact on the efficiency. The simplified explanation for all the variables can be seen in the Table 4.2. While Table 4.3 will explain details about the special characteristic in term of subsidized programme, regulation and group of business (dummy variables) in various ar-rahnu categories in this study.

2.3 Data Sources and Input-Output Specification

Data from the 111 ar-rahnu branches were used to determine the relative efficiency of ar-rahnu in Malaysia. All the data are the 2006 secondary data obtained from Islamic pawnshop (ar-rahnu) operated by co-operative under Yayasan Pembangunan Ekonomi Islam Malaysia (YaPEIM), Mu'assasah Gadaian Islam Terengganu (MGIT), Permodalan Kelantan Berhad (PKB) and Bank Rakyat. The data have been collected from their headquarters but this study has to follow the rule where some data cannot be disclosed (private and confidential). However, based on the objective of the study, this may not affect the methodology used and also the analysis.

The input-output specification is developed based on the production approach. The inputs of ar-rahnu consist of total expenses for salary (RM) **(x_{1j})**, and operating expenses (RM) **(x_{2j})** and the outputs is the loan distributed to customers (RM) **(y_{1j})** The above inputs were adopted from the model which have been developed by Camanho and Dyson (1999) to analyze the efficiency of bank branches, while the outputs were developed based on the objective of the study that is to analyze the ability of ar-rahnu in providing and distributing funds to the society (marketability efficiency). Based on Sealey and Lindley (1977), there is a production approach in measuring input and output in the banking system. Under the production approach, financial institution is defined as a producer of services for account holder that is to perform transactions on deposit accounts and process documents such as loans. According to Fadzlan (2007), the number of accounts or its related transactions is the best measures for output, while the number of employees and physical capital is

considered as inputs. Therefore, based on the objective of this study and experts' opinions, this study chooses the expenses for salary and operating expenses as inputs and the outputs is the loan distributed to customers[6].

As discussed before, dependent variable in the Tobit model is the estimated efficiency using DEA approach. A positive coefficient implies an increase in efficiency with the increase of degree of competition, size, financial self-sufficiency, subsidy, regulation and business group of ar-rahnu. Meanwhile, a negative coefficient implies a decrease in efficiency score of ar-rahnu with the decrease of those variables explained. The significant of the regression result will be estimated at 95% level or higher by using the maximum likelihood estimator (MLE).

3. The Results

The objective of this study is to measure the efficiency of ar-rahnu and to identify the factors that affect the efficiency. This study has used the DEA and the Tobit Model to achieve these objectives. This section will explain detail on DEA result and Tobit regression result.

The empirical results from the DEA efficiency index are discussed in two sub-sections; first sub-section is for the all categories and the second sub-section will explain details on three categories. The discussions cover efficiency scores for all categories, followed by discussions within the separate categories, i.e. state-linked company, cooperatives under foundation and subsidiaries of banking institution. Within the state-linked company, discussions will involve Permodalan Kelantan Berhad (PKB) and Muasasah Gadaian Islam Terengganu (MGIT).

Three different types of DEA model, i.e., Charnes-Cooper-Rhodes Model (TE model), Banker-Charnes-Cooper Model (PTE model) and Scale Efficiency model (SE Model). The relative efficiency of ar-rahnu in Malaysia is measured using the secondary data for 2006 across 111 Ar-rahnu operators. Production approach based on input orientation is used to estimate relative efficiency of the Ar-rahnu outlets in the DEA models.[7]

The descriptive statistics of the inputs and outputs in each DEA stage are reported in Table 1. The table shows the results for 111 Ar-rahnu outlets from four (4) categories, with Bank Rakyat (90 outlets), PKB (10 outlets), MGIT (6 outlets) and the co-operative under YaPEIM (5 outlets). The results show that the mean of the yearly operating expenses is about RM35,008 (USD 9,724). The mean expenses for salary is RM61,124 (USD 16,978), while the mean for the number of employees is four (4) persons. For output, the mean of the loan distributed to customers is RM10,127,000 (USD 2,813,055) per year for each outlet.

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[6] See also Colwell and Davis, 1992

[7] An input orientation is chosen because there is a tendency fort Ar-rahnu to have greater control in input quantities relative to output quantities.

Referring to column 5 in Table 1, the standard deviation is high, indicating that the variation of the amount of operating expenses, salary and the average loan distributed to customers (from the mean) per Ar-rahnu outlet is high. This is reflected from the large difference between the minimum and maximum values of the number of the amount of operating expenses, salary and the average loan distributed to customer (columns 2 and 3).

TABLE 1: Descriptive Statistics of Inputs and Outputs for All Categories

	Number of observations	Minimum	Maximum	Mean	Std. Deviation
Inputs:					
Operating expenses (RM)	111	1,052	1,368,840	35,008	135,830
Salary (RM)	111	28,800	198,000	61,124	18,957
Number of employees (Person)	111	3	11	4	1.12
Outputs:					
Average loan distributed to customers (RM'000)	111	139.82	37,097	10,127	7,362

To measure the efficiency of each outlet, the computer program DEAP version 2.1 is employed in order to estimate the nonparametric programming model. The empirical results which include TE, PTE and SE scores are evaluated based on DEA and presented in Table 2.

The summary results of the production approach for TE, PTE and SE are reported in Table 2. Under the constant returns to scale assumption (TE model), the Ar-rahnu outlets are characterized by a large asymmetry in their efficiency scores. Only five out of 111 Ar-rahnu outlets are efficient of which four are from banking institution. The average efficiency of the Ar-rahnu is only 0.173. This implies that the ar-rahnu outlets could produce, on average, the same amount of outputs with approximately 82.7% fewer resources than they actually employe. This indicates that in general the technical efficiency of the Ar-rahnu is relatively low.

If we allow for variable-returns-to-scale (PTE model), we find higher efficiency scores for every Ar-rahnu outlets. Allowing for variable-returns-to-scale always results in higher average efficiency because DMUs that are efficient under the constant-returns-to-scale are accompanied by new efficient DMUs that might be operated under the increasing or decreasing returns-to-scale. The average efficiency of the Ar-rahnu outlets is 0.428. This implies that the ar-rahnu outlets could produce, on average, the same amount of outputs with approximately 57.2% fewer resources

than they actually employe. There are 26 ar-rahnu outlets being efficient where banking institution have 24 ar-rahnu outlets which operate at efficient level.

Furthermore, the average scale efficiency (SE model) score is 0.411. This condition indicates that the Ar-rahnu in Malaysia is operating far below the optimal scale. Only five out of 111 Ar-rahnu outlets are efficient. In conclusion, PTE model has the highest number of efficient outlets for Ar-rahnu and also the highest for average efficiency score. Banking institution has numerous ar-rahnu outlets which are operated at efficient level.

TABLE 2 Summary Results of DEA Scores for All Categories

Efficiency	State-linked company	Cooperative	Banking Institution	Average efficiency
TE (CCR model) – CRS	1 (1%)	0	4 (16.7%)	0.173
PTE (BCC model) - VRS	2 (1.8%)	0	24 (21.6%)	0.428
SE – scale	1 (1%)	0	4 (16.7%)	0.411

In addition, Table 3 shows that of 111 Ar-rahnu outlets in this study, 94 (85%) show increasing returns-to-scale, 5(4%) show constant returns-to-scale, and 12(11%) show decreasing returns-to-scale. The previous information indicates that the percentage of Ar-rahnu outlets under increasing returns-to-scale greater than the others. It means that most of Ar-rahnu outlets can improve their performances by increasing their inputs, and a small number can improve their performances by decreasing their inputs. It indicates that managers' capability to utilize Ar-rahnu resources still needs to be enhanced to increase their efficiency in providing and distributing funds to society.

TABLE 3 Summary Results of Returns to Scale for All Categories

Returns to scale	State-linked company	Cooperative	Banking Institution	Percentage
Increase Returns to Scale (IRS)	10	5	79	85% (94)
Constant Returns to Scale (CRS)	1	0	4	4% (5)
Decrease Returns to Scale (DRS)	5	0	7	11%(12)
Total	16	5	90	100% (111)

Note: IRS, CRS, DRS represent increasing returns-to-scale, constant returns-to-scale and decreasing returns-to-scale, respectively.

The following section, we will discuss the descriptive statistics for every variable used in the Tobit regression model. The objective of this analysis is to elaborate in detail the criteria of each variable used in this study. This study uses nine (9) variables all together e.g., TE resulted from DEA for constant returns to scale (TE), for variable returns to scale (PTE) and scale efficiency (SE), Log for competition (LCOMP), firm size (SIZE) and financial self-sufficiency (FSS). The other three variables are dummy variable (1 or 0) such as subsidy (SUB), regulation (REG) and group (GROUP).

TABLE 4: The Descriptive Statistic for Each Variable

Variable	Minimum	Maximum	Mean	Standard Deviation	Skewness	Kurtosis
TE	.002	1.000	.172	.226	2.396	6.044
PTE	.004	1.000	.428	.359	.578	-1.065
SE	.027	1.000	.411	.271	.579	-.611
LCOMP	-7.936	-3.089	- 4.55	0.933	-1.430	2.606
SIZE	38	47062	3.404	0.481	5.300	32.499
FSS	0.511	3.803	0.766	0.788	1.375	1.835
SUB	.000	1.000	0.819	0.386	-1.609	0.599
REG	.000	1.000	0.937	0.244	-3.644	11.489
GROUP	.000	1.000	0.847	0.362	-1.952	1.846

Table 4 illustrates the descriptive analysis for each variable used in this study. For the efficiency score, PTE and SE have similar mean which is 0.4 but for TE, the mean is lower at 0.2. The skewness and kurtosis for PTE and SE are around zero (0) which mean the PTE and SE data are normally distributed. Meanwhile, kurtosis for TE is far from 0, but since the skewness is 2.4 therefore the data still can be categorized as normally distributed.

For variable LCOMP and FSS, the skewness and kurtosis statistics indicate that both variables are normally distributed. However, SIZE data is not normally distributed. Meanwhile SUB, REG and GROUP have interesting results. Although the mean and standard deviation values for these three variables are similar at 0.8 to 0.9 and 0.3 to 0.4 respectively, but the skewness and kurtosis are different. The data for SUB and GROUP are normally distributed but not for variable REG.

From the results of the descriptive analysis, we find that most variables are normally distributed, except SIZE and REG. We assume that those two variables are not normally distributed and thus will affect the results in Tobit regression.

The first part of this section refers to Equation 11. This equation is a Tobit model used to identify the determinants of ar-rahnu efficiency. Our discussions will be separated into three sections. First, we will discuss the results from Tobit regression with Technical Efficiency (TE) as dependent variable, followed by Pure Technical Efficiency (PTE) and Scale Efficiency (SE) as dependent variables. TE, PTE and SE are obtained from DEA which measure efficiency score with the value between 0 and 1.

In discussing the determinants of ar-rahnu efficiency in TE category, we find that, the coefficients of LCOMP, SIZE, FSS, REG and GROUP are significant in the Tobit regression (Table 5). LCOMP and REG have negative impact to ar-rahnu efficiency, mean while SIZE, FSS and GROUP have positive impact to ar-rahnu efficiency.

LCOMP is log HHI defined as sum of squares of the loans disbursed to customers at each outlet per the total loans in the ar-rahnu market. This variable is expected to have negative impact to the efficiency score. Based on Tobit and regression result, LCOMP is negatively correlated with efficiency score at 1 per cent significance level. Increase in HHI generally indicates a decrease in competition and an increase market power whereas decrease indicates the opposite. The result implies that, ar-rahnu outlet with decrease of HHI (means the degree of competition is increase) will increase ar-rahnu efficiency.

Variable REG is expected to have a positive impact on the efficiency score. REG is a dummy variable and is assigned the value '1' if the outlets are regulated by the Department of Co-operative Development (JPK) and '0' if otherwise. From the regression result, REG has a negative impact on the ar-rahnu efficiency at 1% significance level. This implies that, ar-rahnu outlet with more regulations will affect the efficiency score negatively. The result differs from the hypothesis. However, in this study the regulation is just means simple regulation which sends an annual report to the JPK and not more than that. Therefore, the negative impact can be accepted.

There are three (3) variables that positive relationship with ar-rahnu efficiency which are SIZE, FSS and GROUP. The results are parallel with the hypothesis. For SIZE, the result is consistent with Casu and Molyneux, 1998; Jackson and Fethi, 2000; Rivas, Ozuna and Policastro (2002); Souza et al, 2003; Stavarek, 2003; Chang and Chiu, 2006. They found that firm size has positive impact to the efficiency in banking system. Firm size would bring brand name. From the Tobit regression results, SIZE has a positive impact on ar-rahnu efficiency level and is significant at 1% level. The result implies that the increase of firm size means the larger firms (outlet) have better market penetration and are better able exploit economies of scale and scope. Larger firm also have greater funds and are able to employ better managers as stated by

Kumar, 2003. Therefore, the larger the firm size the greater the efficiency level of ar-rahnu outlet.

Financial self-sufficiency (FSS) is the ratio of customers to loans disbursed. This variable is expected to have a positive impact on the efficiency score. From the Tobit regression result, FSS has a positive impact on ar-rahnu efficiency level and is significant at 1% level. This means that an ar-rahnu outlet with more customers is associated with a higher efficiency score. This implies that the more customers per loan (1 to 4 customers per loan) they have, the outreach will increase and this situation will give a positive impact for the growth of ar-rahnu and thus could cater to more needy people especially those from the low-income group.

Variable GROUP is defined as ar-rahnu operates in nationwide group (1) (which means that it can open outlets) or state group (0). This variable is expected to have positive impact on the efficiency score. Based on the Tobit regression results, variable GROUP has positive impact on ar-rahnu efficiency score and is significant at 1% level. This means that an ar-rahnu institution that is capable of opening outlets will have higher efficiency score. For Tobit regression result, the value for Log-likelihood is 21.96 and the sigma is significant at 1% level.

Now, we discuss the determinants of ar-rahnu efficiency in PTE category. Results shown in Table 6 are that the PTE as a dependent variable for Tobit regression model. From the Tobit regression, the coefficients of all variables LCOMP, SIZE, FSS, SUB, REG and GROUP are significant. The coefficient SUB is not significant in TE category. However, SUB is significant in PTE category. The results shown LCOMP and REG have negative impact to the ar-rahnu efficiency. Meanwhile, SIZE, FSS, SUB and GROUP positively correlated with ar-rahnu efficiency.

In this study, subsidies (SUB) are divided into two types which are interest subsidy (capital providers funded with lower interest rate) and premise subsidy (using available business premise to operate ar-rahnu). Variable SUB is expected to have either positive or negative impact on the efficiency score. From Tobit regression results, SUB is positively correlated to efficiency score at 1% significance level. This implies that, ar-rahnu outlet that has more subsidies from capital providers or parent company is associated with a higher efficiency score. As mentioned by Muhammad Yunus (2003), subsidy is important to start a business until it stabilizes to ensure that MFIs can sustain and achieve the outreach.

Next discussions are on the determinants of ar-rahnu efficiency in SE category. Table 7 shown the result when SE as a dependent variable. In Tobit regression there are four (4) variables significant which are SIZE, SUB, REG and GROUP. In this result LCOMP and FSS are not significant as in TE and PTE category. SIZE and GROUP

affect ar-rahnu efficiency positively while SUB and REG affect ar-rahnu efficiency negatively. The interesting result here is that SUB is found to have negative impact on ar-rahnu efficiency in SE category but has positive impact in PTE category.

In SE category, Tobit regression results shown SUB is negatively correlated to efficiency score at 5% significance level. This result differs to the result when PTE is the dependent variable which gives rise to positive correlation with efficiency score. The variable SUB might have either positive or negative impact on the efficiency score. This implies that the ar-rahnu outlet with more subsidies from capital providers or parent company is associated with a lower efficiency. Subsidy can affect efficiency negatively as argued by Hollis and Sweetman, 1998; Morduch, 2000; Aghion and Morduch, 2005. The negative impact of SUB to ar-rahnu efficiency would reflect the motivation of ar-rahnu operator or manager.

TABLE 5: The Tobit Regression Results of Technical Efficiency Score (TE), Pure Technical Efficiency (PTE) and Scale Efficiency (SE)

Dependent Variable	**TE**		**PTE**		**SE**	
	Coefficient	t-ratio	Coefficient	z-ratio	Coefficient	z-ratio
Constant	-0.553	-4.057***	-1.147	-5.379***	0.696	3.865***
LCOMP	-0.146	-5.631***	-0.292	-7.092***	0.831	0.238
SIZE	0.129	3.970***	0.115	2.301**	0.150	3.050***
FSS	0.177	6.219***	0.459	8.308***	0.469	1.258
SUB	0.683	1.192	0.211	2.444***	-0.155	-2.033**
REG	-0.376	-3.909***	-0.597	-4.108***	-0.359	-2.640***
GROUP	0.196	3.175***	0.329	3.554***	-0.145	1.732*
Log likelihood	21.965		33.256		-4.723	
Sigma	0.182	14.3***	0.271	12.26***	0.238	14.375***

Notes:
*** Significant at 1%
** Significant at 5%
* Significant at 10%

From our findings, we can summarize that SIZE, FSS and GROUP have positive impacts on ar-rahnu efficiency. While LCOMP have negative impact to ar-rahnu efficiency. These regression results are expected as discuss in methodology section. However, REG has a negative impact on ar-rahnu efficiency that is unexpected because in the methodology, we expect REG to have a positive impact. Meanwhile, for SUB, we expect that the variable SUB to have a positive impact on ar-rahnu efficiency, but the result shown positive impact in TE and PTE but negative impact in SE. All of these results have brought forth some interesting discussions.

4. Conclusions

Based on the efficiency scores for TE, PTE and SE models, we find that PTE result are higher than the other two models. The highest average efficiency score among the categories is banking institution. In this study, banking institution is the based-group because there are 90 outlets that being analyzed simultaneously with the other categories. However, ar-rahnu outlets have to improve their efficiency because only 24% of 111 outlets operate at the efficient level.

In addition, most of the ar-rahnu branches are facing increasing returns to scale in their operations. This means that most of the ar-rahnu branches can improve their performances by increasing their inputs, implying that ar-rahnu branches can still expand their businesses by increasing their inputs in terms of labor or capital. The implication is that the ar-rahnu business can create more jobs for the community indirectly and at the same time requires more funds from donors.

Subsidized program has positive impact to the efficiency score. Ar-rahnu industry is unique where some branches are subsidized and some not. Subsidized program in this study means interest subsidy (donor funded with lower interest rate) and premise subsidy (use available business premise to operate ar-rahnu). This implies that the ar-rahnu branch with more subsidies from donors or parent company is associated with a higher efficiency.

The development of MFIs always being ignored by the main players (government, donors and operators) in the industry because MFIs is a non-profit industry. As shown in the findings, ar-rahnu industry really needs funding to start their businesses and operates efficiently. To start the ar-rahnu business, around RM3 to RM5 million is needed. With this huge amount, supports are needed from donors especially the government and NGOs. MFIs are created to help the poor, lower income group and MSEs to ensure they can survive in the short term. Poverty could be greatly reduced through smart subsidy for ar-rahnu. Ar-rahnu is an alternative to the conventional pawnshop. Therefore, it is important to ensure that ar-rahnu institution operates efficiently and can be sustained in the market.

References

Abd Ghafar Ismail, Nafisah Mohamed and Selamah Maamor (2007) The Effects of Competition on the Outreach Level of Pawnshop Industry in Malaysia. Paper presented in *International Seminar on Islamic Alternatives to Poverty Alleviation: Zakat, Awqaf and Microfinance, Dhaka*

Aghion B.A . & Morduch J. (2005) The economics of microfinance. Massachusetts Institute of Technology.

Attaullah A., Cockerill T. and Le, H. (2004) Financial liberalization and bank efficiency: a comparative analysis of India and Pakistan. *Applied Economics*. 36, 1915-1924.

Barth J.R. (1991). *The great saving and loan debacle.* Washington D.C: The AEI Press.

Berger A. N. and Hannan T. H. (1998). The Efficiency Cost Of Market Power In The Banking Industry: A Test Of The "Quiet Life" And Related Hypotheses," *The Review of Economics and Statistics,* MIT Press. 80(3), 454-465

Berger A. N., Herring R. J. and Szego G. P. (1995). The role of capital in financial institutions. *Journal of Banking and Finance.* 23, 135-194.

Brau J. C. and Woller G. M. (2005) Microfinance: a comprehensive review of the existing literature and an outline for future financial research. *Journal of Entrepreneurial finance and business ventures*. 9(1), 1-26.

Camanho A.S. and Dyson R.G. (1999). Efficiency, size, benchmarks and targets for bank baranches: an application of data envelopment analysis. *Journal of the Operation Research Society.* 50(9), 903-915.

Casu B. and Molyneux P. (1998). A comparative study of efficiency in European Banking. *Working paper*. University of Wales. Bangor, UK.

Chang T. C. and Chiu Y. H. (2006). Affecting factors on risk-adjusted efficiency in Taiwn's banking industry. *Contemporary Economic Policy*. 24(4), 634-648.

Coelli T. (1996). *A Guide to DEA Version 2.1: A Data Envelopment Analysis (Computer) Program*. http://www.une.edu.au/econometrics/cepa.htm. Retrieved 22nd April 2006.

Colwell R. and Davis E. (1992). Output and Productivity in Banking, *Scandinavian Journal of Economics*, 94(S), 111-129.

Fadzlan Sufian (2007). Malmquist indices of productivity change in Malaysia Islamic banking industry: foreign versus domestic banks. *Journal of economic cooperations.* 28(1), 115-150.

Furlong F. T and Keeley M. C. (1989). Capital regulation and bank risk-taking: A note. *Journal of Banking and Finance.* 13, 883-891.

Gianfranco A. V. (2004). New challenges in micro-finance: the importance of regulation. Paper presented in the finance and growth survey session, *Wolpertinger Annual Seminar*, Cracow University of Economics.

Grosskopf S. (1996). Statistical inference and nonparametric efficiency analysis in H.Freid, C.A.K. Lovel and S.S. Schmidt (eds). The measurement of productive efficiency and application. New York, Oxford University Press.

Hollis A. and Sweetman A. (1998). *Microcredit: What can we learn from the past?* World Development. 26(10), 1875-1891.

Jackson P. M. and Fethi M. D. (2000). *Evaluating the efficiency of Turkish commercial banks: An application of DEA and Tobit Analysis*. Paper presented at the International DEA Symposium, University of Queensland, Bribane, Australia, 2-4 July.

Joaquin M. and Juan F. G. (2007). The cost of market power in banking: Social welfare loss vs. cost inefficiency. *Journal of Banking & Finance, Elsevier.* 31(7), 2103-2125.

Jemric I. and Vujcic, B. (2002). Efficiency of Banks in Croatia: A DEA approach. *Comparative Economic Studies.* 44(2/3), 169-193.

Kaufman G. G. (1991). Capital in banking: Past, present and future. *Journal of Financial Services Research.* 5, 385-402.

Keeley M. C. and Furlong F. T. (1990). A reexamination of mean-variance analysis of bank capital regulations. *Journal of Banking and Finance.* 14, 69-84.

Krivonoshko V. E., Utkin O. B., Volodin A. V. And Sablin I. A. (2002). Interpretation of Modeling Results in Data Envelopment Analysis. *Managerial Finance*. 2(9), 37-47.

Leong W. H., Dollery B. and Coelli T. (2003). Measuring the Technical Efficiency of Banks in Singapore for the Period 1993-99: An Application and Extention of Bauer et al. (1997) Technique. *ASEAN Economic Bulletin*. 20(3), 195 – 211.

Luo X. (2003). Evaluating the profitability and marketability efficiency of large banks: An application of data envelopment analysis. *Journal of Business Research.* 56, 627-635.

Mohd. Arshad Sehan. (2004) in *Isu-isu Dalam Perlaksanaan Pajak Gadai Islam di Negara Serantau.* Article presented in Konvensyen Ar-Rahnu Serantau, Hotel Renaissance, Kuala Lumpur, 12-13 Oktober.

Morduch J. (2000) *The microfinance schism.* World Development. 28(4), 617-629.

Muhammad Yunus (2003). II banchiere dei poveri. Quinta edizione. Feltinelli. Roma.

Park, R. K. and De, P. (2004). An Alternative Approach to Efficiency Measurement of Seaports. *Maritime Economics & Logistic*. 6(1), 53-66.

Periera, R. O. (2002). *Microcredit Evaluating the Efficiency of Financial Institutions.* http://www.federativo.bndes.gov.br/bf_bancos/estudos/e0001907.pdf. Retrieved on 3rd May 2006.

Rivas A., Ozuna T. and Policastro F. (2002). *Latin American Banks use of derivatives and the impacts on their efficiency levels.* Working paper. Texas A&M International University, University Blvd, Laredo.

Sealey, C. W. and Lindley. J. T. (1977) Inputs, Outputs, and Theory of Production Cost at Depository Financial Institutions. *Journal of Finance.* 32, 1251-1266.

Soteriou, A. and Zenios, S. A. (1999). Operation, Quality, and Profitability in the Provision of Banking Services. *Management Science*. 45(9), 1221-1238.

Souza Geraldo de Silva, Roberto Blass Staub and Benjamin Miranda Tabak. (2003). *Assessing the significance of factors effects in output oriented DEA measures of efficiency: an application to Brazillian banks*. Financial stability report. 129-144.

Stavarek D. (2003). *Banking efficiency in Visegrad countries before joining the Europian Unions*. Paper presented in Workshop on efficiency of financial institutions and Europian Integration at Technical University Lisbon, Portugal. October 30-31.

Stevens E. (2000). Evolution in banking supervision. *Economic Commentary*, Federal Reserve Bank of Cleveland.

Wang W. K and Huang H. C. (2005). Measuring the Relative Efficiency of Commercial Banks: A Comparative Study on Different Ownership Modes in China. *Journal of American Academy of Business, Cambridge*. 7(2), 219-223.

Woller G. (1999) Reassessing the financial viability of village banking: Past performance and future prospects. *Microbanking Bulletin*. 5, 3-8.