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SCALE AND TECHNICAL EFFICIENCY OF DEVELOPMENT FINANCE INSTITUTIONS IN MALAYSIA

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ABSTRACT

This study focuses on the performance of credit guarantee corporations and development financial institutions that promotes industrialisation, agricultural investment, and growth in small and medium enterprises in Malaysia. A non-parametric technique is used in this analysis to determine the scale and technical efficiency of development financial institutions since the performance of these institutions is directly reflected in the development and economic growth of the sector they promote. The empirical findings we obtained suggested that all development financial institutions are operating satisfactorily in extending their services to small and medium local enterprises.

Keywords*: Technical and scale efficiency; development financial institutions; non-parametric approach.*

ABSTRAK

Kajian ini tertumpu kepada penilaian kecekapan koperasi jaminan kredit dan institusi-institusi kewangan pembangunan yang mempromosikan kegiatan-kegiatan perindustrian, pelaburan pertanian serta pertumbuhan perindustrian kecil dan sederhana di Malaysia. Oleh kerana pencapaian institusi-institusi ini secara langsung mencerminkan pertumbuhan sektor-sektor yang dipromosikan, kajian ini dijalankan untuk menentukan kecekapan skala dan

teknikal institusi-institusi kewangan dengan menggunakan teknik bukan parametrik. Keputusan empirik kajian ini merumuskan bahawa kesemua institusi-institusi kewangan pembangunan beroperasi dengan memuaskan di dalam memberikan perkhidmatan mereka kepada industri kecil dan sederhana tempatan.

Kata Kunci: *Kecekapan teknikal; kecekapan skala; institusi-institusi kewangan pembangunan; kaedah bukan parametrik.*

INTRODUCTION

Large corporations and multinationals (MNCs) are doing well in this information age as they are backed by years of experience and huge financial support from their accumulated retained earnings. On the contrary, small and medium enterprises (SMEs), mainly locally owned, are struggling to remain competitive, let alone face challenges of information and communication technology (ICT). When compared to MNCs, SMEs lack capital for research and development to improve the quality of the products they produce, to upgrade their operation processes and improve office administration. They are also inexperienced and deficient in proper accounting principles to reflect their financial position.

Therefore, SMEs find it difficult to provide information and supportive documents to justify the validity and creditability of their businesses to convince financial institutions for a loan. Making matters worse, financial institutions in developing nations are mostly net lenders, where demand for credit are generally more than supply. Banks are also reluctant to lend to SMEs as quite a substantial amount of risk is involved in SME lending (Camino & Cardone, 1999).

In Malaysia, in order to strike a balance between the conflicting objectives of maximising profits and complementing the government's effort in financing SMEs, a credit guarantee corporation known as the Credit Guarantee Corporation Berhad (CGC) was established to enable SMEs to seek loans from banks. CGC stands as a guarantor for SMEs that are unable to offer adequate collateral to secure credit facilities from financial institutions. By doing so, as SMEs' businesses mature and their relationship with financial institutions are established, they would be able to provide the necessary information and financial requirements to negotiate for credit without CGC's assistance as a guarantor. The initial credit guarantees can help put the SMEs' businesses in place.

Besides, development financial institutions also provide direct lending and other financial services generally not provided by other banking institutions to help finance domestic businesses, especially SMEs. Each development financial institution has its function and objectives in promoting industrialisation, agricultural, investment and general development of the country through promoting active participation of local business entrepreneurs. Development financial institutions extend advisory services as well as mid-term and long-term capital financing.

The lending activities of CGC and development financial institutions are directly reflected in the development, sustainability and growth of SMEs. However, few studies had been conducted to evaluate the performance of these financial institutions. We assess the efficiency of CGC and other development financial institutions to ascertain their performance in the industry they seek to promote. Specifically, we study the performance of CGC as well as four development banks, namely, Malaysia Industrial Development Finance Berhad (MIDF), Development and Infrastructure Bank of Malaysia (BPIM), Agricultural Bank of Malaysia (BPM), and Industrial and Technology Bank of Malaysia (BI), by evaluating their scale and technical efficiency.

In the next section of this paper, we review some related literature on financing SMEs as well as previous non-parametric studies. Next, we discuss the empirical technique used, followed by the data employed. We proceed with a brief analysis of our empirical findings before ending our discussion by offering some concluding remarks.

FINANCING SMEs

Most SMEs are incapable of generating their own source of financing and they are dependent on financial intermediaries, especially commercial banks, for external funds. In Spain, SMEs usually have to pay for expensive credit funding, if they were able to obtain one. However, proper cost restructuring and mutual loan guaranteed schemes in Spain managed to reduce the average cost of bank borrowings to SMEs (Camino & Cardone, 1999). Perhaps the successful stories of the European guarantee programmes could be referred to as a guide to design SME financing schemes in other parts of the world. Approximately 99% of European firms are classified under SMEs, out of which, 94% are micro-firms with less than 10 employees (Camino & Cardone, 1999). There is an appropriate financial institutional framework to issue guarantees that cover the risks involved in extending credit to SMEs in Europe.

In Italy, there are two types of co-operative banks, namely the co-operative banks and the credit co-operation banks (CCB). Both provide banking services to their members, as well as non-members, but CCBs concentrated more on small business loans, usually providing credit to firms with less than 10 employees. Angelini, Di Salvo and Ferri, (1998) found that CCBs were able to grant more favourable lending terms to their own members, namely, small businesses. The reason was because CCBs had established a close relationship with them, long enough to understand their financial needs, strengths, weaknesses and creditability.

In Japan, credit co-operatives were organised under the Law for Small Business Corporation of Japan, based on mutual support for owners and workers of Japanese SMEs. These credit co-operatives accepted deposits and savings from members of corporations, government municipals, public firms and non-profit organisations. With these deposits, their primary activity was to lend and discount bills to members and certain creditable non-members, as well as to make payments associated with security transactions (Fukuyama, Guerra & Weber, 1999).

The efficiency of financial institutions in providing credit has a direct impact on the development and growth of SMEs. Nevertheless, financing SMEs is fruitful if there is proper cost-effective loan administration, monitoring of business activity and loan repayments. Loan pricing should be able to cover the cost of financing as well as be affordable to SMEs. In order to monitor the performance of financial institutions in providing credit to deserving SMEs, efficiency evaluation can be done through a parametric or non-parametric approach. Since the input-output regression of ordinary least square model resulted in average or expected level of outcome when given certain inputs instead of the desired maximum achievable outcome (Soteriou, Karahanna, Papanastasiou & Diakouratis, 1998), a non-parametric estimation is used in this study to estimate scale and technical efficiency. Furthermore, a prior functional specification of the unknown technology or distribution assumptions about the error term that may cause potential specification error is not required when non-parametric estimation is used.

The multiple outputs and variable return to scale of production provides meaningful technical and scale efficiency measures for each decision-making units without having data on input price or costs. This method also identifies sources of production growth, hence

provides recommendation for performance improvement (Fukuyama, 1993; Grabowski, Rangan & Rezvanian, 1994). By employing linear programming techniques, efficiency of operating units with the same objective is measured, where efficient firms are those that use less of every input to produce the given amount of output or produce much more of every output given the amount of inputs as compared to other firms or linear combination of firms.

NON-PARAMETRIC EVALUATION

Non-parametric techniques are commonly used to evaluate the efficiency of relative homogeneity of organisation units like schools, universities, banks, airports, farms, hospitals, military and government departments (Elyasiani & Mehdian, 1993; Fukuyama, 1993; Charnes, Copper, Lewin & Seiford, 1994; Miller & Noulas, 1996; Soteriou & Stavrinides, 1997; Chen & Yeh, 1997; Jorge-Moreno & Garcia-Cebrian, 1999; Al-Shammari, 1999; Cummins, Tennyson & Weiss, 1999).

Elyasiani and Mehdian (1993) studied the technical and scale inefficiencies of the United States (US) beer industry for the period between 1950 to 1986. They measured the overall technical efficiency using data envelopment analysis (DEA). The unit of observation of overall technical efficiency was a single time period, rather than individual firm, and the efficiency of the beer industry being measured was examined over time and relative to the period of "best performance". The maximum potential output for each period was derived by designing and solving a host of linear programming problems under alternative conditions. These maximum output values delineated the best practice frontiers which were piecewise linear. Subsequently, efficiency indexes were derived from the ratios of actual output to the potential output values under appropriate conditions. Generally, throughout the sample period, it was found that the beer industry in the US was operating at a rather high level of pure technical efficiency relative to a production frontier with variable returns to scale.

Due to increasing interest in measuring the performance of firms, business units or departments, Charnes *et al*. (1994) authored a book to provide a vast discussion of DEA studies on several industries mentioned. In their book, the most researched area using DEA estimates is the banking industry.

Miller and Noulas (1996) measured the relative technical efficiency of 201 large banks in the US for the period between 1984 and 1990. Using

data from Call Report for that period, the efficiency of large banks was conducted. Four inputs, namely, total transaction deposits, total non-transaction deposits, total interest expense and total non-interest expense, as well as six outputs consisting of commercial and industrial loans, consumer loans, real estate loans, investment, total interest income and total non-interest income, were identified by intermediation approach. It was concluded that average inefficiency, both pure technical and scale efficiency of banks under study was small, approximately 5%.

In another study, Chen and Yeh (1997) measured the efficiency of 34 banks in Taiwan. Based on the intermediary approach, staff employed, bank assets, number of branches, operating costs, deposits and interest expense were viewed as inputs while loan services, portfolio investment, interest income and non-interest income were outputs. 15 out of the 34 commercial banks under study were found to be relatively effective, with a rather high overall efficiency rate. Nevertheless, the study had not included service quality as its output and analysis of foreign owned Taiwanese banks were omitted, both due to unavailability of data.

However, Soteriou and Stavrinides (1997) investigated internal customer service quality in their estimation of bank branch performance in the Mediterranean countries for the period between July and December 1994. From their findings, they suggested that there was excess computer time in inefficient branches and thus, further investigation on how to increase computer utilisation would improve service quality. Nevertheless, they had warned that the interpretation of their study should be made with caution since it was myopic in nature and bank branch performance was obviously associated with more than one output, not just service quality.

Jorge-Moreno and Garcia-Cebrian (1999) studied the production efficiency of European Railways from 1984 to 1995. Inputs and outputs for each individual company were gathered to determine the influence of organisational changes on the companies' efficiency due to adaptation to the environment in which they operated. They found that a major part of technical efficiency of European railway companies were scale inefficient due to an error made in size selection. As such, they recommended that those European railway companies should downsize in order to improve their technical efficiency.

Al-Shammari (1999) researched on the productive efficiency of public or government owned hospitals in Jordan for the period between 1991 and 1993. By sampling 15 hospitals, it was discovered that many public

hospitals in Jordan appeared to be relatively efficient, and those not classified as efficient were very close to it. However, services provided by these public hospitals were found to be under-utilised by the general public. It was suggested that deployment of staff, equipment, beds and medical supplies could improve the efficiency by obtaining first hand information on the current provision of services required by the people in Jordan.

As for the insurance industry, Cummins *et al.* (1999) investigated the relationship between mergers and acquisitions, efficiency and scale economy in the US life insurance industry for the period between 1988 and 1995. It was found that merging insurance companies gained greater technical, cost and revenue efficiencies than non-merging companies. They supported that restructuring the life insurance industry the US produced significant efficiency gains and improved profitability for target companies. They also maintained that constant or increasing return to scale insurance companies were more likely to become acquisition targets than firms operating with decreasing returns to scale.

Fukuyama (1993) measured the scale and technical efficiency of several commercial banks in Japan. In his more recent study with other researchers, Fukuyama et al. (1999) examined the efficiency of credit co-operatives in Japan for the sampling period of 1992 and 1996. They discovered that pure technical inefficiency dominated the scale inefficiency of Japanese and foreign owned credit co-operatives. Based on input allocative inefficiency, they recommended the reallocation of input, either by producing more output at the same cost or producing the same amount of output at a lower cost.

In Taiwan, the efficiency of the Credit Department of Farmers' Associations (CDFA), an organisation responsible for providing more than 50% of Taiwan's total agricultural loans, was found to be highly scale efficient but technical and allocative efficiencies were not satisfactory (Chang & Hsieh, 1998).

It is obvious that there are limited studies conducted to measure the performance of financial institutions in Malaysia. A study of the performance of CGC was conducted by Ong, Habibullah, Radam and Azali (2003), and they discovered that CGC achieved a relatively low average overall technical efficiency score, largely caused by pure technical inefficiency. Since they only measured the performance of CGC, in our study, we would like to assess the efficiency of CGC as well as four other development financial institutions, namely, MIDF, BPIM, BPM, and BI.

ESTIMATION TECHNIQUE

The overall technical efficiency (OTE), consists of scale efficiency (SE) and pure technical efficiency (PTE). We used an output maximising model where the maximum potential output for each period is determined by solving a host of LP problems. The ratios of actual output to the potential output values, subjected to appropriate constraints, are constructed to determine the overall technical efficiency. The maximum output for each observation (t = 1, 2, …,18) is ascertained from LP (1) under the assumption of constant return to scale (CRS).

$$\text{Max } y^*_t - Y'\gamma \qquad (1)$$

Subject to
Input Constraint $\quad X'\gamma \leq x'_t$
Intensity Constraint $\quad \gamma \in R^T_t$

where T is the period for year 1981, …1998, Y_t^* is the maximum (best practice) output, Y is the vector of output for all observations, x_t is the vector of input used for production for period t, X is the input matrix for all observations, and γ is the vector of intensities or weight attached to each observation t in the construction of potential output.

The ratio of output that is actually produced in period t, known as y_t, to the best practice output, yt^* is the overall technical efficiency for period t relative to the best practice frontier. The efficient frontier is constructed with all linear combination of the periods in the sample which used not more than the input bundle in t, $X'\gamma \leq x'_t$ and produces an output bundle equal to or more than that produced in that period. The combination with maximum output that constitutes a point on the frontier will be chosen as an efficient point. The process would be repeated for all observations whereby, the locus of the efficient points will form the best practice frontier. Since the constant return to scale condition imposed in LP (1) is restricted to a constant return to scale technology, we construct LP (2) to derive PTE and SE with the relaxation of the assumption of CRS.

$$\text{Max Max } y_t^{**} - Y'\gamma \qquad (2)$$

Subject to
Input Constraint $\quad X'\gamma \leq x'_t$
Intensity Constraint $\quad \sum_{t=1}^{T} \gamma_t = 1$
$\gamma \in R_t$

PTE for observation t is the ratio of actual output y_t to the potential output, derived under unrestricted return to scale (y_t^{**}). $PTEf = y_t / y_t^{**}$. *PTE* can take the value of one or less than one. When PTE is equal to 1, then production is purely technical efficient. If PTE is less than one, then the firm is operating at a purely technical inefficient level. As for scale efficiency, it is related to long run price-taking competitive equilibrium, meaning, for observation *t*, a firm's degree of deviation from long-run competitive equilibrium is scale inefficient. SE_t can take the value of less than or equal to one and OTE_t can be either less than or equal to PTE_t. Therefore, a unit value of *SE* score at constant return to scale will mean optimality and any value between zero and one represents deviation from optimality. In order to determine the cause of scale inefficiency, LP (3) is constructed with restrictions on intensities to allow analysis for production at a non-increasing return to scale (NRS).

$$\text{Max } y_t^{***} - Y'\gamma \qquad (3)$$

Subject to $X'\gamma \leq x'_t$

Input Constraint $\sum_{t=1}^{T} \gamma_t \leq 1$

Intensity Constraint $\gamma \in R_t$

As such, when SE_t is less than one, whereby NRS technology is equal to OTE_t, then scale inefficiency is due to production at a decreasing return to scale. If SE_t is less than one, NRS technology is more than OTE_t, then scale inefficiency is due to a production at increasing return to scale (Fukuyama, 1993; Elyasiani & Mehdian, 1993).

Source of Data

Data for inputs and outputs are extracted from the CGC and the development financial institutions' annual report for financial year ended from 1981 to 1998. Outputs and inputs of CGC and development financial institutions are determined through the intermediary approach (Miller & Noulas, 1996; Chen & Yeh, 1997; Chang & Hsieh, 1998) and measured in denomination (Grabowski *et al.*, 1994).

Guaranteed loans approved by CGC to the business, manufacturing and agricultural sectors are regarded as outputs, where inputs are identified as rental of premises, fixed assets and operating expenses. For BI, fixed assets, government securities and deposits are identified as inputs, while short term and long term loans are outputs. The inputs for BPIM, are fixed assets, interest receivables and investments, while

its outputs are current and non-current portions of term loans. As for BPM, the outputs are short term loans, intermediate term loans, long term loans, and paddy loans; inputs are identified as investments, deposits, fixed assets and government loans.

Due to the unavailability of published data, the outputs for MIDF are analysed in two fold, first for the year 1981 to 1989 where outputs are categorised into three, namely, term loans, hire purchases and factory mortgage loans. For 1990 to 1998, outputs are only segregated into two, namely current and non-current portions of long term loans. Inputs used by MIDF from 1981 to 1998 are fixed assets, investments and general administration expenses.

All development financial institutions as well as CGC are multiproduct firms providing various forms of credit facilities and services to the respective sectors of the economy that they promote. The efficiency of each financial institution, namely CGC, BPM, BPIM, MIDF and BI in each financial year is measured relative to their performance in all other financial years between 1981 and 1998.

RESULTS AND ANALYSIS

The average overall technical efficiency, pure technical efficiency and scale efficiency scores of credit guarantees granted by CGC are 36.3%, 53.3% and 55.3% respectively. The relatively low average OTE score is largely caused by pure technical inefficiency. These findings are in accordance to those found by Ong *et al.* (2003). Credit guarantees provided by CGC, however, were at a constant return to scale for 1981, 1995 and 1996. For the other remaining sampling period, scale inefficiency is due to an increasing return to scale. The summary of the empirical findings for CGC is presented in Table 1.

Table 1
Overall Technical, Pure Technical and Scale Efficiencies of CGC

Year	OTE	PTE	SE	NRS
1981	1.0000	1.0000	1.0000	1.0000
1982	0.8606	1.0000	0.8606	1.0000
1983	0.3151	0.6719	0.4690	0.6719
1984	0.1824	0.6324	0.2884	0.6610
1985	0.1110	0.3563	0.3116	0.3563
1986	0.0971	0.3111	0.3121	0.3111

(*continued*)

1987	0.0645	0.2030	0.3178	0.2030
1988	0.0430	0.1372	0.2577	0.1552
1989	0.0722	0.1465	0.4928	0.1465
1990	0.2211	0.4441	0.4979	0.4441
1991	0.1216	0.3363	0.3615	0.3363
1992	0.1396	0.3136	0.4453	0.3136
1993	0.0969	0.1660	0.5837	0.1660
1994	0.3208	0.4924	0.6515	0.4924
1995	1.0000	1.0000	1.0000	1.0000
1996	1.0000	1.0000	1.0000	1.0000
1997	0.7591	1.0000	0.7591	1.0000
1998	0.1357	0.3892	0.3487	0.3890
Mean	0.3634	0.5333	0.5532	0.5532
SD	0.3694	0.3314	0.2634	0.2634
Min	0.0430	0.1372	0.2577	0.2577

As for BI, the average OTE score is 87.5%, while its average PTE and SE are 96.5% and 90.8% respectively. The inefficiency of BI is mainly caused by scale inefficiency and BI could achieve optimal level of efficiency by extending approximately 12.5% more credit facilities at its current level of inputs used. For BPIM, its average OTE, average PTE and average SE are 89.1%, 92.4% and 96.2% respectively. The inefficiency of BPIM is mainly caused by pure technical inefficiency. Usage of its current level of inputs BPIM could improve its current efficiency level by providing more credit facilities, approximately 10.9% to SMEs,. The summary of the empirical findings for BI and BPIM are presented in Table 2 and 3.

Table 2
Overall Technical, Pure Technical and Scale Efficiencies of BI

Year	OTE	PTE	SE	NRS
1981	1.0000	1.0000	1.0000	1.0000
1982	0.5582	1.0000	0.5582	0.5582
1983	0.5610	1.0000	0.5610	0.5610
1984	0.7081	1.0000	0.7081	0.7081
1985	0.8944	1.0000	0.8944	0.8944
1986	1.0000	1.0000	1.0000	1.0000
1987	1.0000	1.0000	1.0000	1.0000
1988	0.7017	0.7690	0.9126	0.7017
1989	1.0000	1.0000	1.0000	1.0000
1990	0.9612	1.0000	0.9612	0.9612
1991	1.0000	1.0000	1.0000	1.0000

(*continued*)

1992	1.0000	1.0000	1.0000	1.0000
1993	1.0000	1.0000	1.0000	1.0000
1994	0.7782	0.8115	0.9589	0.7782
1995	0.7411	0.7906	0.9375	0.7572
1996	1.0000	1.0000	1.0000	1.0000
1997	1.0000	1.0000	1.0000	1.0000
1998	0.8491	1.0000	0.8491	0.8491
Average	0.8752	0.9651	0.9078	0.8761
Std Dev	0.1551	0.0785	0.1432	0.1544
Min	0.5582	0.7690	0.5582	0.5582

Table 3
Overall Technical, Pure Technical and Scale Efficiencies of BPIM

Year	OTE	PTE	SE	NRS
1981	1.0000	1.0000	1.0000	1.0000
1982	1.0000	1.0000	1.0000	1.0000
1983	1.0000	1.0000	1.0000	1.0000
1984	1.0000	1.0000	1.0000	1.0000
1985	1.0000	1.0000	1.0000	1.0000
1986	1.0000	1.0000	1.0000	1.0000
1987	0.8105	0.8513	0.9521	0.8513
1988	0.6900	0.7539	0.9152	0.7539
1989	0.6717	0.7366	0.9119	0.7366
1990	0.7086	0.7201	0.9840	0.7201
1991	0.6618	0.7354	0.9000	0.7354
1992	0.7739	0.8351	0.9267	0.8351
1993	0.9152	1.0000	0.9152	1.0000
1994	0.9725	1.0000	0.9725	1.0000
1995	0.9073	1.0000	0.9073	1.0000
1996	1.0000	1.0000	1.0000	1.0000
1997	0.9279	1.0000	0.9279	1.0000
1998	1.0000	1.0000	1.0000	1.0000
Average	0.8911	0.9240	0.9618	0.9240
Std Dev	0.1325	0.1147	0.0409	0.1147
Min	0.6618	0.7201	0.9000	0.7201

The BPM achieved a relatively high overall average technical efficiency of 94.1% and is also highly technical efficient with an average PTE score of 97.3% for the sampling period of 1981 to 1998. Table 4 provides the summary of efficiency scores for BPM.

Table 4
Overall Technical, Pure Technical and Scale Efficiencies of BPM

Year	OTE	PTE	SE	NRS
1981	1.0000	1.0000	1.0000	1.0000
1982	0.7831	1.0000	0.7831	0.7831
1983	0.8494	0.9546	0.8898	0.8494
1984	0.8763	0.9816	0.8928	0.8763
1985	0.8549	0.9660	0.8849	0.8549
1986	1.0000	1.0000	1.0000	1.0000
1987	1.0000	1.0000	1.0000	1.0000
1988	1.0000	1.0000	1.0000	1.0000
1989	1.0000	1.0000	1.0000	1.0000
1990	0.9708	0.9729	0.9979	1.0000
1991	1.0000	1.0000	1.0000	1.0000
1992	1.0000	1.0000	1.0000	1.0000
1993	1.0000	1.0000	1.0000	1.0000
1994	0.7606	0.7909	0.9617	0.7909
1995	0.8459	0.8488	0.9966	0.8459
1996	1.0000	1.0000	1.0000	1.0000
1997	1.0000	1.0000	1.0000	1.0000
1998	1.0000	1.0000	1.0000	1.0000
Average	0.9412	0.9730	0.9670	0.9445
Std Dev	0.0860	0.0583	0.0622	0.0833
Min	0.7606	0.7909	0.7831	0.7831

As for MIDF, its average OTE, PTE and SE of 92.0%, 98.2% and 93.4%, respectively, is satisfactory. On average, scale inefficiency is more dominant for MIDF as compared to technical inefficiency. Table 5 provides the summary of efficiency scores for MIDF.

Table 5
Overall Technical, Pure Technical and Scale Efficiencies of MIDF

Year	OTE	PTE	SE	NRS
1981	0.8444	1.0000	0.8444	0.8444
1982	0.5325	0.8660	0.6149	0.8660
1983	1.0000	1.0000	1.0000	1.0000
1984	1.0000	1.0000	1.0000	1.0000
1985	1.0000	1.0000	1.0000	1.0000
1986	1.0000	1.0000	1.0000	1.0000
1987	1.0000	1.0000	1.0000	1.0000
1988	1.0000	1.0000	1.0000	1.0000
1989	1.0000	1.0000	1.0000	1.0000
1990	1.0000	1.0000	1.0000	1.0000
1991	0.7781	1.0000	0.7781	0.7781

(*continued*)

1992	0.9198	1.0000	0.9198	0.9198
1993	0.6976	0.8086	0.8627	0.6976
1994	1.0000	1.0000	1.0000	1.0000
1995	0.7926	1.0000	0.7926	0.7926
1996	1.0000	1.0000	1.0000	1.0000
1997	1.0000	1.0000	1.0000	1.0000
1998	1.0000	1.0000	1.0000	1.0000
Average	0.9203	0.9819	0.9340	0.9388
Std Dev	0.1369	0.0535	0.1116	0.0985
Min	0.5325	0.8086	0.6149	0.6976

Besides the average efficiency scores, the annual level of efficiency scores achieved by CGC and all the development financial institutions seems to relate directly to the current economic condition. BI is noted to have operated at an optimal level of constant return to scale in 1986, 1987, 1991, 1992, 1993, 1996 and 1997. As for BPIM, it was operating at an optimal level of constant return to scale in 1981 to 1986, 1996 and 1998.

BPM operated at an optimal level of a constant return to scale in 1981, 1986 to 1989, 1991 to 1993 and 1996 to 1998, while operating at a decreasing return to scale from 1982 to 1995, and 1995. MIDF is found to have operated at an optimal level of a constant return to scale in 1983 to 1990 and 1994 to 1998. As for the remaining years, where MIDF was not operating at a constant return to scale, it was found to be operating at a decreasing return to scale, except for 1982.

The plunge in OTE, PTE and SE scores experienced by CGC and the development financial institutions were pro-cyclical, especially in the 1980s. In 1982, the poor performance of CGC, BI, BPM, and MIDF was largely due to the economic downturn experienced Malaysia, in major agricultural commodities like rubber and palm oil, as well as the dampening business activities and demand for credit. The sluggish economic conditions and low lending activities persisted in 1985 to 1986, causing low levels of efficiency scores among CGC and other financial institutions.

Although the economic condition in the Asian region improved in 1988, the efficiency scores of CGC, BI, and BPIM were low as they were still preoccupied with the repercussion of problems posed during the recession in 1985. These development financial institutions were more cautious in extending credit in order to mitigate a significant increase in non-performing loans. Subsequently, the fall in efficiency score for all the institutions in 1997 was due to the Asian financial crisis that

witnessed rising non-performing loans and a wide spread of credit crunch in the financial market.

In summary, for the sampling period from 1981 to 1998, among the five development financial institutions under study, the average overall technical efficiency level for CGC is the lowest. The best performing institution for the period is Bank Pertanian Malaysia. Table 6 provides the summary of average efficiency scores for all five development finance institutions.

Table 6
Average Efficiency Score for CGC, BI, BPM, MIDF, and BPIM

Institution	OTE	PTE	SE	NRS
CGC	0.3634	0.5333	0.5532	0.5532
Bank Industri	0.8752	0.9651	0.9078	0.8761
Bank Pertanian	0.9412	0.9730	0.9670	0.9445
MIDF	0.9203	0.9819	0.9340	0.9388
Bank Pembangunan	0.8911	0.9240	0.9618	0.9240

CONCLUSION

CGC was operating efficiently at a constant return to scale in 1981, 1995 and 1996. On average, OTE, PTE and SE scores for the sampling period of 1981 to 1998 was 36.3%, 53.3% and 55.3% respectively. The average efficiency score of CGC was much lower as compared to those of Japanese credit corporations and Taiwanese CDFA. The low average efficiency score was found to be caused slightly more by pure technical inefficiency rather than scale inefficiency, corresponding to findings by Fukuyama et al., (1999) and Chang and Hsieh, (1998) in the Japanese credit corporation and Taiwanese CDFA settings, respectively.

On the whole, all four development finance institutions were operating at a rather satisfactory level. However, the efficiency scores suggest that there is still room for improvement for CGC and all development finance institutions. CGC ought to strive to reallocate its existing resources and avoid wastage. At a relatively low level of scale inefficiency, CGC could improve its performance should it put in more than double its existing effort in issuing credit guarantees and consider expanding its economies of scope by providing guarantee coverage to the emerging e-commerce or IT related businesses. For the other development finance institutions under study, they could improve their

scale efficiency by increasing their loan portfolios with optimum use of all available inputs.

A comparison of performance between CGC and the other development finance institutions could not be done since each of their respective functions and objectives are different from one another since, each promotes the development of different industries in the country. Finally, readers are cautioned that the findings are analysed on each institution individually, based on the average score value.

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