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Productivity and Efficiency Performance of the Malaysian Life Insurance Industry

Shazali Abu Mansor
Alias Radam

ABSTRAK

Kajian ini adalah suatu usaha bagi mengukur produktiviti dalam industri insuran nyawa berasaskan kaedah 'Malmquist Non-parametric Index'. Kajian ini mendapati bahawa walaupun produktiviti industri insuran meningkat, tetapi secara relatif pertumbuhannya rendah berbanding dengan pertumbuhan sebenar ekonomi Malaysia. Sama seperti sector pembuatan, pertumbuhan masa depan sektor ini amat bergantung kepada keupayaannya bersaing secara cekap. Keupayaan menyediakan perkhidmatan yang cekap merupakan sumber penting kepada kelebihan saingan sektor ini dalam era globalisasi. Hasil kajian juga mendapati perkembangan dan kecekapan teknologi menyumbang kepada peningkatan keseluruhan produktiviti dalam industri ini.

ABSTRACT

This study attempts to measure the productivity of the life insurance industry by employing the non-parametric Malmquist Index approach. The finding shows that despite the productivity growth in the insurance industry, it is relatively low compared to the real economic growth experienced by Malaysia. Like the manufacturing sector, the future growth of this industry would depend on its ability to compete efficiently. Being able to provide service in an efficient way would be an important source of comparative advantage under the era of globalization. The results also suggest that both technical efficiency and technical progress contribute to the overall productivity growth of the industry.

INTRODUCTION

The insurance sector has been an important source of support to the economic development of Malaysia. The importance of insurance stems from its ability in offering financial security for the insured, covering the whole spectrum of life and businesses. Being part of the financial system, the ability of the insurance sector to compete in the era of globalization is vital, as Malaysia's commitment under WTO would gradually remove the shield given to the service sector. Thus the ability of the insurance sector to operate efficiently in a more liberalized business atmosphere posed a challenge to the industry when facing global competition from more developed countries. While the insurance industry has enjoyed a remarkable growth in terms of business volume, little is known about the efficiency growth of firms in the industry.

This paper attempts to examine the productivity and efficiency of the insurance industry in Malaysia. This study employs data envelopment analysis (DEA) to measure technical efficiency, technical changes and factor productivity. DEA has been widely used to calculate and compare technical efficiency across individual firms. Past studies that utilized this method include Arnade (1994), Fare et al. (1992), Fare and Grosskoft (1994), Grifell-Tatje and Lovell (1995), Piesse et al. (1996), Chavas and Cox (1990) and others. The next section presents the backdrop of the insurance industry, followed by a literature review on productivity and subsequently sections on results and policy implications.

AN OVERVIEW OF THE MALAYSIAN INSURANCE INDUSTRY

Before the introduction of the Insurance Act 1963, the insurance industry was dominated by branches of foreign firms operating in the urban areas. The Act paved the way for increased participation of domestic firms, where the number of Malaysian incorporated insurance companies increased from six in 1963 to 51 in 1997. The increase was accounted for by the local incorporation of the foreign branches and opening of new domestic companies. Domestic insurance companies outnumbered the foreign insurance companies for the first time in 1979. The number of foreign companies had been further reduced from 67 in 1970 to 7 in 1997 whereas the number of local companies increased from 25 in 1970 to 51 in 1997, a 51 percent increase in 27 years (Bank Negara 1999).

The government has played a major role in steering the insurance industry in tandem with the economic development of Malaysia. The government had taken measures to encourage the participation of the local companies in the insurance industry. Following the requirement of Insurance Act 1996, there are only two foreign-incorporated insurers left in the direct insurance market in Malaysia in 1999. However, the foreigners still hold 45.8 percent of the total equity of insurance companies and control 74.3 percent of life insurance premiums (Bank Negara Malaysia 1999).

The growth of the insurance industry has contributed towards increased employment opportunities in Malaysia. Total employment in the insurance industry increased from 10,911 in 1988 to 19,280 in 1998. Measures have been taken to upgrade the skill of the insurance workforce. Various training programs in insurance have been made available by the public and private higher learning institutions. Life insurance industry can be viewed as a strategic industry in generating technical skills for the nation as high degree of technical know how are required in this industry including actuarial science, underwriting, risk management and information technology.

The insurance industry continued to experience high growth over the years. As shown in Table 1 total new premiums had increased from RM 384.0 million in 1988 (69.2 percent of GNP) to RM1420.4 million in 1998. The comparable figures for premiums in force were RM1,082.7 in 1988 and 6,208.3 in 1998.

The amount of sums in forced had increased from RM60,390.7 million in 1988 (69.2% of GNP) to RM336,795.7 (125.1% of GNP) in 1998 (Table 2). This represents an annual growth of about 18.5 percent during the said period.

TABLE 1. New premiums and premiums in force (RM million)

	New Premiums	Premiums in Force
1988	384.0	1,082.7
1989	493.0	1,299.9
1990	573.1	1,576.7
1991	731.7	1,986.3
1992	829.7	2,456.8
1993	977.8	3,008.7
1994	1,263.0	3,733.5
1995	1,510.5	4,612.8
1996	1,422.8	5,259.4
1997	1,581.4	5,957.8
1998	1,420.4	6,208.3

Source: Adapted from Bank Negara Malaysia 1999

TABLE 2. Sum insured in force

	RM Million	% of GNP
1988	60,390.7	69.2
1989	73,033.6	73.5
1990	86,678.0	76.0
1991	105,666.5	82.3
1992	129,568.9	90.8
1993	161,410.7	98.5
1994	202,162.3	108.7
1995	246,228.5	116.1
1996	282,605.2	116.8
1997	321,852.7	120.6
1998	336,795.7	125.1

Source: Adapted from Bank Negara Malaysia 1999

In terms of cost, commisions paid to agents constituted the largest portion of total expenses (Table 3). While total expenses accounted for about more than one third of the total annual income, it had fallen substantially from 43.5 percent in 1988 to 31.2 percent in 1998.

TABLE 3. Expense ratio (% of annual premium income)

	Commission	Staff Costs	Other Expenses	Total Expenses
1988	25.2	5.0	13.3	43.5
1989	28.5	4.6	12.6	45.7
1990	29.2	4.3	12.4	45.9
1991	29.9	4.0	13.3	47.2
1992	33.2	3.8	9.4	46.4
1993	33.5	3.7	9.5	46.7
1994	34.0	3.3	8.9	46.3
1995	34.4	3.1	10.5	47.9
1996	31.8	3.1	7.1	42.0
1997	27.4	3.2	6.2	36.9
1998	22.3	3.1	5.8	31.2

Source: Adapted from Bank Negara Malaysia 1999

THE MEASUREMENT OF PRODUCTIVITY CHANGE

Productivity measurement has an important role in applied economics. Contemporary empirical works of productivity have focussed considerably on overall effects. While aggregate studies are useful, efforts to unbundle efficiency effects can offer important insights into the sources of productivity. This can assist better understanding of the role of economic agents and policy making.

Efficient firms or industries are defined as those operating on the cost or production frontier, whilst inefficient firms are those operating above the cost or below the production frontier. The amount by which firm lies below its production or profit frontier, or the amount by which it lies above its cost frontier, can be regarded as the measure of inefficiency.

Farrell (1957) first made operational the concept and measurement of efficiency, and distinguished between technical efficiency and inefficiency. Technical inefficiency is defined as the failure to achieve maximum possible output from whatever combination of inputs that have been chosen. Numerous methodologies for measuring productivity have been developed over the last three decades. The commonly accepted indices of productivity change are Tornqvist Index (Tornqvist 1936), Fisher Ideal Index and Malmquist Index (Malmquist 1953).

The popularity of Tornqvist and Fisher Ideal indices result from two desirable features they share (Gritell-Tatje & Lovell, 1995). First, both can be calculated directly from price and quantity data, and it is not necessary to recover the structure of the underlying best practice production frontier, and how it shifts over time whether by using econometric techniques to estimate the parameters of functions characterizing the frontier or by using mathematical programming techniques to construct the frontier. Second, both are consistent with flexible representations of the frontier, i.e, both are superlative indices (Caves et al. 1982).

The popularity of the Malmquist Index stems from three quite different sources. First, it is calculated from quantity data only, a distinct advantage if price information is unavailable or if prices are distorted. Second, it rests on much weaker behavioral assumptions than the other two indices, since it does not assume cost minimizing or revenue maximizing behavior. Third, provided panel data is available, it provides a decomposition of productivity change into two components. One is labeled technical change, and it reflects improvement or deterioration in the performance of best practice manufacturing industries. The other is labeled technical efficiency change, and it reflects the convergence toward or the divergence from best practice on the part of the remaining firms. The value of the decomposition is that it provides information on the source of overall productivity change in the firms. We implement the Malmquist Index by solving a series of linear programming problems to construct the distance function that make up the Malmquist Index. These distance functions characterize the best practice frontier at any point in time, and they also characterize shifts in the frontier over time as well as movements towards or away from the frontier.

The non-parametric approach, introduced by Farrell (1957) is used here largely because it does not require prices and it leads directly to simple efficiency comparisons and the Malmquist Index. The Farrell technical efficiency measures is defined so that the isoquant, which is the locus of the efficient points that form the boundary of input requirements set, designated the minimal set of inputs, X_T, resulting in the unit level of output of y_t. The efficiency of the other firms is measured radially relative to this isoquant.

A useful feature of the total Malmquist productivity index, first noted by Fare et al. (1995), is that it decomposes into the product of an index of technical efficiency change and an index of technical change, as follows;

$$(1) \quad M_i(y^0, y^1, x^0, x^1) = [E_i(y^0, y^1, x^0, x^1)]\,[T_i(y^0, y^1, x^0, x^1)]$$

where

$M_i(y^0, y^1, x^0, x^1)$ = Malmquist Productivity Index
$E(y^0, y^1, x^0, x^1)$ = an index of relative technical efficiency change
$T(y^0, y^1, x^0, x^1)$ = technical change of component of productivity.
y^0 = output at time period 0
y^1 = output at time period 1
x^0 = input at time period 0
x^1 = input at time period 1

Productivity changes arising from changes in technical efficiency can be measured as the ratio of two distance functions at different points in time, or as:

$$(2) \quad E(y^0, y^1, x^0, x^1) = \frac{D^1(y^1, x^1)}{D^0(y^1, x^1)}$$

An index of relative technical efficiency index measures the ratio of technical efficiency at time period 0 and time period 1. This is a measurement of a firm i catching up to a frontier representing best-practice technology. This index is greater than, equal, or less than unity, accordingly, as the relative performance of producer i is improving, unchanging or declining.

The second component of total Malmquist productivity index is an index of technical change. Fare et al. (1995) calculated the technical change component of productivity as the geometric means of two ratios of output distinct function as follow;

$$(3) \quad T(y^0, y^1, x^0, x^1) = \left[\frac{D^0(y^1, x^1)}{D^1(y^1, x^1)} \cdot \frac{D^0(y^0, x^0)}{D^1(y^0, x^0)} \right]^{\frac{1}{2}}$$

The four distance functions defined the shift of the technical progress frontier. The ratios compare year t observations with the t + 1 reference technology, or vise versa. In the first ratio, the numerator measures the technical efficiency in time period 1 relative to technology in time period 0. This is the mixed distance function. The denominators measure technical efficiency in time period 1 relative to the technology in period 1.

The technology index measures the shift in the frontier. This index shows whether the best practice relative to which firm i is compared is improving, stagnant or deteriorating. This component is greater than, equal to, or less than unity, accordingly as technical change is positive, zero or negative, on average, at the two observation (y^0, x^0) and (y^1, x^1).

ESTIMATION OF MALMQUIST PRODUCTIVITY INDEXES

We develop the Malmquist productivity estimates from mathematical programming models of the frontier production function. For a recent survey of this approach see Fare, Grosskoft & Lovell (1994) and Seiford & Thvell (1990).

Calculation and decomposition of the Malmquist productivity index requires the calculation of four output distance functions, for each firm in each pair of time period. We concentrate our attention on Malmquist based productivity growth in the context of year by year improvements. The Malmquist Index is computed for each firm in each year of the data using 1975 as the base year for comparison. We follow Arnade (1994) by using linear programming techniques to calculate these output distance functions observations. The reference technology must be defined and the distance of the K observation from the reference technology must be measured. The programming problem used to calculate the Farrell measure of technical efficiency for a specific observation; K', in time period 0 is set up as

$$(4)\quad F^0(y_{k'}^0, x_{k'}^0) = [D^0(y_{k'}^0, x_{k'}^0)] = \min \lambda$$

subject to

$$Y_{k'm}^0 \le \sum_{k=1}^{K} z_k Y_{km}^0 \qquad (m = 1,\ldots\ldots,M)$$

$$\sum_{k=1}^{K} z_k X_{kn}^0 \le \lambda X_{k'n}^0 \qquad (n = 1,\ldots\ldots,N)$$

$$z_k \ge 0 \qquad (k = 1,\ldots\ldots,K)$$

$$\sum_{k=1}^{K} z_k = 1$$

Superscripts on the data represent the time period 0. Superscripts on functions represent the technology that is defined by the data. Subscript *K'* refers to a specific cross-sectional observation. Subscript *m* and *n* refer to output and inputs.

Mixed-distance functions are estimated by comparing observations in one time period with the best-practice frontier of another time period. An example is given here: set up a programming problem that calculates the shrinkage required of inputs of observation *K'* in time period 1 relative to the technology of time period 0. The result is an estimate of the inverse of the mixed-distance function for observation *K'*. This can be defined as:

$$[D^0(y_{k'}^1, x_{k'}^1)]^{-1} = \min \lambda$$

subject to

$$Y_{k'm}^0 \le \sum_{k=1}^{K} z_k Y_{km}^0 \qquad (m = 1,\ldots\ldots,M)$$

$$\sum_{k=1}^{K} z_k X_{kn}^0 \le \lambda X_{k'n}^0 \qquad (n = 1,\ldots\ldots,N)$$

$$z_k \geq 0 \qquad\qquad (k = 1,\ldots\ldots,K)$$

$$\sum_{k=1}^{K} z_k = 1$$

The technology is define from data in time period 0, where the efficiency of the specific observation *k'* is defined using data from time period 1.

In measuring the efficiency performance, we evaluate the Malmquist Index of a sample of 12 Malaysian insurance company over the 1987 to 1997 period. According to Evanoff and Israilevich (1991), DEA can be used with small sample sizes. Thus due to limitation in obtaining suitable data, only a sample of 12 firms out of 58 were employed. Although only three companies namely, GREAT EASTERN, AIA and PRUDENTAL provide only life insurance products while the rest provide both life and general insurance products, this is not a limitation to this study as the data available from Annual Report of Director General of Insurance is segregated between general and life insurance products. We adopt the Malmquist Index measures using three variables as output (new policy issued, premium and policy in force) and five inputs, namely claims, commission, salaries, expenses and other cost. All data are obtained from the Annual Report of Director General of Insurance.

RESULT AND DISCUSSION

Two primary issues are addressed in our computation of the Malmquist index of productivity growth in Malaysian insurance companies. The first is how to measure productivity and technical efficiency over a time period. The second is how such productivity can change, if its existence can be decomposed into a catching up effect and frontier shift effect.

Firms on the production frontier can be labeled as "best practice" and they demonstrate optimum efficiency in resource utilization. An index measure of 1.0 indicates that a firm lies on the best-practice frontier while an index measure of less than 1.0 indicates inefficient resource utilization compared to those on the best-practice frontier. An inefficiency index subtracted from one represents the largest proportional amount of input that can be reduced without reducing output.

We begin by looking at the whole production possibility set consisting of observed inputs and related outputs produced in the insurance

TABLE 4. Mean technical efficiency index of Malaysian Insurance Company, 1975 – 1997

	Efficiency
Malaysia National Insurance Company Bhd. (MNI)	0.9808
Malaysian Assurance Alliance (MAA)	0.5975
Malaysia Co-operative Insurance Society Limited (MCIS)	0.7028
Safety Life General Insurance Sdn. Bhd (SAFETY)	0.6261
Talasco Insurance Sdn. Bhd. (TALASCO)	0.7480
United Malaysian Insurance Company (UMI)	0.7573
American International Assurance Co. (AIA)	0.5626
Asia Life Assurance Society Ltd. (ASIA LIFE)	0.7092
Great Eastern Life Assurance Co. Ltd. (GREAT EASTERN)	0.7371
Oversea Assurance Corporation Ltd. (OAC)	0.8743
Prudential Assurance Co. Ltd. (PRUDENTAL)	0.4546
Malaysia Co-operative Insurance Society (Housing) (MCIS (H))	0.9671
AVERAGE	0.7265

Source: Computed from Insurance Annual Report (various issues)

industries over the period of 1975 to 1997. In Table 4, the constructed frontier is shown by the average Farrell efficiency index for each firm. The average technical efficiency for Malaysian insurance industry for the period of this study is quite high, that is 72.65 percent. Firms which experience high levels of technical efficiency include Malaysian National Insurance (98.08 percent), Malaysia Co-operative Insurance Society, Housing Service (96.71 percent) and Overseas Assurance Corporation (87.43 percent). The disparity between the highest (98.08 percent) and lowest (45.46 percent) average technical efficiency was quite large.

Table 5 shows the Malmquist productivity index of the life insurance industry, comprising the technical change and technical efficiency of the insurance firms from 1975 to 1997. Most of the firms, except for MCIS, AIA and Safety experienced growth in efficiency. Asia Life recorded the highest growth in technical efficiency (156 percent) followed by Great Eastern (128 percent). For the case of technical change, UMI (240 percent) and MAA (193 percent) recorded high technical progress. The overall productivity growth which is reflected by the Malmquist Index, shows that most of the firms except MCIS, Safety and AIA, experienced growth in productivity. MAA experienced 287 percent growth in productivity followed by UMI at 129 percent. The negative productivity growth of some of the firms,

TABLE 5. Malmquist index, technical efficiency change index and technical change index for insurance companies, 1975 – 1997

Firm	Technical Efficiency Change Index	Technical Change Index	Malmquist Index
MNI	1.76	0.75	1.32
MAA	1.39	2.93	3.87
MCIS	0.98	0.54	0.53
SAFETY	1.55	0.70	0.96
TALASCO	0.75	2.43	1.49
UMI	0.76	3.40	2.29
AIA	1.52	0.63	0.91
ASIA LIFE	2.56	0.69	1.74
GREAT EASTERN	2.28	0.56	1.18
OAC	1.27	1.11	1.41
PRUDENTAL	1.71	0.64	1.03
MCIS (H)	0.97	1.25	1.03
AVERAGE	1.46	1.30	1.48

suggests that the firm produced less output per unit of resource consumed in 1997 compared 1975. There was a large disparity of productivity growth between firms. On average the technical efficiency, technical change and productivity have shown growth of 46 percent, 30 percent and 48 percent respectively over the period. These are equivalent to less than 2 percent annual growth, which are well below than the National GNP growth.

POLICY IMPLICATIONS

In terms of business volume, the life insurance industry had experienced a high growth exceeding more than 10 percent annually over the period 1975 to 1997. However, the average annual productivity of the industry that include technical change and efficiency change over the same period was lower than 2.0%, a figure substantially below the 8.0% GNP growth achieved over the same period. Growth in insurance industry is expected to be a positive function of GDP growth. Given normal structural change patterns observed in developed economies, the growth of essential services in the early development trajectory will tend to be lower than the primary and secondary sectors. However, given manufacturing's double-digit growth annually over several decades, slow productivity growth in the insurance industry raises serious concerns over the quality of essential complementary services in the country. The result also suggests certain policy options. In the light of liberalization in trade and services under WTO, the insurance industry needs to address certain prevalent efficiency issues to strengthen its competitiveness.

Rationalization efforts undertaken in the banking industry should be extended to the insurance industry so that inefficient firms can be revitalized. Such pressures are already mounting since the formation of WTO in 1995. The liberalization initiatives under the General Agreement on Trade in Services (GATS) provisions in the WTO are already forcing the insurance and banking industries to undergo ownership deregulation. Unless rationalization exercises are quickly carried out to reform the insurance sector, external pressure could crowd out local firms. Efficiency improvements should be the basis for implementing the merger exercises. The external effects of efficient mergers is expected to spillover to the rest of the industry.

Rationalization should also entail the absorption of "gales of creative destruction" effect. The use of information technology and other cutting edge process and organizational techniques that raise organizational efficiency must be encouraged. Organizational efficiency – including services rendered per hour of employees – involving Malaysian insurance companies were considered to be substantially below that of their counterparts in the United States and England.

Efficiency in this industry can also be enhanced by upgrading the distributive channels with gradual utilization of information technology and better transport facilities. The conventional distributive agency problems can be overcome by undertaking strategic alliances with other institutions to eliminate duplication.

Finally, human resource development is another aspect that needs to be addressed. The skills of personnel working in the insurance industry should match the changing requirements of these industries forced upon by globalization. Without a competent workforce, it is difficult to compete particularly in this type of knowledge based industry. Modern insurance should figure considerably in higher institutions of learning. While whole degree programs are unnecessary, specific courses in insurance should be added to a number of degree programs. Insurance employees should also enjoy access to specific off-work skills training facilities for life long learning.

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Faculty of Business Management
Universiti Malaysia Sarawak
94300 Kota Samarahan
Sarawak

Faculty of Economics and Management
Universiti Putra Malaysia
43400 Serdang
Selangor Darul Ehsan