Efficiency-profitability model of Philippine Non-life insurers: A viewpoint on pre-ASEAN liberalization period

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Abstract: This study examined the efficiency performance of the Philippine Non-life Insurers with the comparison of paid-up-capital complaint against the paid-up-capital non-compliant. The efficiency-profitability matrix is further utilized to gauge the performance between paid-up-capital compliant and non-compliant Philippine Non-life Insurers and also to enable the characterization of the insurer's performance profile. The analysis covers the period from 2008 to 2012. Empirical results show that the paid-up-capital compliant insurers have more number of technically efficient insurers rather than paid-up-capital non-complaint insurers coming mostly from smaller firms. This suggests that insurer's efficiencies are mainly technical (managerial) rather than scale (size) in nature. Thus, it has a great prospect to increase efficiency and strong potential for further growth in the Philippines. Results also shows that the technically more efficient insurers are necessarily larger, have greater profitability and underwriting capacity. A large paid-up-capital complaint insurer is relatively superior in terms of underwriting capacity and capital adequacy. Findings further suggest that the DEA measures can be used separately or concurrently with standard accounting measures in determining insurer performance.

Key Words: Data Envelopment Analysis; Efficiency-Profitability Matrix; Paid-up capital of compliant and non-compliant Philippine non-life insurers

1. INTRODUCTION

Insurance commissioner Dennis B. Funa in his statement in 2017 PIRA Fact book is optimistic that an increase in disposable income of Filipinos would enable to purchase insurance products, letting them to mitigate risk of uncertainty. As revealed by Oxford Business Group (2017), the Philippines have been considered as one of the model countries for microinsurance. To be considered as microinsurance, the premium must affordable at cost no more than 7.5% of average daily wage of Php 34.00 per day and

provide benefit f 1,000 times the daily minimum wage (Php 481,000). Despite superior product offering out of affordable premium, the question of efficiently allocating the resources cannot be discounted especially if the consideration is protecting the interest of the general public.

Many insurers in the Philippines aimed to be well positioned for the next few years. It is interesting to look at the historical footprints of the Philippine Non-life insurance market before paving the way for the implementation of the Republic Act 10607 also known as the Insurance Code. The amendment from Presidential 612 to Republic Act

10607 paved the way for two important components in the insurance industry: 1) to increase capitalization requirements and; 2) to give insurance company a liberty of their investment strategies. These two amendments is an important factors in increasing the potential income of insurers to be able to compete with the members of ASEAN Economic Community (AEC).

The current study gauged how a definite level of input affects the efficient allocation of resources in the Philippine Non-life insurance industry. This provides comprehensive model to achieve optimal efficiency. Thus, the paper seek to answer the following questions: 1) which Philippine Non-life insurer is the most efficient; and 2) the practices to improve the Philippine Non-life insurers. The objective of the study is to provide efficiency framework that insurance personnel can made use to increase their understanding and strategies. Consequently, revealing the effect of insurers' activity on their performance.

To shed the light for the research questions, this study provides evidence on the performance of the Philippine Non-life insurance industry over the period of 2008-2012. This is based on the technical efficiency measurement, Data Envelopment Analysis (DEA) – Malmquist model, which also examines the insurers' pure technical efficiency (PTE), and scale efficiency (SE). In order to specify input-output variables, the output-intermediation approach is utilized. Finally, this study gauges the efficiency – profitability matrix which has connection in structure to the product portfolio matrix approach.

2. RELATED LITERATURE

There has been a lot of descriptive literature that provides judgement of the instruments used in industry. It also discusses legal parlance and regulatory issues related to insurance industry such as: Cummins and Xie (2008), Cummins, Weiss, Xie, and Zi (2010), and Elango, Ma, and Pope (2008). Existing empirical research on insurance industry focuses primarily in assessing the performance of insurance industry on efficiency scores. For instance, Libenberg and Sommer (2008) develop and test model that expounded insurers' performance as function of line-of-business diversification and other variables utilizing a sample of non-life insurers over the period of 1995-2004. The statistical evidence suggests that undiversified insurers beat diversified insurers. They also found that unaffiliated insurers and mutual insurers can be outperformed by insurance groups and stock insurers.

Despite of the extensive academic literature on insurance industry, and the practitioners' use of straightforward financial ratio analysis for understanding and predicting the performance of insurers, there are few studies being attempted to actually measure the efficiency performance of insurers in developed market. The lack of coherent evidence regarding the efficiency of insurers is likely to be a consequence of Philippine industry's small size as compared to the allies in the ASEAN Economic Community (AEC) members.

Among those who investigate empirically the efficiency of insurers is Cummins and Xie (2008). They provide new evidence on the performance of United States of America Non-life insurance industry over the period 1993-2006. The research work is based on efficiency measurement in which DEA was utilized to analyze the technical efficiency (TE), and scale efficiency (SE) of USA Non-life insurers. Findings indicated that majority of firms below median size in the industry are operating with increasing returns to scale. On the other hand, few firms in each size have reached constant return to scale. On the given period, increase in total factor productivity was evident, caused by upward trend in scale and allocative efficiency. This indicates that cost and revenue efficiency did not improve significantly. Multivariate analysis shows that efficiency and productivity improvements have been scattered randomly through the insurers. Unlike the study of Libenberg and Sommer (2008), diversified firms outweigh the undiversified although stock insurers and insurance groups achieve efficiency and productivity. This suggests that higher technology expenses increase probability of achieving maximum spectrum for direct writing insurance companies but not for independent agency firms.

Overall, there is lack of evidence regarding the efficiency performance of Non-life insurance operating in the Philippine financial institutions. Also, it can be noted that expense preference hypothesis claims that mutual insurers are less efficient due to higher agency costs which might be affirmative in the developed market already and no sufficient evidence in the ASEAN Economic Community. This intends to put that evidence into practice utilizing the non-parametric deterministic approach, DEA.

3. METHODOLOGY

Different approaches have been utilized for scrutinizing insurer's level of efficiency, from traditional financial ratio analysis to multifaceted econometric procedures. Complex efficiency estimation techniques can be categorized into parametric and non-parametric methods. There is no

unanimity in the body of literature as to the best approach is the best as either have their pros and cons. The parametric approach assumes regarding specific form of cost or profit function and the distribution of efficiency. On the other hand, the nonparametric process requires no such specification of the functional form. The most commonly used method is the Data Envelopment Analysis (DEA).

3.1 Efficiency measurement using DEA approach

DEA is a non-parametric approach to be reflected as an alternative method to estimate productive efficiency in the financial institutions. DEA approach represents how an insurer operates relative to non-life insurers in the Philippines. It delivers benchmark for best practice technology based on the experience of those insurers in the sample. The DEA estimates are based on technological efficiency where efficient insurers are those for which no other insurers yields as much as more output considering given inputs, or so to say utilize little or less input to produce a given output.

DEA approach does not need any assumption on the structural form of insurers as it requires no pre-specified functional form. Relatively, the functional form is generated from the sample of the evaluated insurers; hence, it reduces the probability of an incorrect functional model. DEA can estimate technical efficiency under the assumption of Constant-Returns-to-Scale (CRS) and Variable-Returns-to-Scale. The CRS is applicable if all Decision Making Units (DMUs) are operating at optimal scale. However, factors like imperfect rivalry and limitations in finance may cause the sample insurers not to operate well at their optimal scale of operations.

Given the prior arguments, this study compares the non-life insurers based on their compliance with the paid-up-capital. The Insurance Commission is on a presumption that the paid-up-capital can potentially increase the production volume of the insurers. It is essential to look for their comparisons because there non-life insurers who were not able to maintain their paid-up-capital but they are still operating. On the other side, it is unfair with those who are compliant and those who are even exceeding their paid-up-capital requirements believing that it might boost up their productivity. In appropriately account for the varying compliant with paid-up-capital requirements, the DEA-model under the assumption of VRS approach (also known as BCC-model) (Banker, Charnes, and Cooper, 1984;

Cooper et al., 2007)

The efficiency can be measured through an input-oriented model (i.e. input/output) or an output oriented model (i.e. output/input). The input-oriented model aims to identify technical efficiency as a proportional reduction input utilization. In the On the other hand, output-oriented model, technical inefficiency is measured as a proportional increase in output production. Several researchers still is not into an agreement as to the best choice between the two orientation models. The choice of orientation will not have a major impact on efficiency estimations since both approaches will construct the same frontier, and thus the same efficient DMUs (best performers) would be identified. However, inefficient DMUs ranking would possibly change (Coelli, 1996). In this research, an output-oriented approach was used. This is because this measure is due to its reliability and a better fit to Philippine Non-life insurance industry's environment. Non-life insurers operating under competitive environment therefore, endeavor to provide the best possible insurance products and services for their policyholders. Hence, they are more likely to strength their competitive advantage by increasing outputs production rather than reducing the input usage.

3.2 Data and variables

This study examines the relative efficiency of the non-life insurers' paid-up capital compliant and non-compliant. The distribution of insurers is illustrated in table (1) below. Furthermore, the study time span 2008-2012 helps to account for the impact of the recent financial crisis on the efficiency of the insurers

3.3 Selection of inputs and outputs

While the multi-product nature of the insurance firms is documented in the body of literature, there is still no consensus as to the definition and measurement of insurers' inputs and outputs. The insurance industry literature is divided concerning this issue. Researcher takes one of two approaches labelled the intermediation and the production approach. The production approach views insurers as producers of insurance policies using the traditional factors of production i.e. capital and labor. In the intermediation approach, insurers act as financial intermediary to collect premiums and invest earned funds, and then transform these into payment of claims incurred by policyholders and other assets. The intermediation approach is preferable to the production approach to model insurer behavior. This is because it does not exclude

loss expenses, which accounts for a significant level of insurer's total costs. This paper uses the DEA intermediation approach. This inevitably implies the importance of insurer's intermediary activities.

3.4 The DEA model

A DMU garnering a score of 100% and all slacks are zeros in relation to others is identified as efficient. Meanwhile, an existence of combination to other unit which does not rule over the current output vector of the reference DMU but otherwise utilize fewer resources is said to have an efficient score of 100% and some of the slacks are non-zeros. These DMUs may be categorized as weakly efficient (Berger and Humphrey, 1997). In DEA, "slack" can be defined as overuse of input or under production of output that exists even there is a proportional change in the inputs or the outputs. It shows the improvements needed to convert an inefficient unit to an efficient one. These improvements are in the form of an increase/decrease in inputs or outputs. Slack might be considered as the amount of inefficiency exhibited by non-efficient DMUs and possibly a consequence of poor performance of inputs, outputs or both. If inputs are being used ineffectively, then we have input slack, and conversely we will have output slack.

Two-stage DEA, to move to an efficient frontier by maximizing the sum of slacks essential to move from the first-stage projected point to another; and 3) Multi-stage DEA, to facilitate a sequence of radial linear programs to identify the efficient projected point. This study utilizes the multi-stage DEA as it is computationally more rigorous and demanding. The advantage of multi-stage DEA is that it identifies efficient projected points which have input and output mixes that are as similar as possible to those of the inefficient points, and also it is invariant to units of measurement (Coelli, 1996).

This applied the DEA method to further scrutinize the input and output "targets" for an insurer. These targets are the results of respective slack values added on to original outputs, and subtracted from original inputs. Furthermore, target for outputs are computed by multiplying optimal efficiency scores by the outputs and then adding the slack values to that value. Though, it must be distinguished that approximately the efficiency improvement options and the target values may not be pertinent and cannot be applied.

4. RESULTS AND DISCUSSION

This section illustrates first the DEA results. This further considers the results from the correlation analysis of the DEA efficiency scores with financial performance, and the efficiency-profitability matrix.

4.1 Efficiency of Philippine Non-life insurance industry

Table 1. PUC Compliant Non-life insurers' relative overall efficiency for the year 2008-2012

Insurer	CRSTE	Insurer	CRSTE	Insurer	CRSTE
1	0.344	19	0.4665	46	0.4820
2	0.1181	20	0.2015	48	0.2470
3	0.7056	22	0.7139	49	0.2310
5	0.0381	25	0.2738	50	0.3474
6	1	28	0.3361	51	0.1949
7	0.4229	29	0.2935	52	0.7346
8	0.217	38	0.6067	53	0.2655
11	0.4448	39	1	55	0.9760
12	0.1253	40	0.6227	56	0.4287
13	0.5018	42	0.1855	57	0.6199
14	0.8025	43	0.0734	62	0.6377
16	0.2234	44	0.4032	67	0.5593
18	0.4699	45	0.2411	71	0.5893
Mean				0.4396	

Table 1 showed the percentage of the realized output level at the given input mix. Almost 48.72% of the PUC compliant insurers falls below the average efficiency. For instance, insurer number 5 garnered the lowest produced output at 3.81% for the sample period. Meanwhile, only insurer numbers 6 and 39 are considered the most efficient.

Despite non-compliance with the Php 250 million required paid-up-capital, non-compliant insurer numbers 36 and 65 still managed to reach their 100% realized output level at the given input mix. Although the percentage of inefficient insurers falling below the mean is greater than the compliant firms (53.13%), their lowest inefficient insurer is number 68 at 15.66% which is really higher as compared to compliant firms.

The overall efficiency of non-life insurers appears to be mostly due to pure technical efficiency (DEAVRSTE). Since the DEAVRSTE captures the management practices while the DEASE indicates whether the insurers operates at optimal economies of scale, the above results suggest that efficiencies are greatly owed to efficient management practices rather than the size of the insurer's operation given that insurers who did not complied (technically smaller insurers) can manage to be efficient.

The evidence on efficiency results from

Table 2. PUC Non-compliant Non-life insurers'
relative overall efficiency for the year 2008-2012

Insurer	CRSTE	Insurer	CRSTE	Insurer	CRSTE
4	0.3275	30	0.6278	54	0.8327
9	0.4914	31	0.3568	58	0.3693
10	0.6682	32	0.5095	59	0.6076
15	0.5159	33	0.5129	60	0.6712
17	0.3014	34	0.5412	61	0.4078
21	0.4729	35	0.7088	63	0.7402
23	0.719	36	1	64	0.5536
24	0.3541	37	0.1878	65	1
26	0.5398	41	0.6066	66	0.5116
27	0.3541	47	0.6514	68	0.1566
Mean					**0.4396**

nonlife insurers grouped by PUC compliance provides significant insight into the analysis. It displays that the compliant to PUC can enjoy economies of scale consistent with the theory. However, violators are said to be efficient still which is unfair to those who intentionally complied and strategically exceeds their PUC hoping to attract more policyholders to show their vibrancy in the industry. This obviously portrays that the "bigger is not necessarily better ". Needless to say, the larger the insurer, the less efficient it is and the more it can be affected by the financial instability. This is a notable insight specially to further shed the light that these noncompliant insurers are eating too much slice in the market share that should have been enjoyed by the compliant firms.

Table 3. PUC Compliant Non-life insurers' relative efficiency change for the year 2008-2012

Insurer	VRSTE	SE	Insurer	VRSTE	SE
1	0.5971	0.5761	39	1	1
2	0.3496	0.3379	40	0.9093	0.6849
3	0.7602	0.9282	42	0.4837	0.3836
5	0.7503	0.0508	43	0.1594	0.4603
6	1	1	44	0.7097	0.5681
7	0.6492	0.6515	45	0.4264	0.5654
8	0.5203	0.4170	46	0.8421	0.5724
11	0.6885	0.6461	48	0.9688	0.255
12	0.4781	0.2620	49	0.4451	0.5191
13	0.864	0.5809	50	1	0.3474
14	0.8143	0.9855	51	0.4231	0.4606
16	0.5599	0.3990	52	0.8374	0.8772
18	0.9112	0.5157	53	0.7636	0.3477
19	0.5383	0.8666	55	1	0.9760
20	0.9093	0.2216	56	0.5035	0.8516
22	0.8767	0.8143	57	0.7051	0.8791
25	0.5675	0.4825	62	0.7977	0.7993
28	0.7162	0.4693	67	1	0.5593
29	1	0.2935	71	0.8168	0.7214
38	0.9181	0.6609			
Mean	**VRSTE**				**0.7246**
	SE				**0.5894**

The overall efficiency is further decomposed into two subcomponents, namely pure technical efficiency (VRSTE) and scale efficiency in which the results are reported in Table 3 and 4. The results indicate that the pure efficiency and scale efficiency appear to be an equally important source of growth to overall efficiency. The maximum potential output level at a given input mix is said to be the main contributor to the overall efficiency of PUC compliant non-life insurers at 72.46%. Insurers 6, 29, 39, 50, 55, and 67 produced the highest potential at 100%. In contrast, 46% falls below the mean which indicates that they have to work hard to reach their maximum potential output level. Consequently, insurer 43 garnered the lowest at 15.39%.

Table 4. PUC Non-compliant Non-life insurers' relative efficiency change for the year 2008-2012

Insurer	VRSTE	SE	Insurer	VRSTE	SE
4	0.5088	0.6437	36	1	1
9	0.7750	0.6341	37	0.4573	0.4107
10	0.6826	0.9788	41	0.6816	0.8899
15	0.7537	0.6845	47	0.7733	0.8424
17	0.4904	0.6145	54	0.8749	0.9518
21	0.9169	0.5157	58	0.4986	0.7407
23	0.8813	0.8158	59	0.9073	0.6697
24	0.4807	0.7368	60	0.7893	0.8504
26	0.6552	0.8225	61	0.7292	0.5592
27	0.8605	0.7547	63	0.7550	0.9804
30	0.7250	0.8659	64	0.812808	0.681034
31	0.4435	0.8045	65	1	1
32	0.8565	0.5949	66	0.7845	0.6522
33	0.6819	0.7522	68	0.6894	0.2272
34	1	0.5412	69	0.728	0.5857
35	0.8447	0.8391	70	0.4819	0.5749
Mean	**VRSTE**				**0.735**
	SE				**0.7255**

Table 4 revealed that the mean pure technical efficiency of the non-compliant insurers exceeds the compliant insurers at 73.5% garnering the only three insurers (insurer numbers 34, 36, and 65) that reached their maximum output level given a certain input mix. Aside from higher potential, the inefficient insurers falling below the mean is nearly the same percentage compared to the compliant resulted to 47%. Consequently, the lowest insurer but still higher with the compliant ended up at 44.35%.

Table 3 and 4 illustrates the DEA-efficiency scores of Non-life insurers in the Philippines. The results appear in the table indicates that the insurers with PUC more than the required has efficiency scores of less than 1 (DEAVRSTE < 1). Hence, it is identified as technically inefficient. The

results seem to imply that setting up PUC equals to or larger than required is not only technically inefficient but also inefficient in exploiting the economies of scale given its scale of operations. On the other hand, the results also revealed that even though PUC compliance is not really a big issue if an insurer can operate efficiently in the Philippines which invalidate the argument that exceeding the PUC (also larger firm) can freely enjoy economies of scale and can operate efficiently. This discloses that the insurers are operating at scale that is overly large in number and thus should shrink the output endowments and activities.

4.2 The efficiency-profitability matrix

The results essentially concentrate on evaluating the performance of PUC compliant insurers and PUC non-compliant insurers based on an efficiency-profitability matrix (Figure 1 and 2). The median value is used to split the matrix into two halves to create high and low groups of profitability (Luo, 2003), as measured by ROA, and efficiency scores as measured by DEA. The matrix was split into four quadrants: stars, question marks, sleepers, and dogs.

ROA					
High	Sleeper	N = 9 or 23.08% (large size = 7;small size = 2)	Star	N = 10 or 25.64% (large size = 4;small size = 6)
Low	Question mark	N = 10 or 25.64% (large size = 5;small size = 5)	Dogs	N = 10 or 25.64% (large size = 1;small size = 9)
		Low		High
		VRSTE		

Figure 1. The efficiency–profitability matrix of PUC Compliant Non-life insurers

ROA					
High	Sleeper	N = 9 or 28.13% (large size = 3;small size = 6)	Star	N = 8 or 25% (large size = 3;small size = 5)
Low	Question mark	N = 7 or 21.87% (large size = 0;small size = 7)	Dogs	N = 8 or 25% (large size = 3;small size = 5)
		Low		High
		VRSTE		

Figure 2. The efficiency–profitability matrix of PUC Non-compliant Non-life insurers

The star quadrant contains of firms which show a high level of profitability and efficiency and thus, considered as the leading insurers. The insurers falling in sleeper category have high profitability but low efficiency which is not a good sign from long-term standpoint. These sleeper insurers are profitable due to primarily more favorable environmental conditions than good management. The question marks category has low profitability and low efficiency. These companies have a possibility for greater efficiency and possibly greater profits. The dogs have a low profitability but high efficiency thereby, these companies are efficient, but are still not profitable. These companies are efficiently operated units but low on profitability due to an unfavorable environment.

Given the insurers falls in the question marks, this indicates that the bank has a low profitability and efficiency. Consequently, the market presence of insurers is week; the market growth is low and thus, is considered as under-performing but has the potential to maintain the business and to increase its operating efficiency by delivering enough cash. Thus, with a favorable environment and additional resources, it can be expected to enhance its efficiency and profitability performance. By increasing efficiency, the bank can possibly move to the "star" quadrant.

5. CONCLUSIONS AND RECOMMENDATIONS

Empirical outcomes based on the extensive analysis show that the PUC compliant small size insurers are technically inefficient. PUC compliant insurers is also efficient in exploiting the economies

of scale given its scale of operations and considering that most efficient insurers are coming from large insurers. It appears that the PUC compliant larger size insurers are driven, to a large extent, by adequate management compared with small size compliant insurers. Based on ROA, small PUC compliant insurers tend to have better financial performance than large PUC compliant insurers mainly because small insurers tend to cede less their portfolio as compared to larger insurers.

Results suggest that the optimal size for the insurer to achieve better levels of efficiency performance is neither large nor small rather medium. Since the PUC is expected to increase, many small insurers and non-compliant insurers are becoming acquisition candidates while large insurers are more affected by the financial instability and thus recognized as a troublesome due to the high leverage and complex risk exposures.

In addition, this reveals that the insurers with higher efficiency levels are larger in total assets (size), tend to exhibit higher profitability. It is also relatively superior in terms of underwriting capacity and PUC requirements. This study revealed that there were very few substantial growths in technical components and efficiency change suggesting that the Philippine Non-life insurers was due to the management decision components coupled with considerable improvement in the efficiency aspect.

This proposition is consistent with the argument of Insurance Commission that complying or even exceeding the paid-up-capital can increase the efficiency of the firms. Theoretically speaking, firms who exceeds the PUC requirements are more or less the firms under the top 18 players in the Non-life insurance industry. Thereby, there is no doubt that as to the reliability of the results, they can enjoy the economies of scale. However, insurers who are operating under the required PUC and companies who are just complying on an average, will deteriorate in the future.

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