Fair-Value Accounting and Financial Statement Analysis in Thai Insurance Companies

Keertiman Sharma
Stamford International University, Bangkok Thailand
keertiman.sharma@stamford.edu

Abstract

Historical cost basis has been a fundamental tenet of accounting for assets and liabilities in many countries. Historical costs are normally perceived as more reliable. On the other hand, fair value accounting provides more relevant information to the stakeholders like shareholders, prospective investors and creditors. As more and more countries are harmonizing their Accounting standards with that of International Financial Reporting Standards (IFRS) prepared by IASB, the use of fair value accounting is gaining popularity. This paper addresses whether a change from historical cost to the fair value method affects financial statement analysis. Data Envelopment Analysis (DEA) has been performed, on key financial statement items. Then, the results based on fair-value have been compared with that of the historical cost basis for ten (10) Thai insurance Companies (Public Companies Limited). The findings report the change in efficiency scores of these Thai insurance companies and whether the relative efficiency to each other altered when they shift from historical cost to the fair value basis.

Keywords: Fair value accounting, historical cost, DEA, financial statement analysis, Thai insurance Companies

1. Introduction

Fair value is the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date or an estimated value when it is difficult to determine the current price (IASB, 2013). Fair value estimates of investment securities provide significant explanatory power beyond that provided by historical costs. Strikingly, historical costs provide no significant explanatory power incremental to fair values (Barth, 1994). The two defining characteristics of financial reporting are 'reliability' and 'relevance'. Fair value accounting provides relevant information to investors and stakeholders as compared with the historical cost basis that provides reliable information. The views of many accounting practitioners and scholars have changed from 'reliability' to 'relevance' of financial reporting to the stakeholders and users, in the past few decades.

Preparing the financial statements with fair value accounting will change the accounting numbers compared to their preparation by using the historical costs. This might also have an effect on the financial statement analysis. A change from historical cost to the fair value accounting (in accordance with the IFRS), will therefore, alter the analysts and stakeholders decision making towards the companies, whose financial information is being compared. Rodríguez-Pérez et al. (2011) conducted research on Spanish insurance companies and advocated that the numbers on the face of the financial statements changed considerably on restating the financial statements on fair-value and observed that the magnitude of these changes varies between companies and classes of assets. Information on the fair value of financial investments had higher explanatory power of market-to-book ratios over and above the information already contained in historical costs, although it only accounted for a modest portion of the variation (Eccher et all., 1996).

However, only in a few cases does a change in the valuation basis lead to a relevant change in Data Envelopment Analysis (DEA) scores (Rodríguez-Pérez *et al.*, 2011). Most of the studies done in the past have been unable to answer specifically whether the purported informational benefits of fair-value accounting can actually alter the users' decisions like whether to invest in a company or not. This paper explores whether change from the historical cost to fair value accounting will have a significant impact on the face of the financial statements in the Thai insurance companies. The study also addresses the degree to which the company's efficiency and profitability will be altered. This study will be undertaken by using the DEA model for the analysis of financial statements of Thai insurance companies.

This paper addresses whether a change from historical cost to the fair value affects the financial statement analysis and the extent to which the efficiency of a Thai insurance company changes as reflected through the financial statements. The point here is to analyze whether fair value accounting instead of the historical costs, will lead users to position a company different from its competitors. For this purpose, a non-parametric, linear programming based technique that turns any number of variables into one overall score, relative to best in class observations has been used. Specifically, DEA analysis has been performed on financial statement items commonly used in a DuPont analysis like asset-turnover and profit margin ratios and the results of fair value have been contrasted with the historical cost for the same sample of Thai insurance companies.

Some authors in the management-science and operations-research like Thanassoulis *et al.* (1996), Berger and Humphrey (1997), and Feroz *et al.* (2003), have suggested that DEA might be superior to traditional financial ratios analysis or at least complement it. The study will help the financial statement analysts and preparers in understanding the value of financial items & relevance of fair values better and the investors in making sound financial decisions based on the analysis of financial statements. This study will also contribute towards the relevance of use of DEA analysis for financial statement analysis to the academia and analysts.

2. Literature Review
Financial Statement Analysis
Financial statements include the Statement of profit or loss and other comprehensive income, Statement of financial position, Statement of changes in equity, Statement of cash flows of a company and Notes to financial Statements. Financial analysis is an essential instrument for assessing the financial position of enterprises (Kulchev, 2017). Kulchev (2017) advocates that the key areas of financial analysis include revenue, business performance, turnover, profitability, inventory and capital structure, liquidity and indebtedness. Financial statement analysis is important for the users of financial information of a company like shareholders in analyzing the financial health and for the managers to take operating, financing and investing decisions.

Fair Value and historical costs
Fair value accounting is the practice of accounting that values certain assets and liabilities at their current market value. Theoretically, fair value accounting seeks to capture and report the present value of future cash flows associated with an asset or a liability. Businesses and market participants should understand this measure to represent "the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date." (SFAS No. 157 FASB, par. 5). According to Rahmawati (2006), HCA (Historical cost accounting) basis entails that most assets and liabilities should be measured and reported at their acquisition price (historical price).

The relevance of historical cost based financial statements has been subject to debate and controversy among the practitioners, scholars and the accountants across the globe. There has been a movement to shift from the historical costs to the fair value accounting, particularly in the past two decades or so. Barth (1994) advocated that the fair value estimates of the investment securities provided more explanatory power than that provided by the historical costs. FVA (Fair value accounting) is more useful and reliable during the stable market condition than during the period of financial markets' turmoil (Menicucci & Paolucci, 2017).

There are other studies which investigate the motivations for the companies to revalue. Missonier-Piera (2007) suggests that in Switzerland, the companies that revalue assets are the ones which are more indebted companies and have less opportunities of investment. His study concludes that revaluations improve the perception of international stakeholders on the financial health of a company and thereby improves its borrowing capacity. Many studies have been done to compare the fair value accounting with the historical costs to know which one is better for the companies and the stakeholders. Hitz (2007) found that comparative analysis of fair value accounting with historical accounting yielded mixed results. His findings indicate that the decision relevance of **fair value** measurement can be justified from both perspectives, measurement and information, yet the conceptual case is not strong. Fair value accounting and historical cost should be used in tandem to get rid of disadvantages of both these methods (Ari & Yilmaz, 2015).

DEA Analysis
Data envelopment analysis (DEA) is a linear programming based technique for measuring the relative performance of organizational units where the presence of multiple inputs and outputs makes comparisons difficult. Data Envelopment Analysis (DEA) is a non-parametric, linear-programming-based technique that turns any number of variables into one overall score, relative to best-in-class observations (Rodríguez-Pérez *et al*., 2011).
DEA analysis has not been used extensively for the purpose of financial statement analysis, although the trend is growing. Halkos and Salamouris (2004) suggested that data envelopment analysis can be used as either an alternative or complement to ratio analysis for the evaluation of an organization's performance. A major advantage of the DEA approach is that it clearly identifies the factors contributing to the performance of company over its competitors (Malhotra & Malhotra, 2008).

In the insurance sector, the research on financial analysis using the DEA approach is scarce. Chhikara and Rani (2012) applied the DEA technique to measure the technical efficiency, overall technical efficiency and scale efficiency of life insurance companies in India and were able to suggest the best and inefficient insurers based on the efficiency scores. Mostly, the research in has been directed towards two areas. The first one is how the insurance companies maintain solvency and achieve a sound financial position. The other concerns the efficiency in which that use the inputs in the process of generating outputs. Wanke and Barros (2016) used the two stage DEA-data mining approach and suggested that efficiency is affected by different type of insurance and regions. Sinha (2016) developed a robust performance indicator using a smoothened bootstrap data envelopment analysis. He found that, while ownership has a significant impact on efficiency, the same cannot be said about solvency.

Research Hypothesis
Specifically, this research focuses on two main issues. The first is the extent to which restating the financial statements i.e. the use of the fair value instead of historical costs will impact the financial statements. The second is whether the conclusions drawn from financial statements analysis will be different when the fair value basis is used.

H1: There are significant changes in numbers when the financial statements of Thai insurance companies are restated on fair value basis.

H2: The conclusions drawn from financial statements analysis will be different when the fair value basis is used.

Further, two sub-hypothesis for hypothesis 2 have been formulated:

H2:1 When a Thai insurance company changes from historical cost to fair value, its efficiency changes.

H2:2 When all the insurance companies in an industry change from historical cost to fair value, then a company's efficiency relative to each other changes.

3. Methodology
Sample and data collection

The annual reports of a sample of ten Thai insurance public companies limited were obtained. These companies were considered as all the financial information needed could be obtained from their annual reports including the fair values of some of the assets, in order to test the hypothesis and analyze the findings. This research is based on the secondary data which is the annual reports/financial statements of the insurance companies. This information was obtained from the websites of these companies. The Securities and Exchange Commission Thailand (SEC) and the Stock Exchange of Thailand (SET)websites were used to gather financial information. The main reason for selecting the insurance companies is that they have a high proportion of tangible and financial investments on their balance sheets which are likely to show considerable differences in fair value and historical cost measures.

Therefore, the financial statement analysis using these two different bases will be clearly observed. The information of revenues and expenses was collected from the balance sheet and statements of income of these companies based on historical cost. The fair values and historical cost information of a) available-for-sale investments b) other investments were also extracted from the notes to the financial statements. Thus, there were two sets of data obtained for some of these items, the set based on historical cost and for the same set of items based on fair values. This helped in analyzing and testing hypothesis 1 and 2.

Measures

a. The asset-turnover and profit margin ratios were focused upon to obtain a summary measure for the conclusions drawn from analysis of financial statements based on fair value drawn from the analysis of two sets of financial statements. Data envelopment analysis (DEA) was then used to simulate the process of mapping the multiple financial statement items related to these ratios into a one-dimensional score.

b. The financial statement items were compared based on historical cost with that of fair value in order to study Hypothesis 1. For that, standard deviation was used.

c. In order to contrast hypothesis 2.1, a pair-wise comparison was performed of the DEA scores of historical costs and fair value obtained in Step b.

d. The two sets of DEA scores were co-related and checked whether the differences in scores were statistically significant. It was also determined if the ranking of the insurance companies changed if the DEA based fair value scores were used, to evaluate hypothesis

DEA Analysis

DEA software DEAP and SPSS software were used in undertaking the research and testing the hypothesis. SPSS software has been used in finding the measures like Standard Deviation. DEA converts multiple input and output measures for a set of decision making units into a single

comprehensive measure of efficiency (Rodríguez-Pérez *et al*., 2011). It was used intesting hypothesis H2.1 and H2.2. It is a powerful tool of analyzing the efficiency. The framework has been adopted from multiple- input, multiple-output production functions and has been applied in many industries. In DEA model used in this study, the input variables consisted of three, namely total expense, available-for-sale investments and other financial investments and one output, namely the total revenues. The reason for taking these inputs is that they are the major resources which generate the total revenues of the company.

In an insurance company, the assets viz. the financial investments like the available-for-sale investments form a major chunk of its assets. So, they have been taken as inputs. Please refer to the table below:

Table 1: Input and Output Variables used in DEA models

Total expense	Total revenues
Available for sale securities	
Other financial Investments	

An example of simple DEA with one input and output is explained by the diagram below:
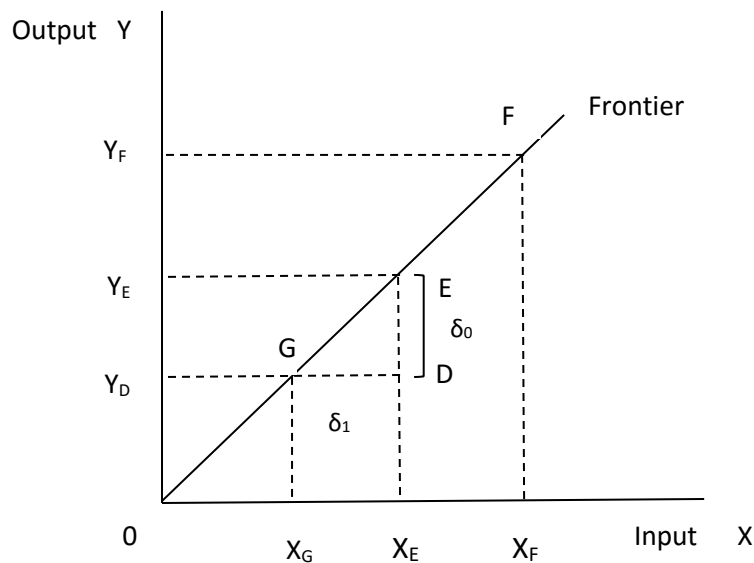

Figure 1: DEA Analysis

The points E and F represent the most efficient firms among a set of observations. This curve from 0 and connecting E and F is called the efficiency frontier as it shows the interpolation of the most efficient combinations of input and output. Firm D is inefficient because its input is more (X_E) and output less (Y_D), compared to the firms on the efficient frontier.

For it to be efficient, there are two ways:

1. Firm D should improve its output by δ_0

$$\alpha = \frac{Y_E/X_E}{Y_D/X_E} > 1$$

Here α represents the factor by which Firm D's output should be increased so that it becomes fully efficient. This approach is called the output-oriented approach because it focuses on improving the output.

    OR

2. Firm D should decrease its input by δ_1

$$\beta = \frac{Y_D/X_G}{Y_D/X_E} > 1$$

Here β represents the factor by which Firm D's input should be decreased so that it becomes fully efficient. This approach is called the input-oriented approach because it focuses on decreasing the input and maximizing efficiency.

An output oriented approach and constant returns-to-scale has been assumed. The mathematical equation mentioned below was originally derived in Charnes *et al.*, (1978) and is generally referred to as the "CCR ratio form of DEA". Let us assume that there are S decision making units (DMUs) to be investigated, each uses *m* inputs to produce n outputs.

Also, let DMU_k, *(1<k<S)* uses a combination of *m* inputs, denoted by $X_k = \{X_{k1}, X_{k2}, ..., X_{km}\}$ to produce *n* outputs, denoted by $Y_k = \{Y_{k1}, Y_{k2}, ..., Y_{kn}\}$. The relative efficiency, E_k for DMU_k is defined as

$$E_k = \frac{\sum_{j=1}^{n} h_j Y_{kj}}{\sum_{i=1}^{m} c_i X_{ki}}, \qquad k = 1, 2, \dots\dots\dots, S \qquad (1)$$

where the weights c_i represents the price (i.e. the value or shadow cost) of one unit of input X_{ki}, $1 \le i \le m$, $\forall\ k = 1, 2, ..., S$, and h_j represents the price (or the value of the contribution) of one unit of output Y_{kj}, $1 \le j \le n$,

$$\forall\ k = 1, 2, \dots\dots\dots, S$$

According to Mohamad & Said (2011), in order that the performance of the firm gets better, there should be possible improvements in the levels of outputs. This leads to an equivalent dual output-oriented DEA model which is given by:

maximize Ω_0

subject to

$$-X_{0i} + \sum_{k=1}^{S} X_{ki} \lambda_k \le 0, \qquad i = 1, 2 \dots\dots\dots, n \qquad (2)$$

$$-Y_{0j}\Omega_0 + \sum_{k=1}^{S} Y_{kj} \lambda_k \ge 0, \qquad j = 1, 2 \dots, m,$$

$$\lambda_k \ge 0, \qquad k = 1, 2 \dots\dots, S, \qquad (3)$$

$$\Omega_0\ \text{unconstrained.}$$

The above model is the output-oriented model under constant return to scale, CRS.

4. Results

The following information have been taken from the financial statements, annual reports and notes of Thai insurance companies for the one year ended on 31st December 2016. This data pertains to ten (10) insurance companies (Public Limited Company) in Thailand.

PCL means Public Company Limited. All figures in **Baht '000**

Firms/Insurance Companies	Decision making units (DMUs)/Insurance Companies	Revenues	Expenses	Available-for-sale investments - Amortised Cost	Available-for-sale investments - Fair Value	Other investments - Cost	Other Investments - Fair value
1	Bangkok Insurance PCL	13,457,776	10,635,882	9,554,845	37,139,029	687,173	1,422,347
2	Bangkok Life Assurance PCL	55,482,436	49,384,265	57,335,352	65,314,232	135,389	155,100
3	Krungthai-AXA Life insurance PCL	62,570,439	56,213,790	178,569,910	186,609,603	6,065,408	6,835,310
4	Thaire Life Assurance PCL	2,054,364	1,668,366	714,368	719,919	73,299	73,299
5	FWD Life Insurance PCL	23,666,617	23,111,845	71,460,825	77,130,975	9,124,000	10,050,000
6	Sri Ayudhya General Insurance PCL	2,270,414	2,152,181	382,002	385,407	121	550
7	The Navakij Insurance PCL	2,906,708	2,835,367	2,103,886	2,260,006	86,881	285,273
8	The Thai Insurance PCL	1,682,042	1,634,952	777,072	768,758	8,100	40,200
9	Muang Thai Insurance PCL	8,930,966	8,145,730	6,916,896	6,848,100	56,100	95,000
10	Thaivivat Insurance PCL	2,847,136	2,821,745	1,851,597	1,967,182	271,693	255,051

From the data above, it is clear that the hypothesis 1 is accepted because there are significant changes in numbers when the financial statements of insurance companies are restated on fair value basis. Available-for-sale investments and other investments show a significant change when in numbers when they are restated from historical cost to the fair value basis. The mean, median and standard deviation of the same also suggest significant change in numbers on restatement. The reason for this is that the current market value of these investments is different from their historical cost. To a financial analyst, it will seem obvious as normally the fair values of financial investments depend on how well the economy and the stock markets of the country are performing. Having said that, the real data has been brought out to substantiate this hypothesis.

Statistics

The skewness and Kurtosis of all the descriptives like revenues, expenses are not near to zero. So, the data is not normally distributed. Further, the Kolmogorov-Smirnov test also indicated that for all the variables mentioned above, the significance is close to zero or zero. This suggests that the data is not normally distributed. So, it makes sense to do further analysis by using a non-parametric technique like the DEA.

Input and Output variables used in DEA Models **(in Baht '000)**

	Revenues (Output variable)	Expenses (Input variable)	Available-for-sale investments - Amortised Cost (Input variable)	Available-for-sale investments - Fair Value Cost (Input variable)	Other investments – Cost (Input variable)	Other Investments - Fair value (Input variable)
Mean	17,586,890	15,860,412	32,966,675	37,914,321	1,650,816	1,921,213
Median	5,918,837	5,490,549	4,510,391	4,554,053	111,135	205,076
Std. Deviation	22,973,695	20,610,114	57,311,470	59,721,355	3,220,854	3,543,742
Minimum	1,682,042	1,634,952	382,002	385,407	121	550
Maximum	62,570,439	56,213,790	178,569,910	186,609,603	9,124,000	10,050,000
Kolmogorov-Smirnov (Sig.)	.002	.002	.000	.001	.000	.000

Historical cost basis

The ten insurance companies are called Decision making units (DMUs) in DEA analysis. On undertaking the DEA analysis, with revenue as the output and expenses, available-for-sale investments - amortised Cost & other investments at cost as inputs, the DEA efficiency came out as follows:

DEA efficiency (historical cost)

firm	te (technical efficiency)
1	1.000
2	1.000
3	0.880
4	1.000
5	0.809
6	1.000
7	0.857
8	0.943
9	0.979
10	0.809
mean	0.928

From the above (previous page), it is clear that following is the ranking of insurance companies based on historical cost.

Ranking of insurance companies

1	Bangkok Insurance PCL
1	Bangkok Life Assurance PCL
1	Thaire Life Assurance PCL
1	Sri Ayudhya General Insurance PCL
5	Muang Thai Insurance PCL
6	The Thai Insurance PCL
7	Krungthai-AXA Life insurance PCL
8	The Navakij Insurance PCL
9	FWD Life Insurance PCL
9	Thaivivat Insurance PCL

Fair value basis
On undertaking the DEA analysis, with revenue as the output and expenses, available-for-sale investments – fair value & other investments at fair value as inputs, the DEA efficiency came out as follows:

DEA efficiency (fair value)

firm	te
1	1.000
2	1.000
3	0.883
4	1.000
5	0.810
6	1.000
7	0.830
8	0.886
9	0.969
10	0.817
mean 0.920	

From the above, it is clear that following is the ranking of insurance Companies based on Fair Value:

Ranking of insurance companies

1	Bangkok Insurance PCL
1	Bangkok Life Assurance PCL
1	Thaire Life Assurance PCL
1	Sri Ayudhya General Insurance PCL
5	Muang Thai Insurance PCL
6	The Thai Insurance PCL
7	Krungthai-AXA Life insurance PCL
8	The Navakij Insurance PCL
9	Thaivivat Insurance PCL
10	FWD Life Insurance PCL

The sub-hypothesis of hypothesis 2, H2:1 was that 'when a Thai insurance company changes from historical cost to fair value, its efficiency changes.' Looking at the above results, it can be said that for some of the insurance companies, the efficiency does not change while for some it does change, when they change from historical cost to fair value basis. For instance, the firms 1 and 2 i.e. Bangkok Insurance PCL and Bangkok Life Assurance PCL, the efficiency is 1, when they change from historical cost to fair value basis. But for insurance companies, The Navakij Insurance PCL, The Thai Insurance PCL and Muang Thai Insurance PCL, the efficiency gets less when they shift from historical cost to fair value basis. Overall, we can say that the hypothesis holds true for some companies, in that the efficiency changes on shifting to fair value basis.

Sub-hypothesis of hypothesis 2, H2:2 was that 'when all the insurance companies in an industry change from historical cost to fair value, the company's efficiency relative to each other changes.' Looking at the above results, it can be firmly said that this hypothesis is rejected. As is seen clearly from the above DEA analysis of information, the companies' relative efficiency to each other does not change at all, except for FWD Life insurance PLC and Thaivivat PLC.

Even for FWD Life insurance PLC and Thaivivat PLC, there is a marginal change in rankings as under historical cost they were ranked at number nine (both) whereas under the fair value basis analysis based on DEA, their respective ranks have changed marginally to number ten and nine respectively.

5. Conclusion and Recommendations

The financial statements have been prepared on a historical cost basis except where otherwise disclosed in the Notes to the financial statements. In all the companies that have been studied for the purpose of research here, the available-for-sale investments have been measured at fair value by all the Thai insurance companies. They have also mentioned historical cost and fair value numbers for some of the investments in the Notes to the financial statements. The Thai Financial Reporting Standards issued by the Federation of Accounting Professions have been harmonized to a great extent with that of the International Financial Reporting Standards (IFRS) prepared by the IASB. It is quite clear from the DEA analysis of DMUs (Decision making units/insurance companies) undertaken that the efficiency of insurance companies relative to each other did not change when all of them shifted from historical cost to the fair value based on the variables considered.

That is, there is unlikely to be any change in the rankings based on either of these basis and therefore difficult for investors and other stakeholders to make investment and other decisions. Although, an (individual) insurance company's efficiency might change when it shifts from historical basis to fair value basis. This adds to the debate for analysts and academia as to the relevance and utility of fair values vs historical values in decision-making contexts. Although, it can be affirmed that the fair values of some significant assets are different from the historical costs, the relative efficiency of the companies does not change much when shifting from one method to another based on the findings.

Thus, the investor will find the efficiency rankings of either of the basis to be almost the same. Other researches similar to this also have not been able to bring out any clear findings in this context and are often contradictory. In future, some more input variables like premises and equipment can be added to bring out better results as it comprises a major chunk of assets. This time this could not be done because the fair values of it were not mentioned in insurance companies' annual reports. In order to get the fair values of Premises and Equipment, probably in future the insurance companies headquarters can be visited and information solicited from them. In future, the study can use DEA analysis by considering financial statements of the latest three years instead on just one, in order to generate better results and optimize the business cycle.

Limitations

As pointed out above, this research can include some other assets like premises and equipment in the input variables. This research takes into account only ten insurance companies. This number could be increased when undertaking future research as there are twenty four Insurance companies (Public Company Limited) in Thailand. Initially, the intention was to include twelve insurance companies, but some of the insurance companies financial statements in English could not be found. This research takes into account only the insurance companies which generally have high amount of financial investments. Such research should also be undertaken in other industries like Oil and Gas, manufacturing etc. which can come out with interesting results.

References

Ari, M., & Yilmaz, R. (2015). Avantaj ve Dezavantajları Açısından Gerçeğe Uygun Değer ile Maliyet Değeri Muhasebesinin Karşılaştırmalı Olarak İncelenmesi. *Journal of Accounting & Finance*.

Barth, M. E. (1994). Fair value accounting: Evidence from investment securities and the market valuation of banks. *Accounting Review*, 1-25.

Benston, G. J. (2008). The shortcomings of fair-value accounting described in SFAS 157. *Journal of Accounting and Public Policy*, **27**(2), 101-114.

Berger, A. N., & Humphrey, D. B. (1997). Efficiency of financial institutions: International survey and directions for future research. *European journal of operational research*, **98**(2), 175-212.

Charnes, A., Cooper, W. W., & Rhodes, E. (1978). Measuring the efficiency of decision making units. *European journal of operational research*, **2**(6), 429-444.

Chhikara, K. S., & Rani, S. (2012). Data Envelopment Analysis: A Study Measuring Efficiency of Public Sector Banks in India by using Data Envelopment Analysis: A Study. *Journal of Institute of Public Enterprise*, 35.

Coelli, T. (1996). A guide to DEAP 2.1. *A data envelopment analysis (computer) program, CEPA Work Paper*, **8**.

Eccher, E. A., Ramesh, K., & Thiagarajan, S. R. (1996). Fair value disclosures by bank holding companies. *Journal of accounting and economics*, **22**(1), 79-117.

Feroz, E. H., Kim, S., & Raab, R. L. (2003). Financial statement analysis: A data envelopment analysis approach. *Journal of the operational Research Society*, **54**(1), 48-58.

Halkos, G. E., & Salamouris, D. S. (2004). Efficiency measurement of the Greek commercial banks with the use of financial ratios: a data envelopment analysis approach. *Management accounting research*, **15**(2), 201-224.

Hitz, J. M. (2007). The decision usefulness of fair value accounting–a theoretical perspective. *European Accounting Review*, **16**(2), 323-362.

IASB, International Accounting Standards Board. (2013). International Financial Reporting Standard 13, *Fair Value Measurements*.

Kulchev, K. (2017). The Interpretation Of Financial Statements In Terms Of Contemporary Financial Analysis. *Business Management / Biznes Upravlenie*, (1), 74.

Malhotra, D. K., & Malhotra, R. (2008). Financial Statement Analysis Using Data Envelopment Analysis. *Proceedings For The Northeast Region Decision Sciences Institute (NEDSI)*, 330-335.

Menicucci, E., & Paolucci, G. (2017). Fair Value Accounting within a Financial Crisis: An Examination of Implications and Perspectives. *INTERNATIONAL JOURNAL OF BUSINESS AND SOCIAL SCIENCE*, **8**(2), 41-56.

Missonier-Piera, F. (2007). Motives for fixed-asset revaluation: An empirical analysis with Swiss data. *The International Journal of Accounting*, **42**(2), 186-205.

Mohamad, N. H., & Said, F. B. (2011). Comparing macroeconomic performance of OIC member countries. *International Journal of Economics and Management Sciences*, **1**(3), 90-104.

Rahmawati, E. (2016). Support and Against Historical Cost Accounting: Is it Value Relevance for Decision Making?. *Jurnal Akuntansi dan Investasi*, **7**(1), 113-125.

Rodríguez-Pérez, G., Slof, J., Solà, M., Torrent, M., & Vilardell, I. (2011). Assessing the Impact of Fair-Value Accounting on Financial Statement Analysis: A Data Envelopment Analysis Approach. *Abacus*, **47**(1), 61-84.

Sinha, R. P. (2016). Efficiency-Ownership-Solvency Linkage of Indian General Insurance Companies : A Bootstrap DEA Approach. *Journal of Institute of Public Enterprise*, **39**(3/4), 1-20.

Thanassoulis, E., Boussofiane, A., & Dyson, R. G. (1996). A comparison of data envelopment analysis and ratio analysis as tools for performance assessment. *Omega*, **24**(3), 229-244.

Wanke, P., & Barros, C. P. (2016). Efficiency drivers in Brazilian insurance: A two-stage DEA meta frontier-data mining approach. *Economic Modelling*, *538*-22. doi:10.1016/j.econmod.2015.11.005

Websites

Http://www.bangkokinsurance.com. (n.d.). Retrieved from http://www.bangkokinsurance.com/investor_file/Annual/annual_2560TH.pdf

Http://www.sagi.co.th. (n.d.). Retrieved from http://www.sagi.co.th/uploads/pdf/SAGI-Annual-Report-2016_EN.pdf

Https://www.set.or.th. (n.d.).

Http://www.sec.or.th/EN/Pages/Home.aspx

Https://www.bangkoklife.com. (n.d.). Retrieved from https://www.bangkoklife.com/Corporate/Upload/InvestorFile/28fdd81f504344ccb6f497be670d1137.pdf

Https://www.krungthai-axa.co.th. (n.d.). Retrieved from https://ktaxa.cdn.axa-contento-118412.eu/ktaxa/fcf7d210-05db-4208-aed8-df8f3c1462c1_company-performance-2559-q4-en.pdf.pdf

Http://www.thairelife.co.th. (n.d.). Retrieved from http://www.thairelife.co.th/upload/ir/quarterly/filee_20170504140120.pdf

Https://www.fwd.co.th. (n.d.). Retrieved from http://www.thairelife.co.th/upload/ir/quarterly/filee_20170504140120.pdfhttps://www.fwd.co.th/~/media/Files/FWDTH/pdf/about/financial-report/Financial-Reports-Q4-2016.pdf

Http://www.navakij.co.th. (n.d.). Retrieved from http://www.navakij.co.th/nkiweb-web/page/37

Https://www.thaiins.com. (n.d.). Retrieved from https://www.thaiins.com/home/upload/content/_1523415736.pdf

Https://www.thaivivat.co.th. (n.d.). Retrieved from https://www.thaivivat.co.th/en/investor_annual.php

Http://www.muangthaiinsurance.com. (n.d.). Retrieved from http://www.muangthaiinsurance.com/th/investorrelations/annual-report/

IFRS 13 Fair Value Measurement. (n.d.). Retrieved August 10, 2017, from http://www.ifrs.org/issued-standards/list-of-standards/ifrs-13-fair-value-measurement/