

**MEASURING THE EFFICIENCY BETWEEN CONVENTIONAL GENERAL
INSURANCE AND GENERAL TAKAFUL IN MALAYSIA**

By

CHEAH CHEE KEONG

Thesis Submitted to

Othman Yeop Abdullah Graduate School of Business,

Universiti Utara Malaysia,

in Partial Fulfillment of the Requirement for the Master of Sciences (Finance)

PERMISSION TO USE

(For Master Sciences by Coursework Candidate)

In presenting this thesis in fulfillment of the requirements for a Post Graduate degree from the Universiti Utara Malaysia (UUM), I agree that the Library of this university may make it freely available for inspection. I further agree that permission for copying this thesis in any manner, in whole or in part, for scholarly purposes may be granted by my supervisor(s) or in their absence, by the Dean of Othman Yeop Abdullah Graduate School of Business where I did my thesis. It is understood that any copying or publication or use of this thesis or parts of it for financial gain shall not be allowed without my written permission. It is also understood that due recognition shall be given to me and to the UUM in any scholarly use which may be made of any material in my thesis.

Request for permission to copy or to make other use of materials in this thesis in whole or in part should be addressed to:

Dean of Othman Yeop Abdullah Graduate School of Business

Universiti Utara Malaysia

06010 UUM Sintok

Kedah Darul Aman

Abstract

One of recommendations to achieve the vision of The Financial Sector Blueprint launched by Bank Negara Malaysia (BNM) in year 2011 is to intensify the internationalization of Islamic finance through regional and global takaful/ retakaful outreach in Malaysia. While these discussions continue, the performance, particularly in the general or non-life sector whether has consistently achieve a productivity level that outpaced the conventional general insurance in Malaysia. This thesis examines the efficiency of general insurance and takaful industry in Malaysia during the period 2009 to 2013. A total of 31 of general insurance and 8 general takaful operators are selected in this study which cover all the firms in the general insurance industry. The inputs of claim expenses and management expenses, outputs of premium/ contribution earn and investment income are selected based on approach consistent with several literature to measure the efficiency scores. This study employed a non parametric approach which is Data Envelopment Analysis (DEA) base on input orientation measurement to estimate the technical efficiency, pure technical efficiency and scale efficiency to compare the difference between both industries sector. The model results based on constant return to scale (CRS) and variable return to scale (VRS) to assess the efficiency scores between both industries sector. The findings indicate that there is a significant difference in efficiency between takafui industry and insurance industry where that takaful has higher efficiency than conventional insurance throughout the year 2009 to 2013. The finding shows that the general takaful industry improves of their efficiency compare with previous literature where takaful have lower efficiency compare to conventional insurance. The Malmquist productivity index shows a significant improvement in overall productivity of both industry sectors. The study suggests diversified and more selective of risk business while underwrites the risk portfolio in general insurance and takaful industry in Malaysia reduce the claim ratio.

Key words: DEA, Efficiency, Insurance, Islamic, Takaful

Abstrak

Salah satu cadangan dalam pengantarabangsaan kewangan Islam di Malaysia untuk mencapai visi Pelan Sektor Kewangan yang dilancarkan oleh Bank Negara Malaysia (BNM) pada tahun 2011 adalah mengukuhkan integrasi kewangan serantau dan antarabangsa dalam bidang takaful. Padahal, sektor takaful am di Malaysia hari ini sama ada telah mencapai satu tahap produktiviti yang mengejar konvensional insurans am. Tesis ini mengkaji tahap kecekapan konvensional insurans am dan takaful am di Malaysia pada tahun 2009 hingga tahun 2013. Sebanyak 31 daripada syarikat konvensional insurans am dan 8 syarikat takaful am yang merangkumi semua syarikat di dalam industri dipilih dalam kajian ini. Perbelanjaan tuntutan dan perbelanjaan pengurusan dipilih sebagai faktor, sumbangan premi dan pendapatan perlaburan dipilih sebagai pendekatan untuk menguji skor kecekapan yang konsisten dengan kajian literatur terkenal. Kajian ini menggunakan Data Envelopment Analysis (DEA) berdasarkan penilaian input untuk menganggar kecekapan teknikal, kecekapan pure teknikal dan kecekapan skala untuk membuat perbandingan sama ada perbezaan antara sector konvensional insurans am dan takaful am. Model penilaian berdasarkan pulangan berterusan kepada skala (CRS) dan pulangan berubah kepada skala (VRS) digunakan untuk menilai skor kecekapan. Hasil kajian menunjukkan bahawa takaful mempunyai kecekapan yang lebih tinggi daripada konvensional insurans kebelakangan ini. Hasil kajian juga menunjukkan bahawa industri takaful am mencapai peningkatan dalam keekapan berbandingkan dengan literatur sebelumnya di mana takaful mempunyai lebih skor kecekapan lebih rendah. Indeks Malmquist perubahan produktiviti juga menunjukkan peningkatan keseluruhan yang ketara bagi kedua-dua sektor. Kajian ini mencadangkan insurans am dan takaful am mempelbagaikan risiko dengan lebih berwaspada apabila menilai insurans baru untuk mengurangkan nisbah tuntutan.

Kata kunci: DEA, Kecekapan, Insurans, Islam, Takaful

Acknowledgments

First and foremost, I wish to express my deepest gratitude and sincere gratitude to my supervisor, Dr. Norshafizah Hanafi for her kind encouragement and patient while this thesis was in process. She provided me with invaluable guidance and support to develop my research skill while completing the project paper. Also special thanks to all the lectures and staff of the University Utara Malaysia for their teaching, guidance and assistance which help a lot to me.

I would like to thank my family especially my father A.L. Cheah for his encouragement. I will forever be grateful to my wife and my children for their patience and many sacrifices they made to enable me to complete my postgraduate study. Not forgetting, special thanks to all my friends in UUM Kuala Lumpur to make this learning process full of enjoyment.

Finally, a sincere appreciation to Ministry of Education Malaysia to provide the MyBrain 15 scholarship which the financial support helping a lot for me to complete the study.

CONTENTS

LIST OF TABLES	IX
LIST OF FIGURES	XI
LIST OF ABBREVIATIONS/NOTATION/GLOSSARY OF TERM.....	XII
CHAPTER ONE	1
INTRODUCTION	1
1.1 Introduction	1
1.2 Background of the Study	1
1.1.1 Conventional Insurance Industry	2
1.1.2 Takaful Industry	4
1.3 Problem Statement	6
1.3 Research Question	7
1.4 Research Objective	8
1.5 Significance of Study	8
1.6 Scope and Limitations of the Study	10
1.6.1 Input Limitation	10
1.6.2 Country Limitation.....	10
1.6.3 Lack of Information Sauce	11
1.7 Organization of the Thesis	11
CHAPTER TWO	13
LITERATURE REVIEW.....	13
2.0 Introduction	13
2.1 Agency Theory	13
2.2 Efficiency Measurement Theory	15
2.3 Insurance	17
2.4 Takaful.....	19
2.5 Malaysia Studies.....	21
2.6 International Studies on Conventional Insurance Efficiency	23
2.6 International Studies on Takaful Efficiency.....	29
2.7 Chapter Summary.....	30
CHAPTER THREE.....	32
METHODOLOGY.....	32
3.0 Introduction	32

3.1	Research Framework	32
3.2	Hypotheses/Propositions Development.....	33
3.3	Research Design	34
3.4	Operational Definition.....	35
3.4.1	Data Envelopment Analysis (DEA).....	35
3.4.2	Decision Making unit (DMU).....	36
3.4.3	Constant Returns to Scale (CRS)	36
3.4.4	Variable Returns to Scale (VRS)	36
3.4.5	Technical Efficiency (TE).....	36
3.4.6	Pure Technical Efficiency (PTE)	36
3.4.7	Scale Efficiency (SE)	36
3.4.8	Malmquist Index	37
3.5	Measurement of Variables/Instrumentation	37
3.6	Data Collection.....	39
3.7	Sampling.....	39
3.8	Data Collection Procedures	42
3.9	Techniques of Data Analysis.....	43
3.9.1	The Constant Returns to Scale (CRS) Model	45
3.9.2	The Variable Returns to Scale (VRS) DEA Model	46
3.9.3	Technical Efficiency, Pure Technical Efficiency and Scale Efficiency 46	
3.9.4	Malmquist Index	48
3.9.5	Software application.....	50
3.10	Chapter Summary	51
	CHAPTER FOUR.....	52
	RESULTS AND DISCUSSION	52
4.0	Introduction	52
4.1	Demographic Profile Analysis	53
4.2	DEA Result Analysis.....	58
4.3	Performance of Total Productivity Change	68
4.4	Chapter Summary	70
	CHAPTER FIVE.....	73
	CONCLUSION AND RECOMENDATION	73
5.0	Introduction	73

5.1	Finding on Efficiency	73
5.2	Theoretical and Practical Contribution.....	75
5.3	Recommendations for Future Research	76
5.4	Conclusion.....	76
REFERENCE.....		77
APPENDIX.....		84

LIST OF TABLES

Table 1.1:	Premium and contribution between conventional general insurance and general takaful in Malaysia.	03
Table 3.1 :	Conventional insurers combine life and general business	40
Table 3.2 :	Conventional insurers for general business only	40
Table 3.3 :	Takaful operators combine family and general business	41
Table 3.4 :	M&A in general insurance and takaful in Malaysia 2009-2013	41
Table 4.1 :	Descriptive statistics comparison of inputs and outputs	57
Table 4.2 :	Technical efficiency scores 2009-2013	58
Table 4.3 :	Technical efficiency scores base on size 2009-2013	60
Table 4.4 :	Technical efficiency scores base on foreign and local firm 2009-2013	61
Table 4.5 :	Pure technical efficiency scores 2009-2013	62
Table 4.6 :	Pure technical efficiency scores base on size 2009-2013	64
Table 4.7 :	Pure technical efficiency scores base on foreign and local firm 2009-2013	65
Table 4.8 :	Scale efficiency scores 2009-2013	66
Table 4.9 :	Scale efficiency scores base on size 2009-2013	67
Table 4.10 :	Scale efficiency scores base on foreign and local firm 2009-2013	68
Table 4.11 :	Malmquist Index summary of annual means	68

Table 4.12 :	Malmquist Index summary of firms means	69
Table A1 :	Efficiency scores 2009	84
Table A2 :	Efficiency scores 2010	85
Table A3 :	Efficiency scores 2011	86
Table A4 :	Efficiency scores 2012	87
Table A5 :	Efficiency scores 2013	88
Table A6 :	Premium and contribution of general insurance and takaful 2009-2013	89
Table A7 :	Investment income of general insurance and takaful 2009-2013	90
Table A8 :	Management expenses of general insurance and takaful 2009-2013	91
Table A9 :	Net Claims of general insurance and takaful 2009-2013	92
Table A10 :	M&A in general insurance industry in Malaysia, 2010 – 2013	93

LIST OF FIGURES

Figure 3.1:	Research Framework	33
Figure 3.2 :	CRS, VRS and Scale Efficiency	47
Figure 3.3 :	Malmquist Index	50
Figure 4.1 :	Premium and contribution growth	53
Figure 4.2 :	Investment income growth	54
Figure 4.3 :	Management expenses comparison	55
Figure 4.4 :	Claim ratio comparison	56

LIST OF ABBREVIATIONS/NOTATION/GLOSSARY OF TERM

BNM	Bank Negara Malaysia
CSR	Constant Returns to Scale
DEA	Data Envelopment Analysis
EFFCH	Efficiency Change
M&A	Merger and Acquisition
MII	Malaysia Insurance Institute
MTA	Malaysia Takaful Association
PECH	Pure Efficiency Change
PTE	Pure Technical Efficiency
TE	Technical Efficiency
TECHCH	Technical Efficiency Change
TFP	Total Factor Productivity
TFPCH	Total Factor Productivity Change
SE	Scale Efficiency
SECH	Scale Efficiency Change
VRS	Variable Returns to Scale

CHAPTER ONE

INTRODUCTION

1.1 Introduction

This chapter provides introduction to the conventional insurance and takaful background of Malaysia and international context. The problem statement and research question are also discussed followed by the research objectives, research methodology, the current scope and possible limitations of the study, and finally the layout of the research of overall study.

1.2 Background of the Study

Since early 1960, Malaysia insurance industry has grown dramatically in the recent decades which bring economic growth and national income increase. A remarkable progress of the Malaysia insurance industry which began in the year 1988 when Bank Negara Malaysia (BNM) started to regulate and supervise the industry. Before this, the insurance industry in Malaysia had been facing a period of structural changes under the unregulated environment, and now towards a significant regulated sector similar to the banking industry as controlled by central bank. An Insurance sector Master Plan of Malaysia (IMP) designed by BNM since 1990s with its main objective to build local insurers to gain a competitive advantage in the global insurance market. On the other hand, consumers also being protected by the insurance products purchase and served by a wide range of the products development (BNM).

The contents of
the thesis is for
internal user
only

REFERENCE

- Abdul Kader, Adams & Hardwick (2010). The cost efficiency of takaful insurance companies. *Geneva Paper on Risk and Insurance: Issues & Practice*, 1, 161.
- Andersen, P., & Petersen, N. C. (1993). A procedure for ranking efficient units in data envelopment analysis. *Management science*, 39(10), 1261-1264.
- Archer, S., Karim, R. A. A., & Nienhaus, V. (2011). *Takaful Islamic Insurance: Concepts and Regulatory Issues* (Vol. 764): John Wiley & Sons. Hoboken.
- Arrow, K.J. (1965). Aspects of the Theory of Risk-Bearing, *Yrjo Johnsson Lectures*, Saatio, Helsinki Y.J.
- Bakar, M. D. (2009). Shari'ah Principles Governing Takaful Models. *Takaful Islamic Insurance: Concepts and Regulatory*, Issues, 31-45.
- Banker, R. D. (1984). Estimating most productive scale size using data envelopment analysis. *European Journal of Operational Research*, 17(1), 35-44.
- Barros, C. P., Ibiwoye, A., & Managi, S. (2008). Productivity Change of Nigerian Insurance Companies: 1994–2005. *African Development Review*, 20(3), 505-528. doi: 10.1111/j.1467-8268.2008.00196.x
- Barros, Carlos Pestana, Milton Nektarios, and A. Assaf. "Efficiency in the Greek insurance industry." *European Journal of Operational Research* 205.2 (2010): 431-436.
- Bhatty, A. (2010). The growing importance of Takaful insurance. *Paper presented at the Asia regional seminar, OCED and bank of Negara*, Kuala Lumpur.
- Biener, C., & Eling, M. (2012). Organization and efficiency in the international insurance industry: A cross-frontier analysis. *European Journal of Operational Research*, 221(2), 454-468.
- Bikker, J. A., & Van Leuvensteijn, M. (2008). Competition and efficiency in the Dutch life insurance industry. *Applied Economics*, 40(16), 2063-2084.
- BNM. (2014). Annual insurance and takaful statistic. Retrieved from Bank Negara Malaysia: <http://www.bnm.gov.my/index.php?ch=statistic&lang=en>
- Boonyasai, T., Grace, M.F., & H.D. Skipper (2002). The Effect of Liberalization and Deregulation on Life Insurer Efficiency, Center for Risk Management and Insurance Research Georgia State University Atlanta, GA Working Paper No. 02-2.
- Caves, D. W., et al. (1982). "Multilateral Comparisons of Output, Input, and Productivity Using Superlative Index Numbers." *The Economic Journal* 92(365): 73-86.

- Chaffai, M., & Ouertani, M. (2002). Technical efficiency in the Tunisian insurance industry: A comparison of parametric and non parametric time variant models: *Working Paper, Research Unit on Production Econometrics*, Sfax University, Sfax.
- Charnes, A., Cooper, W. W., Golany, B., Seiford, L., & Stutz, J. (1985). Foundations of data envelopment analysis for Pareto-Koopmans efficient empirical production functions. *Journal of Econometrics*, 30(1), 91-107.
- Charnes, A., Cooper, W. W., & Rhodes, E. (1981). Evaluating program and managerial efficiency: an application of data envelopment analysis to program follow through. *Management science*, 27(6), 668-697.
- Chen, F.-C., Liu, Z., & Kweh, Q. L. (2014). Intellectual capital and productivity of Malaysian general insurers. *Economic Modelling*, 36, 413-420.
- Choi, B. P., & Weiss, M. A. (2005). An Empirical Investigation of Market Structure, Efficiency, and Performance in Property and Liability Insurance. *Journal of Risk and Insurance*, 72(4), 635-673.
- Chou & Hau (2005). The estimation of efficiency for life insurance industry: The case in Taiwan. *Journal of Asian Economics*, 16, 847-860.
- Coelli, T. (1996). A Guide to DEAP 2.1: A Data Envelopment Analysis Program. *University of New England, Armidale*.
- Coelli, T. (2010). DEAP 2.1: *Centre for Efficiency and Productivity Analysis (CEPA)*. University of New England, Armidale.
- Coelli, T. J., Prasada Rao, D., O'Donnell, C. J., & Battese, G. E. (2005). *Data Envelopment Analysis*. An Introduction to Efficiency and Productivity Analysis, 161-181.
- Cooper, W. W., Seiford, L. M., & Tone, K. (2007). *Data envelopment analysis: A comprehensive text with models, applications, references and DEA-Solver Software. Second editions*. Springer, ISBN, 387452818, 490.
- Cooper, W. W., Seiford, L. M., & Zhu, J. (2011). *Handbook on data envelopment analysis* (Vol. 164): Springer.
- Cummins, J.D., Grace, M.F. & Phillips, R.D. (1999). Regulatory solvency prediction in property-liability insurance: risk-based capital, audit ratios, and cash flow simulation. *Journal of Risk and Insurance*, 66, 417-458.
- Cummins, J.D. & Nini, G. (2002). Optimal capital utilization by financial firms: evidence from the property-liability insurance industry. *Journal of Financial Services Research*, 21, 15-53.
- Cummins, J.D. & Outreville, F. (1987). An international analysis of underwriting cycles. *Journal of Risk and Insurance* 54, 246-262.

- Cummins, J. D., Rubio-Misas, M., & Zi, H. (2004). The effect of organizational structure on efficiency: Evidence from the Spanish insurance industry. *Journal of Banking & Finance*, 28(12), 3113-3150.
- Cummins J.D., S. Tennyson and M.A. Weiss (1999). "Consolidation and Efficiency in the US Life Insurance Industry." *Journal of Banking and Finance*, 23(2-4): 325-357.
- Cummins, J. D., & Weiss, M. A. (2000). The global market for reinsurance: Consolidation, capacity, and efficiency. *Brookings-Wharton Papers on Financial Services*, 3(2000), 159-209.
- Cummins, J. D., & Weiss, M. A. (2013). Analyzing firm performance in the insurance industry using frontier efficiency and productivity methods. *Handbook of insurance* (pp. 795-861): Springer.
- Cummins, J. D., & Xie, X. (2013). Efficiency, productivity, and scale economies in the US property-liability insurance industry. *Journal of Productivity Analysis*, 39(2), 141-164.
- Cummins, Weiss, Xie & Zi (2010). Economies of scope in financial services: A DEA efficiency analysis of the U.S insurance industry. *Journal of Banking and Finance*, 34, 1525-1539.
- Daraio, C., & Simar, L. (2007). *Advanced robust and nonparametric methods in efficiency analysis: Methodology and applications* (Vol. 4): Springer.
- Davutyan, N., & Klumpes, P. J. (2008). Consolidation and efficiency in the major European insurance markets: a non discretionary inputs approach: *Working Paper, Imperial College London*.
- Debreu, G. (1951). The coefficient of resource utilisation. *Econometrica*, 19, 273-292.
- Diacon, S. R., Starkey, K., & O'Brien, C. (2002). Size and efficiency in European long-term insurance companies: an international comparison. *Geneva Papers on Risk and Insurance. Issues and Practice*, 444-466.
- Diboky, F., & Ubl, E. (2007). Ownership and efficiency in the German life insurance market: a DEA bootstrap approach. *Paper presented at the 34 the Seminar of the European Group of Risk and Insurance Economics*, University of Cologne, September.
- Eling, M., & Luhnen, M. (2010a). Efficiency in the international insurance industry: a cross-country comparison. *Journal of Banking & Finance*, 34(7), 1497-1509.

- Eling, M., & Luhnen, M. (2010b). Frontier efficiency methodologies to measure performance in the insurance industry: overview, systematization, and recent developments. *The Geneva Papers on Risk and Insurance-Issues and Practice*, 35(2), 217-265.
- Ernst & Young (2012) "Industry Growth and Preparing for Regulatory Change: *The World Takaful Report 2012*," Dubai, UAE
- Fenn, P., Vencappa, D., Diacon, S., Klumpes, P., & O'Brien, C. (2008). Market structure and the efficiency of European insurance companies: a stochastic frontier analysis. *Journal of Banking & Finance*, 32(1), 86-100.
- Farrel, M.J. (1957). The measurement of productive efficiency. *Journal of Royal Statistical Society*, (A) 120, 253-81.
- Greene, W. H., & Segal, D. (2004). Profitability and efficiency in the US life insurance industry. *Journal of Productivity Analysis*, 21(3), 229-247.
- Fetcher, Perelman & Pestieau (1993). Productive performance of the French insurance industry. *Journal of Productivity Analysis* 4,(1-2), 77-93.
- Hao, J. C., & Chou, L.-Y. (2005). The estimation of efficiency for life insurance industry: The case in Taiwan. *Journal of Asian Economics*, 16(5), 847-860.
- Hardy, C. O. (1922). *Journal of Political Economy*, 30(5), 717. doi: 10.2307/1822743
- Hou, H., Cheng, S.-Y., & Yu, C.-P. (2012). Life Insurance and Euro Zone's Economic Growth. *Procedia - Social and Behavioral Sciences*, 57(0), 126-131. doi: <http://dx.doi.org/10.1016/j.sbspro.2012.09.1165>
- Htay, S. N. N., Arif, M., & Soualhi, Y. (2012). *Accounting, Auditing and Governance for Takaful Operations*. Somerset, NJ, USA: John Wiley & Sons.
- Huang, L. Y., Lai, G. C., McNamara, M., & Wang, J. (2011). Corporate governance and efficiency: evidence from US property-liability insurance industry. *Journal of Risk and Insurance*, 78(3), 519-550.
- Huang, W., & Eling, M. (2013). An efficiency comparison of the non-life insurance industry in the BRIC countries. *European Journal of Operational Research*, 226(3), 577-591. doi: <http://dx.doi.org/10.1016/j.ejor.2012.11.008>
- Hussain, M. M., & Pasha, A. T. (2011). Conceptual and operational differences between general takaful and conventional insurance. *Australian Journal of Business and Management Research*, 1(8), 23-28.
- Insurance Info. (2014). Your guide on fundamentals of Insurance and takaful. Retrieved from <http://www.insuranceinfo.com.my>

- Islamic Finance : Instruments and Markets. (2010). Huntingdon, GBR: *Bloomsbury Information Ltd. Malaysia Insurance Report - Q4 2012*. (2012) (pp. 1-97). London: Business Monitor International.
- Ismail, N., Alhabshi, D. S. O., & Bacha, O. (2011). Organizational form and efficiency: The coexistence of family Takaful and life insurance in Malaysia. *Journal of Global Business and Economics*.
- Jeng, V., & Lai, G. C. (2005). Ownership structure, agency costs, specialization, and efficiency: analysis of Keiretsu and independent insurers in the Japanese nonlife insurance industry. *Journal of Risk and Insurance*, 72(1), 105-158.
- Jensen, M. C., & Meckling, W. H. (1979). *Theory of the firm: Managerial behavior, agency costs, and ownership structure* (pp. 163-231). Springer Netherlands.
- Kader, Adam, Hardwick & Kwon. (2014). Cost efficiency and board composition under different takaful insurance business models. *International Review of Financial Analysis* 32(0): 60-70.
- Kao, C., & Hwang, S.-N. (2008). Efficiency decomposition in two-stage data envelopment analysis: An application to non-life insurance companies in Taiwan. *European Journal of Operational Research*, 185(1), 418-429.
- Khan, A. & Noreen, U. (2014). Efficiency Measure of Insurance v/s Takful Firms Using DEA Approach: A Case of Pakistan. *Islamic Economic Studies*, 22(1), 139-158.
- Klumpes, P. J. (2007). Consolidation and efficiency in the major European insurance markets. *Working Pa-per, Imperial College, London*.
- Knight, F. H. (2005). Risk, Uncertainty and Profit: *Cosimo Classics*.
- Koopmans, T.C. (1951). Efficient Allocation of Resources. *Journal of the Econometric Society*, 19 (4).
- Leverly, J. T., & Grace, M. F. (2010). The robustness of output measures in property-liability insurance efficiency studies. *Journal of Banking & Finance*, 34(7), 1510-1524. doi: <http://dx.doi.org/10.1016/j.jbankfin.2009.08.015>
- Leverly, T., Lin, Y., & Zhou, H. (2004). *Firm performance in the Chinese insurance industry*. Unpublished Dissertation, Georgia State University.
- Luhnen, M. (2009). Determinants of efficiency and productivity in German property-liability insurance: evidence for 1995–2006. *The Geneva Papers on Risk and Insurance-Issues and Practice*, 34(3), 483-505.
- Mahmoud, H.(2008). Insurance: Takaful Gaining Ground, *The Actuary*
- Mansor, S. A., Radam, A., (2000). Productivity and Efficiency Performance of the Malaysian Life Insurance Industry. *Jurnal Ekonomi Malaysia*, 34, 93 – 105.

- Muller, W. (1995). Informations produkte (Informational products). *Zeitschrift fur Betriebs-wirtschaft*, 65, 1017–1044.
- Murdick, R. G., Render, B., & Russell, R. S. (1990). *Service operations management*. Boston, Massachusetts: Allyn and Bacon.
- Obaidullah, M. (2005). *Islamic Financial Services*. Scientific Publishing Centre, King Abdulaziz University.
- Othman, M. S., & Abdul Hamid, M. (2009). A study on the level of knowledge and understanding among muslims towards the concepts, arabic and shariah terms in Islamic insurance (Takaful). *European Journal of social sciences*, 10(3), 468-478.
- Parker, M. (2010). Bank Negara Malaysia reviews new guidelines for Takaful products, McClatchy - *Tribune Business News*. Retrieved from <http://eserv.uum.edu.my/docview/756154067?accountid=42599>
- Redzuan, H., Rahman, Z. A., & Aidid, S. (2009). Economic determinants of family takaful consumption: Evidence from Malaysia. *International Review of Business Research Papers*, 5(5), 193-211.
- Rejda, G., & McNamara, M. (2013). *Principles of Risk Management and Insurance*: Pearson Education.
- Saad, N. M., Majid, M. S. A., Yusof, R. M., Duasa, J., & Rahman, A. (2006). Measuring Efficiency of Insurance and Takaful Companies in Malaysia Using Data Envelopment Analysis (DEA). *Review of Islamic Economics*, 10(2), 5.
- Saad, N. M. (2012). An analysis on the efficiency of takaful and insurance companies in malaysia: a non-parametric approach. *Review of Integrative Business & Economics Research*, 1(1), 33-56.
- Sealey, C., Lindley, J. (1977). Inputs, outputs, and a theory of production and cost at depository financial institutions. *Journal of Finance* 32, 1251-1266.
- Sekaran, U., & Bougie, R. (2010). *Research Methods for Business: A Skill Building Approach*: John Wiley & Sons.
- Trigo Gamarra, Lucinda. (2008). The effects of liberalization and deregulation on the performance of financial institutions: The case of the German life insurance market, *Thuenen-Series of Applied Economic Theory*, University of Rostock, Institute of Economics.
- Vaughan, E. J., & Vaughan, T. M. (2013). *Fundamentals of Risk and Insurance*: Wiley.

- Wahab, A. R. A., Lewis, M. K., & Hassan, M. K. (2007). Islamic takaful: Business models, Shariah concerns, and proposed solutions. *Thunderbird International Business Review*, 49(3), 371-396.
- Wang, J. L., Jeng, V., & Peng, J. L. (2007). The Impact of Corporate Governance Structure on the Efficiency Performance of Insurance Companies in Taiwan*. *The Geneva Papers on Risk and Insurance-Issues and Practice*, 32(2), 264-282.
- Yang, Z. (2006). A two-stage DEA model to evaluate the overall performance of Canadian life and health insurance companies. *Mathematical and Computer Modelling*, 43(7-8), 910-919. doi: <http://dx.doi.org/10.1016/j.mcm.2005.12.011>
- Yazid, A. S., Arifin, J., Hussin, M. R., & Daud, W. N. W. (2012). Determinants of Family Takaful (Islamic Life Insurance) Demand: A Conceptual Framework for a Malaysian Study. *International Journal of Business and Management*, 7(6), 115-127.
- Yusof, M. F., Ismail, W. Z. W., & Abdullah, A. K. M. N. (2011). *Fundamentals of Takaful*. Kuala Lumpur: IBFIM.
- Zhu, J. (2003). *Quantitative models for performance evaluation and benchmarking: data envelopment analysis with spreadsheets and DEA excel solver* (Vol. 51): Springer.