

MEASURING FACTOR AFFECTING PROFITABILITY OF INSURANCE INDUSTRY OF USA AND UK BY USING GMM MODEL

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Abstract

The insurance sector play vital role in the development of any economy in the world. According to the empirical and theoretical literature, the insurance companies are influenced by different factors. These factors can be financial factors as well as macro factors. The main purpose of this paper is to determine the factors that affect the profitability of insurance companies of USA and UK, by using quarterly aggregate data series from 2007 to 2016 and executed GMM model on data. The sample of this study is 12 insurance companies from USA insurance industry. Profitability indicators ROA and ROE are dependant variable while financial factors such as size of firm, liquidity, debt to equity and asset turnover and macro factors including GDP, Interest rate, CPI and WTI oil independent variables of this research. According to the best knowledge of researcher In USA, the financial factors including size of firm, liquidity and asset turnover have positive relationship with the profitability of insurance firms but on the other hand in UK the financial factors liquidity shows positive relationship asset turnover and leverage shows positive relationship with the profitability of insurance companies. Similarly in case of USA macro factors like GDP and WTI oil have positive correlated and CPI and interest rate are negative correlated with the profitability. In contrast In UK WTI and interest rate have positive relationship but CPI and GDP have negative.

Key words: USA insurance industry, UK insurance industry, macro factors, financial factors

1. Introduction:

In this world everybody expose to possibility of any loss. There are different possibility of loss like through accident fire, or business and any disaster like death. So, People want protection against these loses. In this situation insurance companies play very important role for businesses, corporations, and individuals because insurance provide protection against any financial risks. Almost in all developing and developed countries the insurance sector play very important role in financial services industry. According to Das, Davies, & Podpiera, (2003) and Haiss & Sümegi, (2008) insurance industry are also contributing in economic growth, reduction of transaction costs, facilitation of economies of scale in investment, efficient resource allocation, creation of liquidity, and spread of financial losses.

Basically performance is a association between operational efficiency and strategic effectiveness of any organization. Normally the major objective of a firm are improve production processes; product, services and market management. Financial performance of specific organization addresses its profitability. The financial performance can be measure by several ways like gross margin rate, market capitalization. Financial performance play very important role to attract the attention of financial experts, researcher and management of other corporations. The financial performance of insurance industry is very important to various stakeholders including policyholders, agents and policy makers. (Doumpos et al. 2012)

1.1 USA insurance industry

The USA insurance industry one of the largest insurance industries in the whole world In term of revenue. In 2011 revenue (premium) was exceeded to \$1.2 trillion. But, due to the crisis of 2009 the premium of insurance industry really affected. More than 2 million people are employed. The insurance industry contribution in GDP is close to 40%. The USA insurance industry is the largest insurance industry in the whole world. By the capitalization the major players of USA insurance industry are MetLife, Allstate, AIG and prudential financial.

1.2 UK insurance industry

UK insurance industry is very important in leading the worldwide insurance market. In tax payment it contributes up to £10billion and £1,478 billion is the total value of asset of insurance industry. More than 310,000 people are employed. In UK insurance industry £5.5 billion insurance related to exports and its contribution in GDP of UK is 0.4 per cent. 25% of country net worth's investment linked to the insurance industry.

1.3 Comparison of USA and UK industry

USA and UK are two different conglomerate states around the world,. USA has federal and constitutional republic form of government. In contrast the UK instills the constitutional monarchy-parliament governance. The USA is more of continent in contrast The UK is more of an archipelago. In other words the UK was very powerful nation in 19th century and in present the USA is more powerful nation in the whole world. The both USA and UK have strong insurance industry as compare to other countries. These are the reason to choice these two nations USA and UK for comparison in this research.

This research contributes to the literature in different ways.

- First, the author determines the factors that affects of insurance companies of USA and UK.
- Insurance companies' Policy makers can access current policies and also can handle mechanisms to achieve profitability goal.
- Management can hedge any type of risk against insurance industry.
- Macroeconomic related factors help in improve the overall performance of the insurance sector
- Researchers to expand this research area to other countries.

1.5 Research objectives

For show better results, this research included financial and macro factors that were taken as explanatory variables. These variables used to explain the relationship with the profitability of insurance industry in good manners.

- Determine the major factors that affects the profitability of insurance companies of USA
- Determine the major factors that affects the profitability of insurance companies of UK
- Investigate the extent to which financial/macro factors hinder profitability of insurance companies of USA
- Investigate the extent to which financial/macro factors hinder profitability of insurance companies of UK
- Identify the relationships between different factors and profitability of insurance companies of USA
- Identify the relationships between different factors and profitability of insurance companies of UK

2. Literature review

Trinh et al.(2016) investigated the determinants of non life insurance expenditure in developing and developed economies. To prove their research the authors used penal data set of 31 developing and 36 developed economies for the time period from 2000 to 2011. They took economic factors, institutional factors, cultural factors, demographic and social factors as independent variable. The author demonstrated that in both developing and developed economies' non-insurance life expenditure have been affected by bank development, economic freedom, Islamic laws, power distance, urbanization, masculinity and long term orientations. At the end they also suggested that non life insurance need to develop their existing as well as new market potential to work better. This research also recommended that the non life insurance should help the government in implementation of regulation.

Huang et al. (2016) conducted study on investment regulation, portfolio allocation and investment yield in the USA and china industry. For this propose the researcher showed allocation to investable asset annually over the time period from 2005 to 2013 of two insurance

industries. The researchers also compared the investment regulation of both economies. Similarly they also compared asset allocation and investment yield of both. This research demonstrated that China insurance industry faced many problems and invest their assets in bank with low risk of loss as well as low yield. On the other hand the China industry invested very small portion in bonds. Asset-liability mismatched is also a problem. The researcher also found that USA insurance industry is totally opposite to china industry they invest large portion of their asset in bond category and gained extra benefits.

Elango et al. (2008) studied the diversification relationship with firm performance in USA property-liability insurance industry. They selected data over the time period of 1994 to 2002. The performance of firm was measured by profitability of that firm. They used two main indicators of profitability ROA (return on asset) and ROE return on equity. They selected 14 other variables and calculated standard deviation. They applied various tests like split sample analysis, market measure analysis. They argued there was non-linear relationship between firm performance and product diversification. On the other hand, they also suggested there was complex relationship existed between firm performance return and diversification profile of insurer if we focused on geographic diversification and product integration. Geographic diversification affected the performance of firm and diversifications of product. The firm performance would be excellent if there is the low level of both geographic and product diversification.

Kjosevski et al. (2012) investigated determinants of life insurance demand in south-eastern and central Europe. 14 countries selected, over the period between 1998 and 2010. He selected economic, social, demographic and institutional factors and applied regression and correlation model on these factors to test two indicator of insurance demand that was life insurance density and penetration. Data would be collected from different sources. He suggested if income per capita increased then life insurance density and penetration also increased. There was no relationship between real interest rate and life insurance density but there was positive relationship between real interest rate and life insurance penetrations. Inflation had negative impact on life insurance demand while education had positive impact on both life insurance density and penetration. Because education was very important to enhance the awareness of people to understand the policies of insurance companies. They also suggested that government effectiveness, young and old dependency also had no impact on the demand of life insurance.

Zou et al. (2008) tested cost of debt, debt capacity, and corporate insurance of publicly listed Chinese companies over the time 1997 to 2003. They examined the relationship among capacities of debt, their cost and corporate property insurance. They took 2470 observations as a sample, applied regression analysis and developed hypothesis on selected factors. They suggested high cost of debt of the firm to

encourage the firm to use property insurance but on the other hand high leverage of the firm did not lead the firm. In unique situation there was positive relationship among leverage and tangible assets, it may affect the purchase of property insurance. They also suggested the use of property insurance enhanced the capacity of the debt and also helped the firm to reduce their borrowing cost as well, if the borrowing cost of the firm reduced then the market goodwill of firm increased and also increase the debt capacity of the firm.

Shiu (2005) studied the determinants of solvency in UK life insurance market. For this purpose he selected two factors like economic and firm specific factors of 311 life insurer and used panel data over the time period of 1986 to 1999. After that the author applied panel data model that are fixed effect model and random effect model and test the relationship among predicted variables and insurer solvency. The researcher found that firm specific and economic factors affected the solvency insurer. This research also demonstrated that equities to total asset, bonds to total asset and level of new business have positive impact on solvency but on the other hand firm size, insurance leverage, market competition, unexpected inflation, general and life annuity reserves, health permanent reserves, pension reserves and asset that held to cover linked of liabilities to total asset have negative impact on solvency of insurer.

3. Methodology

3.1 Sample and test

The population of this research is all insurance companies of USA and UK. But in this study total 24 insurance companies are selected, 12 from USA and other 12 from UK and quarterly economic factors data is also collected for 10 year 2007 to 2016. This collection of data based on availability of data. Appendix A shows the lists of selected insurance companies. Quarterly data collected for the period from 2007 to 2016 and applied GMM model. This study is focusing on insurance industry and macroeconomic- related variables. Macroeconomic variables include GDP, Interest rate, CPI and WTI oil.

Variables		Brief description
Dependent Variables	ROA	Return on assets measures by divided net income to total assets.
	ROE	return on equity measures by divided net income to total shareholder equity.
Financial Factors	SF	Size of firm is measure by the taking log of firm total asset.
	LIQ	Liquidity is the ratio of current assets and current liabilities
	LEV	Leverage is measures by divided total liabilities to total equity.
	AST	Asset turnover shows value of revenue or sales of the company generated relative value of assets.
	GDP	GDP stands for gross domestic product which shows growth of economy of a

Macro Factors		country
	CPI	CPI refers to rate of change in the price of any commodities.
	INT	Interest rate represent the percentage of amount have been charged to provide services.
	WTI	WTI stands for west taxes intermediate. It is grade of crude oil and used as benchmark in oil pricing.
Notes: brief description of all dependent variable (ROA, ROE) and independent variables like financial variables (SF, LIQ, LEV, AST) and macro variables (GDP, CPI, INT, WTI).		

3.2 Model of study

Correlation matrix:

The correlation matrix is basically a table that shows the correlation coefficient among variables individually. The diagonal values of table id always 1 because each variable is perfectly correlated with itself. Correlation matrix tells us weather the variables are correlated with each other or not. If there are any relationships exist among variables. The correlation matrix also tells which type of relationship existing, negative or positive.

GMM

The GMM stands for generalized method of moments. This model is use for estimating parameters as well as their values. Usually this model is executed in the context of semi parameters models, where the parameter of interest has limited dimensional, whereas the full shape of the distribution function of data may be unknown. Due to this reason maximum likelihood estimation is not applicable. In this method a certain number of *moment conditions are require to specified the model*. These moment conditions are functions of the model parameters and the data. These moment conditions are functions of the model parameters and the data, such that their expectation is zero at the parameters' true values. The GMM method then minimizes a certain norm of the sample averages of the moment conditions. The GMM estimators are known to be asymptotically normal, consistent and efficient in the class of all estimators that do not use any extra information aside from that contained in the moment conditions.

$$ROA_{it} = \alpha + \beta_1 SF_{it} + \beta_2 LIQ_{it} + \beta_3 LEV_{it} + \beta_4 AST_{it} + \beta_5 GDP_{it} + \beta_6 CPI_{it} + \beta_7 INT_{it} + \beta_8 WTI_{it} + \varepsilon_{it}$$

$$ROE_{it} = \alpha + \beta_1 SF_{it} + \beta_2 LIQ_{it} + \beta_3 LEV_{it} + \beta_4 AST_{it} + \beta_5 GDP_{it} + \beta_6 CPI_{it} + \beta_7 INT_{it} + \beta_8 WTI_{it} + \varepsilon_{it}$$

ROA_{it} = return on asset of insurance industry for time t

ROE_{it} = return on equity of insurance industry for time t

SF_{it} = size of firm for time t

LIQ_{it} = liquidity ratio for time t

LEV_{it} = leverage ratio for time t

GDP_{it} = gross domestic product for time t

CPI_{it} = consumer price index for time t

INT_{it} = interest rate LIBOR for time t

WTI_{it} = west taxes intermediate oil price for time t

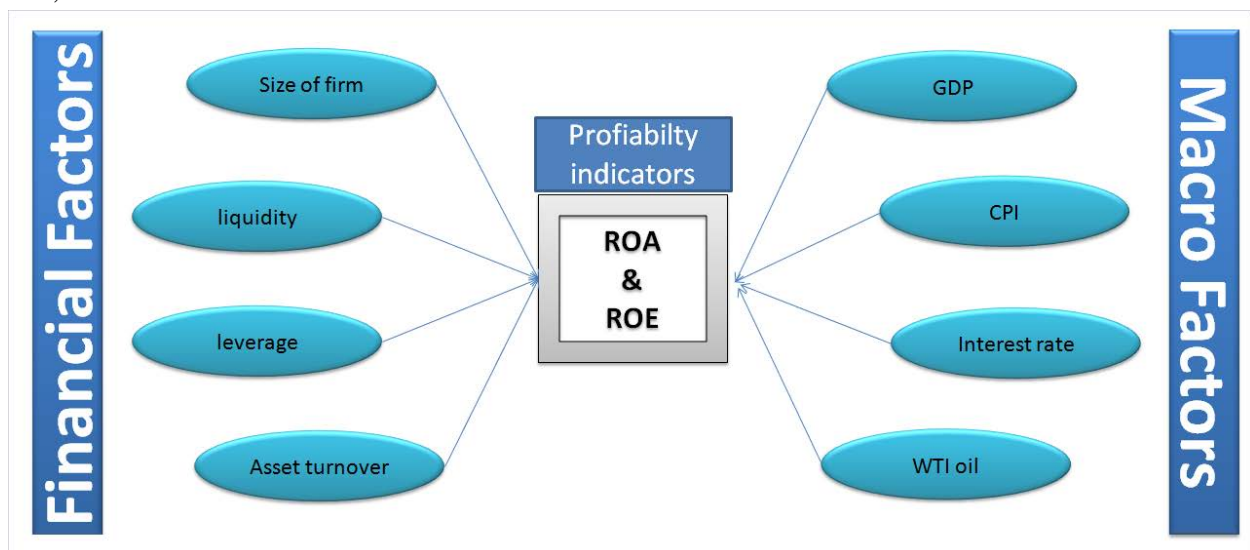
$$Y_{it} = \alpha_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \beta_7 X_{7it} + \beta_8 X_{8it} + \varepsilon_{it}$$

$$ROA_{it} = \alpha + \beta_1 SF_{it} + \beta_2 LIQ_{it} + \beta_3 LEV_{it} + \beta_4 AST_{it} + \beta_5 GDP_{it} + \beta_6 CPI_{it} + \beta_7 INT_{it} + \beta_8 WTI_{it} + \varepsilon_{it}$$

$$ROE_{it} = \alpha + \beta_1 SF_{it} + \beta_2 LIQ_{it} + \beta_3 LEV_{it} + \beta_4 AST_{it} + \beta_5 GDP_{it} + \beta_6 CPI_{it} + \beta_7 INT_{it} + \beta_8 WTI_{it} + \varepsilon_{it}$$

3.3 Framework

This framework shows the financial factors and macro factors that may have positive or negative impact on the profitability of any organization. Profitability has two major indicators that are return on asset and return on equity as well. These indicators may be affected by different factors and it may affect the overall performance of any firm in the world. In this study the researcher categorize the factors in financial and macro factors. The financial factors include size of firm, leverage, liquidity and asset turnover on the other hand; The macro factors are GDP, Interest rate, CPI and WTI oil



3.4 Hypothesis

The alternative hypotheses are following

H₁: There is a significant impact of financial factors (size of firm, leverage, liquidity and asset turnover) and macro factors (GDP, Interest rate, CPI and WTI oil) on profitability (ROA) of insurance companies of USA.

H₂: There is a significant impact of financial factors (size of firm, leverage, liquidity and asset turnover) and macro factors (GDP, Interest rate, CPI and WTI oil) on profitability (ROE) of insurance companies of USA.

H₃: There is a significant impact of financial factors (size of firm, leverage, liquidity and asset turnover) and macro factors (GDP, Interest rate, CPI and WTI oil) on profitability (ROA) of insurance companies of UK.

H₄: There is a significant impact of financial factors (size of firm, leverage, liquidity and asset turnover) and macro factors (GDP, Interest rate, CPI and WTI oil) on profitability (ROE) of insurance companies of UK.

Decision Criteria = Reject H₀, if P value is less than α . Or “Accept” H₀, if P value is greater than α . $\alpha=5\%$

4. Empirical Analysis

4.1 Correlation matrix:

Basically correlation matrix is a table that represents the relationship in percentages among all variables individually. The diagonal values of table are always 1 because each variable is perfectly correlated with itself. Correlation matrix shows weather the variables are correlated with each other or not. This relationship may be positive or may be negative.

Table 4.1: Correlation matrix of USA and UK

Correlation matrix											
USA		ROA	ROE	SF	LIQ	LEV	AST	GDP	CPI	INT	WTI
	ROA	1									
	ROE	0.805	1								
	SF	-0.19	-0.154	1							
	LIQ	0.078	0.0406	0.023	1						
	LEV	-0.46	-0.242	0.419	0.084	1					
	AST	0.480	0.239	-0.16	0.029	-0.64	1				
	GDP	-0.05	-0.072	-0.05	0.368	0.162	-0.03	1			
	CPI	-0.05	-0.066	-0.06	0.312	0.149	-0.03	0.791	1		
	INT	0.025	0.042	0.041	-0.082	-0.07	0.012	-0.29	-0.68	1	
WTI	0.044	0.064	0.018	-0.423	-0.13	0.012	-0.47	-0.21	0.017	1	
		ROA	ROE	SF	LIQ	LEV	AST	GDP	CPI	INT	WTI
	ROA	1									
	ROE	0.596	1								

UK	SF	-0.20	-0.031	1						
	LIQ	-0.09	-0.281	0.046	1					
	LEV	-0.11	0.105	0.351	0.228	1				
	AST	0.163	0.425	-0.25	-0.214	0.119	1			
	GDP	-0.03	-0.051	0.019	0.054	0.034	0.029	1		
	CPI	-0.15	-0.192	-0.11	0.057	0.012	-0.09	-0.21	1	
	INT	0.135	0.110	0.083	-0.036	-0.03	0.029	0.568	-0.52	1
	WTI	0.072	0.143	0.111	-0.068	-0.05	0.175	0.260	-0.25	0.184

Notes: shows the correlation among variables individually. GDP_{t-1} shows lag

Correlation matrix shows relationship among variables individually. As the above table (4.1) show worth of relationship which are existing among variables. In USA ROA and ROE show positive and strong relationship that is 80%. Similarly, GDP and CPI are also positively correlated with each other that are 96%. But on the other hand asset CPI and interest rate negative but very strongly correlated with each other. The worth of relationship is 68%. Similarly, GDP are also negatively correlated with interest rate which is 50%. Leverage and asset turnover shows strong but negative relationship with each other which is 65%. Other variables have positive and negative relationship with others.

In UK ROA and ROE show positive relationship that is 60%. Similarly, GDP and interest rate are also positively correlated with each other that are 57%. But on the other hand asset CPI and interest rate are also but negative correlated with each other. The worth of relationship is 52%. Other variables have positive and negative relationship with others.

4.3 GMM model overall finding:

The authors applied GMM model and correlation matrix on aggregated data.. The overall findings of GMM model is mentioned in table (4.3).

Table 4.3: Overall Dependent variables relationship with profitability of USA and UK

Over all result of USA and UK				
Countries	UNITED STATE AMERICA		UNITED KINGDOM	
	Model I	Model II	Model I	Model II
Variables	ROA	ROE	ROA	ROE
Size of firm	0.089* (0.043)	0.356* (0.226)	-0.106* (0.057)	-0.053 (0.952)
Liquidity	0.087* (0.037)	0.331 (0.247)	-0.014 (0.014)	-0.015* (0.003)
Leverage	-0.059* (0.013)	-0.211* (0.078)	-0.001 (0.003)	0.0691 (0.0716)
Asset turnover	1.421 (0.934)	4.0946** (2.6104)	0.898 (1.221)	63.420* (26.067)
GDP	34.052* (13.278)	149.535* (46.922)	-2.164* (1.023)	-39.684* (18.645)
CPI	-65.784* (23.665)	-308.618* (98.509)	-0.994* (0.468)	-23.4662* (10.195)
Interest rate	-0.0638* (0.027)	-0.332* (0.146)	0.017* (0.007)	0.202* (0.108)
WTI oil	2.034** (1.073)	5.922* (1.842)	0.231 (0.232)	4.576 (4.243)

Notes:* shows variables are significant at 0.05, ** shows variables are significant at 0.1

In USA Table (4.3) discussed the results about correlation coefficient r which is equivalent to 0.123956 and coefficient of determination r^2 value is equivalent to 0.109446 it represent that 11% of variation in return on asset(ROA) is explained financial factors (size of firm, leverage, liquidity and asset turnover) and external factors (GDP, Interest rate, CPI and WTI oil). Similarly coefficient of determination r^2 value is equivalent to 0.127708 it represent that 13% of variation occur in return on equity (ROE).As above discussed almost all independent variables like size of firm, leverage, asset turnover, GDP, CPI and interest rate show significant relationship with return on asset. It indicates that size of firm, liquidity, asset turnover, WTI and GDP rate have positive significant impact profitability of insurance companies of United State. But on the other hand has debt to equity, CPI and interest rate show negative impact on profitability of insurance companies of United State.

In UK Table (4.3) represents the results about correlation coefficient r which is equivalent to 0.105715 and coefficient of determination r^2 value is equivalent to 0.090902 it represent that 10% of variation in return on asset (ROA) is explained internal factors (size of firm, liquidity, debt to equity ratio and asset turnover) and external factors (GDP, Interest rate, CPI and WTI oil). Table (4.3) shows the results about correlation coefficient r which is equivalent to 0.271635 and coefficient of determination r^2 value is equivalent to 0.259571 it represent that 26% of variation occur in return on equity(ROE) As above discussed independent variables like size of firm, asset turnover, liquidity, GDP, CPI and interest rate show significant relationship expect liquidity debt to equity, and WTI oil. It indicates that asset turnover, interest rate and WTI have positive impact of insurance companies of United Kingdom. But on the other hand GDP and CPI show negative and size of firm, liquidity and debt to equity show negative but significant relationship with return on asset of insurance companies of United Kingdom.

4.5 Finding

- In case of USA the impact of the financial factors and macro factors on profitability indicator ROA is 12%, in contract in case of UK the impact of the financial factors and macro factors on profitability indicator ROA is 11%,.
- In case of USA the impact of the financial factors and macro factors on profitability indicator ROE is 14%, in contract in case of UK the impact of the financial factors and macro factors on profitability indicator ROE is 27%,.
- In case of USA, the financial factors including size of firm, liquidity and asset turnover have positive relationship with the profitability of insurance firms but on the other hand in UK the financial factors liquidity shows positive relationship asset turnover and leverage shows positive relationship with the profitability of insurance companies.
- In case of USA macro factors like GDP and WTI oil have positive correlated and CPI and interest rate are negative correlated with the profitability. In contrast In UK WTI and interest rate have positive relationship but CPI and GDP have negative.

5. Conclusion:

USA insurance industry show the financial factors including size of firm, leverage and asset turnover are positively correlated with the profitability indicators that are ROA and ROE. In contrast the financial factors liquidity shows insignificant relationship with the profitability

indicators that are ROA and ROE. It means the finding indicates that the insurance companies should increase their size, leverage and asset turnover to enhance their financial performance of USA based insurance companies. On the other hand, the macro factors including GDP and WTI oil are positively correlated with the profitability indicators that are ROA and ROE. In contrast the macro factors including CPI and interest rate show negative relationship with the profitability indicators that are ROA and ROE. On the based on these finding it can be concluded the high GDP and WTI oil and low CPI and interest rate can gain competitive advantage and safety and then insurance industry achieve highest profitability in United States.

UK insurance industry shows the financial factors liquidity is positively correlated with the profitability indicators that are ROA and ROE. In contrast the financial factors leverage shows negative relationship with profitability indicators that are ROA and ROE. The financial factors including size of firm and asset turnover proved insignificant relationship with the profitability indicators that are ROA and ROE. It means the finding indicates that the insurance companies should increase firm liquidity and decrease leverage ratio to enhance their financial performance of UK based insurance companies. In contrast the macro factors including GDP is positively correlated with the profitability indicators that are ROA and ROE. the macro factors including Interest rate, CPI and WTI oil also positively correlated with the profitability but only one indicator that is ROE. And in the case of other profitability indicate ROA these variables are insignificant. On the based on these finding it can be concluded the high GDP and WTI oil, CPI and interest rate can gain competitive advantage and safety and then insurance industry achieve highest profitability in United Kingdom.

The above points show the USA insurance industry are more effective as compare to UK insurance industry. Because the correlation among firm profitability and internal and macrofactors are stronger as compare to profitability of UK firms.

For future study the research recommended that, this research and its finding are applied only on insurance industry rather than others. The internal and macrofactors are limited. For future study the number of variables can be increases. Similarly few numbers of companies are selected in this study due to availability of data. So the future researchers conducted research on large number of insurance companies.

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Appendix A

USA selected

1. Allstate insurance
2. American financial insurance
3. American international group
4. Aspen insurance
5. Assurant General Insurance Ltd
6. Berkshire Hathaway International Ins Ltd
7. Chubb insurance company
8. CNA Insurance Company Ltd
9. MetLife insurance

10. National western life insurance
11. The Hartford financial service company
12. W. R. Berkley Corporation

UK selected

1. Aegon insurance group
2. Amtrust insurance
3. Ageas insurance
4. Allianz insurance
5. Aviva insurance
6. legal and general insurance
7. MS and AD insurance
8. Markel insurance
9. Sabre insurance
10. Prudential insurance
11. XL group limited
12. Zurich insurance

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