Capital Modelling in the UAE Insurance Industry: Pursuing Economic Sustainability through Financial Simulations

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Abstract
Enhancement of risk and capital management capabilities became the focus of insurance companies by financial capital models in support of business objectives and long-term sustainability, as a result of tough economic environment. Financial models simulation-based approach used by insurance companies to achieve effectiveness in distribution and determination of risks, and to control and manage risks providing them the ability to develop accurate pricing. The UAE insurance industry reaffirms its contribution to greater economic sustainability in the era of rapid evolution of risk landscape. Various challenges identified beyond organizational capabilities. Descriptive, correlational and historical researches used in the study to evaluate how capital modeling in the UAE insurance industry influenced the attainment of economic sustainability. It focused on the capital modelling variables of capital adequacy, return on equity, asset pricing, and insurance penetration. Findings show that the insurance industry has performed as a result of market recovery in the midst of stifling competition and played an important role in the economy through its direct contribution to economic sustainability and its support to the operations of service firms. UAE records the highest economic growth rates in the GCC region attributed to the ongoing economic programs for diversification. The increasing economic sustainability trend in the past ten-year period will continue over the future period and in the long-term. The current penetration rate reveals opportunities for growth in the industry, and is rising steadily. There is significant relationship and degree of association between capital modelling variables and economic sustainability. Capital adequacy and penetration rate in the insurance industry are not predictors of economic sustainability, whereas return on equity and asset pricing, singly, or in combination, predict such sustainability.

Key Terms: Economic Sustainability, Capital Modelling, Capital Adequacy, Return on Equity, Asset Pricing, Penetration Rate, Insurance.

1. Introduction
To achieve organizational objectives and long-term sustainability of the business, insurance companies focused on enhancing capabilities of capital management during times of tough economic environment. Strategies developed by insurers highlighted the importance of capital models to develop insights into the risk profile of the organization and in the provision of support for managerial decision making. Risks that will have impact on organizational success are continuously identified which strengthen capital management capabilities. In the insurance industry, capital models are used to measure the required capital based on government regulations and requirements from rating agencies. Capital modelling requires appropriate
examination standards to follow such as defining clearly the scope of examination. It requires confirming adherence of the prescribed process and the capital figure has been quoted as an accurate reflection of reality and within a specified threshold of materiality.

Amid signals of the Middle East rising economic growth, well-devised insurance systems provide the key to sustain long-term growth of gross development product. The nature of insurance systems creates consistent flow of capital into long-term investments for the GCC economy, offering a great formula for sustained GDP growth in the GCC region. In 2015, Saudi Arabia and United Arab Emirates provide solid insurance growth in the emerging insurance markets. According to Sahli and Hakim (2014), significant opportunities for economic growth are present in the emerging Saudi Arabia and UAE markets, leading to a shift in insurance landscape in rapid growth markets. In Saudi Arabia, rapid consistent premium growth has been recorded even with penetration rates were once low, still insurance market growth has accelerated.

Insurers need capital optimization and formulation of strategies on asset liability while maintaining cost competitiveness without losing sight on customer satisfaction, in the search for revenue and organizational growth. Employing new technologies and building flexibility in every aspect of the insurance industry will be needed to face the challenge of adaptability to an evolving market and regulatory changes. The UAE insurance industry reaffirms its contribution to greater economic sustainability in the era of rapid evolution of the risk landscape. Various challenges have been identified as being beyond organizational capabilities in the management of the country’s emerging risks and their protection. Substantial amounts of capital were viewed as essential in sustaining the demand to cover the growing volume of insurable assets in the developing UAE market.

1.1 Statement of the Problem
The study evaluates how capital modelling in the UAE insurance industry influenced the attainment of economic sustainability. It focuses on the four variables of capital modelling; capital adequacy, return on equity, asset pricing, and insurance penetration. Specifically, it seeks answers to the following:
1. What is the level of economic sustainability as a result of the utilization of financial simulations of capital modelling in the UAE insurance industry?
2. Is there significant influence of capital modelling in the UAE insurance industry and attainment of economic sustainability?
3. Is there significant association between capital modelling in the UAE insurance industry and economic sustainability?
4. Is there significant difference between the economic sustainability of UAE insurance industry over the past ten years and in the long-term?
5. How strongly the variables of capital modelling in UAE insurance industry predict economic sustainability?

Null Hypotheses
Ho1: There is no significant influence of capital modelling in the UAE insurance industry on the attainment of economic sustainability.
Ho2: There is significant association between capital modelling in the UAE insurance industry and economic sustainability.
Ho3: There is no significant difference between the economic sustainability of UAE insurance industry over the past ten years and in the long-term.
Ho4: The variables of capital modelling in UAE insurance industry do not predict economic sustainability.
1.2 Significance of the Study

The study is significant for improving the risk and capital management capabilities of organizations specifically in the insurance industry of the United Arab Emirates. The principles involved in the study relate to the design and application of capital models that promote sound practices with respect to internal risk and development of better informed decisions. Insurance companies would directly benefit from the current investigation where capital models presented will allow information of strategic managerial decisions that enhance the overall value and utilization of financial models. Other businesses can duplicate the approach of investigation adopted in the study and similar framework could serve as a model for their existing financial and capital management practices. Principles discussed in the study are of value to external stakeholders in assessing the soundness and strength of insurers’ capital models. Academicians in financial risk management and economists will benefit from this study where the results could enhance their effectiveness in expounding on the subject which is an update on the developments of concepts on financial models that will impact economic sustainability of a country.

1.3 Scope and Limitations

This research is an evaluation how capital modelling in the UAE insurance industry influenced the attainment of the national goal for economic sustainability. It only covers the most important areas (variables) that influence and predict economics sustainability in UAE; capital adequacy, return on equity, asset pricing, and insurance penetration. It will identify significant influence of capital modelling four-variables on the attainment of economic sustainability in the country. documentary analysis conducted to gather historical data of capital models used by companies in UAE insurance industry.

1.4 Definition of Terms

Capital Modelling. It is a framework used to identify a theoretically appropriate required rate of return of a particular asset. In this study, it refers to the development of financial capital models through simulations, which insurance companies in UAE can utilize, in enhancing capital management capabilities that will contribute to the achievement of national goal for economic sustainability of the country.

Economic Sustainability. It is the implementation of various strategies for the optimal use of resources to achieve beneficial balance in the economy over the long-term. In this research, it refers to the ability of the UAE economy to indefinitely support a defined level of economic production through contributions from the efficient use of assets of firms in the insurance industry.

Capital Adequacy. It is the amount of capital present relative to factors of production. In this paper, it refers to the required capital of UAE insurance firms to strengthen the organizations’ capital capabilities.

Return on Equity. It is the amount of a company’s net income generated from the owners’ investments, as a percentage of the equity of shareholders. In this study, it is the measure of the UAE insurance firm’s profitability through profits generated from the investments of owners/shareholders.

Asset Pricing. It describes the relationship of risk and return expected, used as pricing scheme of risky securities. In this study, it is the model used by UAE insurance firms to determine the appropriate price on an asset at a given level of risk.

Insurance Penetration. It is the development level of the insurance industry in a country. In this study, it refers to the ratio of premium underwritten to GDP in a particular year.
2. Review of Related Literature and Studies

Insurance companies enhance capital management capabilities and organizational risk through insights into their risk profile, in support to achievement of objectives and sustainability over the long-term (North American CRO Council, 2013). Regulators and rating agencies highlight the importance of capital frameworks for effective decision making through identification of risks that are likely to influence the success of firms. Capital models are considered the core component of the enterprise risk management strategy and embedded within the business process, which strengthen capabilities for capital management.

Higher capital adequacy requirements become essential after the global financial crisis (Al Maraj, 2014). These requirements based on cost-benefit analysis and impact assessments performed by various bodies. The Central Bank of Bahrain requires banks to maintain 12.5% minimum capital adequacy ratio, considered as the target ratio which makes public confidence strong. Impact assessments conducted in 2010 revealed that vast majority of banking institutions are well-placed and without incurring extra costs. The regulatory capital in the form of shareholders’ equity was found to be compelling.

Given a non-diversified risk of an asset, capital asset pricing model determines theoretically the appropriate asset’s rate of return (Moody’a Analytics Inc., 2015). Understanding the risk profile and capital position of a firm at any time is essential in the provision of support for strategic decisions on risk-based business planning, specifically in operational decisions and capital allocation. Insurers invest in new technology to support accurate risk-based capital metrics in the management of the business, and at the same time satisfying the burden of regulatory reporting, and compliance. Large portion of capital used by capital intensive industries to acquire expensive machineries compared to labor costs (Jorgenson & Vu, 2005). Greater financial risk results from more expenses allocated to high technology machinery allowing a small share of marketplace in new capital-intensive manufacturing firms (Hunt & Martin, 2009).

Capital adequacy ratio is one of the indices used in the measurement of susceptibility of banks to failure (Fouche et al., 2006). The types of ratios can include non-risk based and risk-based. Leverage, equity capital, Basel II and tier 1 ratios calculated using bank capital and bank risk level indicators. The study constructed models of continuous-time stochastic for the dynamics of each of the ratios. Its finding reveals that the models are consistent with insured institutions data and demonstrated how results can be applied in the banking industry.

The study of Ballotta (2009) provides an assessment of framework for fairness in the valuation of life insurance contracts with predominant financial component in the areas of insurers’ capital requirements, market consistent price contracts’ impact, and embedded options. Dynamics of log-returns of reference fund were modeled. Findings show that consequences of model specifications on requirements of capital are noticeable, although choice of market model does not significantly affect consistent market price of overall benefit because of maturity.

Ballota and Savelli (2005) implement a simulation model based on an internal risk model approach which assesses the default risk for property and casualty insurers over short-term. The framework is a stochastic model for dynamic portfolio strategies and the
financial market. Risk-based capital requirements that focus on the impact of portfolio strategies, confidence levels, and time horizons are analyzed. Findings of the study contribute to the development of a solvency assessment framework which includes the European Union capital requirements.

The study of Parikh and Lovatt (2011) employs unrelated regression models coupled with panel corrected standard errors. The research defines capital intensity as ratio of depreciation and interest expense to total assets which indicates inverse relationship to profitability. Models for cross-equation residual correlation and cross-sectional heteroscedasticity address the potential bias from least squares standard errors. Restricted and unrestricted cross-sectional models used to compute t-statistics based on Litzenberger-Ramaswamy, Fama-MacBeth and standard panel methodologies. The two methods show significant results compared to the utilization of Fama-MacBeth approach.

The research of Dimakos and Aas (2004) presents a new approach to modelling the total economic capital that protects financial institutions from possible losses. The method considers the correlation between risk types, and improves the conventional practice using assumptions on perfectly correlated risks. The study builds a statistical model and uses Monte Carlo simulation to estimate the total loss distribution. Findings show that knowledge of relationships between risks gives a 20% reduction in the total economic capital for a year time horizon.

The study of Giaccotto (1979) deals with forecasting and modelling of cash flows generated from capital investment. The application of autoregressive, processes of mixed autoregressive moving-average, and moving-average to capital budgeting are proposed. Other models considered are frameworks for stochastic, deterministic, and seasonal trends. Analytical expressions are developed for the variance and mean of the net present value of a project for each class of cash flow. The study investigates implications of risk analysis and net present value pricing. Its findings illustrate the impact of cash flow models on the risk and price of a project.

The paper of De la Mare (1979) deals with forecasting and modelling of cash flows generated from capital investment. The application of autoregressive, processes of mixed autoregressive moving-average, and moving-average to capital budgeting are proposed. Other models considered are frameworks for stochastic, deterministic, and seasonal trends. Analytical expressions are developed for the variance and mean of the net present value of a project for each class of cash flow. The study investigates implications of risk analysis and net present value pricing. Its findings illustrate the impact of cash flow models on the risk and price of a project.

2.1 Synthesis of the Study
The research synthesis of the study draws on the best available literature and studies covering a wide range of perspectives on the use of capital modeling in the insurance industry, and factors that lead to economic sustainability. The literature developed by North American CRO Council (2013) Insurance companies emphasized enhancement of capital
management capabilities and organizational risk through insights into their risk profile, in support to achievement of objectives and sustainability over the long-term. The present study focused on the same capital frameworks that identify risks and utilize simulations of the models to strengthen their capital management capabilities. The study of Al Maraj (2014) considered high level of capital adequacy as essential based on cost and benefit analysis. The present study discussed implications of different levels of capital adequacy in the insurance industry and assessed their impact on industry profitability as well as contributions of the industry to the economic sustainability of the country.

The present study dealt with similar concepts of strategic risk-based planning, capital allocation and asset pricing model which are discussed in the literature of Moody’s Analytics Inc. (2015). The framework of capital asset pricing was considered as vital in the determination of the rate of return on assets, influenced by the firm’s risk profile and capital allocation. The paper also focused on the use of technology to support the use of capital metrics in the overall management of the business.

According to the study of Fouche et al. (2006), capital adequacy ratio is one of the indices used in the measurement of susceptibility of banks to failure. The study identified the type of ratios which include non-risk based, risk-based. The present study used similar principles in the construction of time stochastic models for capital management and quantifying risks which are applicable in the insurance industry.

The present study evaluated results of capital models simulation to determine patterns of capital ratios over time periods in the insurance industry. Similar concepts were used in the study of Ballota (2009) which assessed valuation frameworks for capital requirements and price contracts. The study modeled dynamics of log returns and determined consequences of model specifications on capital requirements.

2.2 Theoretical Framework of the Study

Figure 1: Theoretical Framework of the Study

As presented in Figure 1, capital models offer a framework that enables organizations to formulate strategic decisions based on sound economic data and develop strategies to take advantage of business opportunities. In insurance industries, capital models are used to improve risk management practices and achieve efficiency in capital utilization. Strategic uses of the model include capital management, portfolio optimization, setting of risk limits, determining cost of capital for pricing, capital adequacy monitoring, and cost capital allocation. Insurance companies use capital model to formulate tactical and strategic decisions and may need multiple models in the optimization of insurance portfolio. Figure 1 shows the strategic uses of capital models used as theoretical framework of the study.

2.3 Conceptual Framework of the Study

The study utilized the IPO Model of Daniel Stufflebeam, which is a comprehensive framework that serves as a guide in the evaluation of systems, programs, projects, products, personnel, and institutions. The model has core parts of input, process, and output and is a graphical representation of the factors that make up a process. It is configured for internal, external, and self evaluations of organizations and applies to operational and strategic decisions. As depicted in Figure 2, the inputs of the system are the capital modeling variables of capital adequacy, return on equity, asset pricing, and insurance penetration, used by firms in the UAE insurance industry. The industry used financial simulations and computations to generate indices in the insurance industry and create plausible future paths of capital modeling variables that will influence outcomes on economic sustainability, considered as process in the IPO model. The outcome is economic sustainability contributed partly by the insurance industry. Figure 2, presents the conceptual framework of the study.

3. Methodology

3.1 Research Methods

Descriptive, correlational and historic researches used in this study. Descriptive research employed to demonstrate the relationships and associations of capital modelling variables with UAE economic sustainability. Data collection conducted using office records, government
manuals, and brochures and standards of the insurance industry. Sources in the form of variables used to collect data to establish statistical relationships. Correlational research used to explore the relationships between capital modelling variables and economic sustainability and to predict variables that will contribute to its achievement in the long-term. Historical research design utilized secondary sources of data to

A. Correlation Analysis used to measure the strength of linear relationship between capital modelling in the UAE insurance industry and economic sustainability. The formula is:

\[
\rho = \frac{N \sum{XY} - \sum{X} \sum{Y}}{\sqrt{[N \sum{X^2} - (\sum{X})^2] \cdot [N \sum{Y^2} - (\sum{Y})^2]}}
\]

Where:
- \( N \) = number of pairs of scores
- \( \sum{XY} \) = sum of the products of paired scores
- \( \sum{X} \) = sum of X scores
- \( \sum{Y} \) = sum of Y scores
- \( \sum{X^2} \) = sum of squared x scores
- \( \sum{Y^2} \) = sum of squared y scores

B. The Chi-Square Test of Independence used to test some significant associations between capital modelling in the UAE insurance industry and economic sustainability and the independence of the two categorical variables. The formula is:

\[
X^2 = \sum \frac{(O - E)^2}{E}
\]

Where:
- \( X^2 \) = Chi Square obtained
- \( \sum \) = the sum of
- \( O \) = observed score
- \( E \) = expected score

C. T-Test used to test the significant difference between the economic verify and establish facts relative to the hypotheses of the study. Predictive analysis and modelling used to extract information from data to analyze historical and current facts and predict behavior patterns and future trends.

3.2 Statistical Treatment of Data

The data obtained, tabulated, analyzed and interpreted. The following statistical tools used in the analysis: sustainability of UAE insurance industry over the past ten years and in the long-term. The formula is:

\[
t = \frac{\bar{x}_1 - \bar{x}_2}{S_p \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}
\]

\[
s^2_p = \frac{(n_1 - 1)s_1^2 + (n_2 - 1)s_2^2}{n_1 + n_2 - 2}
\]

Where:
- \( T \) = the difference between the means of two groups of data
- \( \bar{x}_1 \) = the mean of the first data group
- \( \bar{x}_2 \) = the mean of the second data group
- \( \Sigma \) = summation
- \( s_1^2 \) = sample variance for first data group
- \( s_2^2 \) = sample variance for second data group
- \( n_1 \) = number of cases in the data set in the first group
- \( n_2 \) = number of cases in the data set in the second group

D. Regression Analysis used to measure the relationship between variables, and to predict which of the capital modelling variables, singly, or in combination, predict the achievement of economic sustainability of UAE. It is also used to measure how strongly each of the variables of capital modelling in the UAE insurance industry predict economic sustainability. The formula is:
where:

- $Y$ = dependent variable
- $X$ = independent variable
- $N$ = number of paired data
- $\Sigma$ = symbol of summation

### 4. Results and Discussions

#### 4.1 Insurance Industry

The insurance industry is performing after the UAE industry registered AED 26.8 Bn in premiums in 2009 as a result of market recovery in the midst of stifling competition. It plays an important role in the economy because of its direct contribution to economic sustainability and its support to the operation of transport, health services, logistics, and other service firms. Its performance has been robust in 2012 indicating improvement in most financial ratios. The total volume of premiums for underwritten insurance premiums reached a 10% increase in 2010, compared to 2009. For all types of insurances, the written premiums amounted to AED 26.3 Bn, showing a 9.5% increase, compared to 2011. The profitability of the industry indicated an increase from AED 0.3 Bn in 2011 to over AED 1 Bn in 2012. Given the insurance industry’s fast population growth, the outlook of the sector is very good. The sector faces challenges in the number of unprofitable companies and needs improvements in the area of risk practices. Studies show that consolidation can help the creation of more profitable companies that can effectively compete and improve the efficiency of the insurance market. United Arab Emirates and Saudi Arabia are the largest insurance markets in the region with the industry as a major driver of the GCC insurance growth, projected to expand in the year 2012 to 2017.

#### 4.2 Economic Sustainability

The United Arab Emirates records one of the highest economic growth rates, the second largest economy in the GCC region attributed to the ongoing economic programs for diversification and its growing gas and oil exports. Fuelled by a strong growth of oil and non-oil sectors, the UAE economy increased by 145% during 2004 to 2008 (Central Bank of the UAE, 2013). Economic recovery from the downturn in real estate and securities markets, continues to take place with 5% GDP growth in 2013. Accelerating growth of the UAE economy was attributed to growth in non-oil GDP driven by a rebound in the real estate industry and strength in the transport, tourism, and trade industry. Feeding into increase demand for insurance products and other services in the areas of construction, tourism, real estate, and trade. Indicators reveal a significant contribution from investment and economic diversification activities and emerging markets in Asia and Africa for non-oil exports and increase in exports of goods in 2013. The economy gained momentum in 2011 and 2012 with GDP growth exceeding 4%. But, growth slowed down in the succeeding years with lower oil prices and reduced oil output (Subramaniam, 2012). Figure 3 presents UAE economic sustainability in the past ten-year period.
The generated UAE growth rate and sustainability show the continued success of diversification policy of income sources and reduction of the reliance on oil in the light of economic financial crises of the global economy and the slow recovery in developed economies. The economy achieved 23.5% surplus in 2011 compared to 2010, establishing its position as a major center for trade and investment (Ministry of Economy Annual Economic Report, 2012). The insurance industry is currently contributing about 1% to the GDP of the country and aims to reach 3% in the immediate future period.

The UAE enjoys a strong economy supported by a climate of investments with high degree of flexibility, economic policies, effective investment, and attractiveness. The economy is based on a modern institutional structure aligned with global variables that create a positive impact on foreign investment flows to the country. The insurance industry is achieving growth in an increasingly competitive environment projected to translate into contributions to UAE economic sustainability in the long-run. Development achieved by the insurance sector asserts its significance in the national economy and its sustainability over the long-term. Figure 4 shows the projected economic sustainability of the country over the long-run.

4.3 Capital Adequacy
Capital adequacy in the insurance industry measures firms’ ratio of capital to risk, providing them with the capacity to meet obligations relative to risk exposure. It is a measure of the organization’s capital position expressed...
as a ratio of the firm’s capital to risk. It equips insurance firms with both the ability to absorb losses and the requirements for capitalization, allowing them to become insolvent that are likely to result from unexpected losses. The requirement determines the insurance company’s ability to meet time liabilities and other organizational risks. A level below the statutory requirement indicates non-adequacy of capitalization to expand insurance operations.

The Insurance Authority in the UAE continuously monitors solvency of insurance companies through the application of laws and regulations to protect the rights of beneficiaries of insurance policies. The industry performance was seen robust in 2013 with increased financial ratios. UAE insurance sector calls for consolidation in order to cutthroat competition as it unveils reforms in the industry. New regulations are introduced continuously specifically on capital adequacy ratios and general supervisions of firms. The reforms aimed to better regulate insurance operations in UAE. Capital adequacy in the industry reached a highest record of 20.7% in 2010 and lowest in 2012, with a ratio of 9.5% as shown in Figure 5.

![Figure 5: Capital Adequacy (2005 – 2015)](source: IFR Middle East Report (2009))

### 4.4 Return on Equity

The UAE insurance industry reported a net income of 29% compound annual growth rate from 2009 to 2013 which translated into a growth rate of 14% return on equity. Driven by growth in insurance operations, increase in return on equity was recorded in the UAE insurance industry with firms delivering 6.45% in 2013. Return on investment reached a high record of 21.35% in 2007 and a low record of 6.25 in 2011. Figure 4 presents return on equity in the UAE insurance industry.

![Figure 6: Return on Equity (2005 – 2015)](source: GulfBase.Com)
4.5 Asset Pricing

Asset pricing in the insurance industry calculates the expected return on insurance assets to compensate investors for taking risk. The model assumes that for any level of risk, the return must exceed by a certain amount of a risk-free asset, and requires higher return as more risk is assumed. Insurance firms asset composition is highly weighted toward equity assets and real estate. The investment rules aim to enhance insurers’ asset profile through reduction of companies’ exposure to higher risks in assets. The rules are also expected to allow greater stability of returns to investment profiles and reduction in asset price volatility caused by fluctuations of asset prices in insurance operations. Risk reduction is expected to improve the financial strength of insurance companies in the industry (Ossman, 1996). Figure 7 shows asset pricing rates in the UAE industry for the past ten years.

**Figure 7: Asset Pricing (2005 – 2015)**

![Asset Pricing Graph](Source: GulfBase.Com)

4.6 Insurance Penetration

UAE has the largest insurance market in the GCC accounting for 44% of the total regional market in 2012 and indicated a penetration rate of 1.98, the premium as percentage of the country’s GDP. Low penetration rates in the UAE insurance market spurs expectation of future growth in the insurance industry driven by strong economic growth and evolution in demography and government regulations. The insurance market records an acceleration at a double-digit rate from its infancy. Growth in the industry comes as the country invests in new medical infrastructures that support health insurance growth and increase in medical insurance. Insurance penetration in the GCC region is set to continue rising in the future period due to both development of regulations and increased awareness of the importance of financial security (Trade Arabia, 2014). The current penetration rate reveals opportunities for growth in the industry, standing at 2% in UAE. The rate is rising and steadily pushed by regulations, education, and increased awareness of the importance of financial security. Data shows UAE penetration and density grew marginally at 2% and US $1,464 respectively in 2012.

The performance of the UAE insurance industry was assessed with reference to insurance penetration reflecting the development level of the insurance sector in the country. It measures as a percentage of the underwritten insurance premium in a
given year to GDP. As shown in Figure 8, insurance penetration rate was at 5% in 2010, slipped from 4.25% in 2012 to 3.5% in 2011 due to slower rate of growth in life insurance premium compared to the UAE economic growth. However, the GCC insurance market indicators trail the world average by large margin and recorded to be underpenetrated. The penetration in 2012 was measured to be 1.1%, with insurance density of US $1,300, to score the highest within the GCC.

![Figure 8: Insurance Penetration (2005 – 2015)](source: The National Business (2013))

### 4.7 Significant Relationship between Capital Modelling and Economic Sustainability:

As presented in Table 1, correlation coefficient of capital adequacy and economic sustainability is .236 and the $\rho$ value for two-tailed test of significance is .015, indicating a weak positive correlation, significant at .05 level of significance. There is also weak positive correlation between penetration rate and economic sustainability, indicated by the correlation coefficient of .166 and $\rho$ value for two-tailed test of significance of .026, significant at .05 level of significance. These findings indicate significant influence of capital adequacy and penetration rate on economic sustainability, hence, the null hypotheses for the two variables are rejected. A change in the ratio of capital adequacy and penetration rate in the insurance industry will slightly influence the level of economic sustainability in the UAE economy. This finding implies that insurance industry in the UAE implements an effective and strengthened financial capital modelling simulation technique of capital adequacy and penetration rate in compliance with insurance regulations that contribute to the achievement of economic sustainability of the country. The
industry is seen to be successful in the implementation of strategies of risk management processes while maintaining a balance for priorities on operating budgets aimed at achieving greater returns over time. Companies determine the ratio through aggregation of relevant types of risks that meet the requirements of an integrated capital management system within the industry.

Correlation coefficient of .685 and $\rho$ value for two-tailed test of significance of .050, significant at .05 level of significance, reveal strong positive correlation between return on equity and economic sustainability. The two variables are significantly positively correlated, hence, the null hypothesis is rejected. A change in the level of return on equity in the insurance industry will strongly influence an identical change, the level of economic sustainability in the UAE economy. Asset pricing has correlation coefficient of .667 and $\rho$ value for two-tailed test of significance of .025, significant at .05 level of significance, which reveal strong positive correlation with economic sustainability. Thus, the null hypothesis is rejected, the variable of asset pricing is significantly positively correlated with economic sustainability. These findings imply that capital modelling techniques of return on equity and asset pricing used in the insurance industry, are given increasing importance in capital management, based on the industry’s view of risk and economic principles, to provide for a specified security level and for making tactical and strategic decisions. Findings show effectiveness of the insurance industry in the utilization of asset pricing model to make informed decisions regarding insurance products’ feasibility and setting strategic decisions in entering market segments. According to Mann (2012), insurers should utilize more capital modelling techniques to be integrated into insurers’ operations, to determine the amount of capital the insurance business needs in meeting future risks. The framework offers a compliance road map and valuable risk information, capital allocation, underwriting, asset pricing, and strategic decisions.

4.8 Significant Association between Capital Modelling and Economic Sustainability

Table 2: Descriptive Statistics: Chi-Square Test of Independence

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>df</th>
<th>Asymp. Sig. (2-sided)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pearson Chi-Square</td>
<td>1.44000</td>
<td>2</td>
<td>.0282</td>
</tr>
<tr>
<td>Likelihood Ratio</td>
<td>6.99</td>
<td>2</td>
<td>1.000</td>
</tr>
<tr>
<td>Linear-by-Linear Association</td>
<td>.219</td>
<td>1</td>
<td>.640</td>
</tr>
<tr>
<td>N of Valid Cases</td>
<td>16</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As shown in Table 2, the $\rho$ value of .0282 is significant at .05 level of significance. The null hypothesis is rejected, there is significant relationship and degree of association between capital modelling in the insurance industry and economic sustainability. Findings reveal that the two categorical variables are not independent of each other. Significant relationship between capital modelling and economic sustainability is at 5% significance level and located at $X^2 = 1.44, df = 2$, and $\rho = .0282$. Analysis show that there is significant degree of association between capital modelling variables and...
economic sustainability. Findings of the analysis imply that as the country concentrates on capital investment and economic growth over the long-term, the insurance industry maintains and enhances utilization of financial capital models to broaden potentials for profitability that influence economic growth and sustainability. Findings further reveal that a change in the level of utilization of capital models will influence economic sustainability of the country. The insurance industry is considered successful in the implementation of capital models to deliver services and to formulate decisions that lead to sustainable outcomes in the economy. Projected scale of sustainable development in the UAE economy is the result of the government’s commitment to sustainable development that shapes international cooperation and domestic policy.

4.9 Significant Difference between Economic Sustainability in the Past Ten Years and Over the Long-Run

Table 3: Group Statistics

<table>
<thead>
<tr>
<th></th>
<th>TP</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECONOMIC SUSTAINABILITY</td>
<td>1.00</td>
<td>11</td>
<td>4.4182</td>
<td>1.99340</td>
<td>.60103</td>
</tr>
<tr>
<td></td>
<td>2.00</td>
<td>5</td>
<td>4.4800</td>
<td>.08367</td>
<td>.03742</td>
</tr>
</tbody>
</table>

Table 3 presents the table of group statistics for the descriptive statistics of data sets, the mean, standards deviation, and standard error of the mean.

Table 4: Independent Samples Test

<table>
<thead>
<tr>
<th></th>
<th>Levene’s Test for Equality of Variances</th>
<th>t-test for Equality of Means</th>
<th>95% Confidence Interval of the Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>Sig.</td>
<td>t</td>
</tr>
<tr>
<td>ECONOMIC SUSTAINABILITY</td>
<td>Equal variances assumed</td>
<td>2.255</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>Equal variances not assumed</td>
<td>0.103</td>
<td>.000</td>
</tr>
</tbody>
</table>

Results of the T-test analysis are presented in Table 4, that show independent samples test for the two sets of techniques. Levene’s test for equality of variances assumes equal variances in the independent and dependent variables. It tests the null hypothesis that the economic sustainability for the last ten years and the level of economic sustainability in the long-run have equal variances. The value of ρ = .000 indicates that the two variables have
equal variances and the null hypothesis is wrong.

The table of t-test for equality of means assumes unequal variances. The value of $\rho = 0.92$ t – statistics indicates that the two groups of data do not have equal variances. The statistic associated with equal variances not assumed is used for the t-test for equality of means. The t-test result, with equal variances not assumed, shows t-statistic of 0.103 with 10 degrees of freedom. The corresponding two-tailed $p$ value is higher than .05 and .01. The null hypothesis is accepted at both significant levels. This finding indicates that economic sustainability in the past ten years and over the long-term are not significantly different from each other. The increasing economic sustainability trend in the past ten-year period will continue over the future period and in the long-term. The finding reveals that the government efforts to ensure sustainable development and pursues the goal of maintaining a balance between economic and social development. The country is committed to sustainable development that extends to international efforts and actively participates in bringing the world together on sustainability and innovation initiatives. (Khaleej Times, 2015).

4.10 How Strongly the Variables of Capital Modelling Predict Economic Sustainability

Table 5: Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R²</th>
<th>Adjusted R²</th>
<th>Std. Error of the Estimate</th>
<th>Change Statistics</th>
<th>Durbin-Watson</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>R² Change</td>
<td>F Change</td>
</tr>
<tr>
<td>1</td>
<td>.787*</td>
<td>0.619</td>
<td>0.366</td>
<td>1.58774</td>
<td>0.619</td>
<td>2.441</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), CA, RE, AP, PR
b. Dependent Variable: ECONOMIC SUSTAINABILITY

Table 5 presents the independent variables and the regression method used in the analysis. The capital modelling variables of capital adequacy, return on equity, asset pricing, and penetration were entered simultaneously for the regression analysis. The model summary table presents the R values for assessing the overall fit of the regression model. The R value equivalent to .787 shows the correlation between the observed and the predicted values based on the regression equation obtained by the variable of economic sustainability. R² value of .619 gives the proportion of variance in the variables of economic sustainability accounted for by the set of capital modelling variables chosen for the regression model. It was used to test how strongly the capital modelling variables are able to predict economic sustainability. The adjusted R Square value of .366 shows that the capital modelling variables in the model account for 36.6% variance in the dependent variable of economic sustainability.

Table 6: Regression Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>95% Confidence Interval for B</th>
<th>Collinearity Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td>t</td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>1.066</td>
<td>2.457</td>
<td>.434</td>
</tr>
</tbody>
</table>
Table 6 presents the regression coefficients of the financial capital modelling variables and their significance, used to test the hypotheses of each independent variables. The \( \rho \) value for the beta coefficient of capital adequacy is .786, \( \rho \) value for the beta coefficient of penetration rate is .851 which are both not significant at 5% level of significance. The null hypotheses of the two variables are accepted. Capital adequacy and penetration rate in the insurance industry are not predictors of economic sustainability of the United Arab Emirates.

The beta coefficient of return on equity and asset pricing have \( \rho \) value equivalent to .044 and .040, respectively, significant at 5% level of significance. The null hypotheses of both variables are rejected. Thus, capital modelling variables of return on equity and asset pricing, singly, or in combination, predict economic sustainability of the country.

Collinearity statistics shows in table 6 present statistics for testing multicollinearity in the regression model. The variance inflation factors (VIF) for capital adequacy, return on equity, asset pricing, and penetration rate are 2.196, 1.695, 1.711, and 2.635, respectively, which are less than 5. These values indicate the absence of multicollinearity. Analysis shows that regression coefficients presented in table 6 are meaningful values that measure how strongly each of the variables of capital modelling predicts economic sustainability of UAE.

Tolerance values of .455, .590, .585, and .380, for capital adequacy, return on equity, asset pricing, and penetration rate, respectively, are higher than the value of .2. Findings reveal the absence of multicollinearity in the regression model.

Table 7 shows the statistics for testing multicollinearity in the regression model to determine if two or more predictor capital modelling variables are highly linearly correlated and can be linearly predicted from other variables with non-trivial degree of accuracy. The condition index obtained in the table of Collinearity Diagnostics measures the presence of multicollinearity in the model. Values of Variance Proportions of any two capital modelling variables do not exceed 0.9 (column values) corresponding to any row in the
Condition Index where values are less than 30, reveal no multicollinearity in the model. The findings imply that the predictor variables of capital modelling in the multiple regression model are not correlated which can result in erratic change in response to small changes in the data.

The absence of multicollinearity and highly intercorrelated predictor variables indicate how well the capital modelling variables predict economic sustainability and estimates obtained by the model are considered valid and precise. Basic assumptions underlying the mathematical estimations and financial simulations are considered valid and regression estimates are stable. Thus, analysis shows the absence of high degree of linear dependency among the independent variables of capital adequacy, return on equity, asset pricing, and penetration rate.

To assess the appropriateness of the linear regression model for the data, and to determine closeness of the theorized model to the real world phenomenon, residuals are defined, and residual plots were examined. The residual plot shows fairly random pattern, dispersed around the horizontal axis, which indicates that the linear model provides a descent fit to the data. Residuals are scattered on both sides of zero and show fairly random pattern, which reveals decent fit and appropriateness of the model to the data.

Figure 9 shows the fairly random pattern of the residual plot versus predicted dependent variable of economic sustainability. The pattern shows appropriateness with the assumption that residuals are normally distributed at each level of Y and constant in variance across levels of predicted variable.

5. Conclusions

1- The insurance industry is performing as a result of market recovery in the midst of stifling competition and plays an important role in the economy because of its direct contribution to economic sustainability and its support to the operation of service firms in the country. UAE records one of the highest economic growth rates in the GCC region attributed to the ongoing economic programs for diversification and its growing gas and oil exports. The current penetration rate reveals opportunities for growth in the industry, standing at 2% in UAE. The rate is rising steadily and pushed by regulations, education,
and increased awareness of the importance of financial security.

2- Correlation coefficient of capital adequacy and economic sustainability indicates a weak positive correlation, significant at .05 level of significance. There is also weak positive correlation between penetration rate and economic sustainability. However, it reveals strong positive correlation between return on equity and economic sustainability. The two variables are significantly positively correlated, thus, the null hypothesis is rejected. Asset pricing has correlation coefficient which reveals strong positive correlation with economic sustainability. The null hypothesis is also rejected, the variable of asset pricing is significantly, positively correlated with economic sustainability.

3- There is significant relationship and degree of association between capital modelling variables in the insurance industry and economic sustainability. The two categorical variables are not independent of each other. Significant relationship between capital modelling and economic sustainability is at 5% significance level and located at $X^2 = 1.44$, df = 2, and $\rho = .0282$. This implies that as UAE concentrates on capital investment and economic growth over the long-term, the insurance industry maintains and enhances utilization of financial capital models to broaden potentials for profitability that influence economic growth and sustainability. Furthermore, a change in the level of utilization of capital models will influence economic sustainability of UAE.

4- Economic sustainability in the past ten years and over the long-term are not significantly different from each other. The increasing economic sustainability trend in the past ten-year period will continue over the future period and in the long-term.

5- Capital modelling variables of capital adequacy and penetration rate in the UAE insurance industry are not predictors of economic sustainability in UAE. The null hypotheses of both variables are rejected. But, those of return on equity and asset pricing, singly, or in combination, predict economic sustainability of the country.

6. Recommendations

1- Develop strategies that will increase the level of insurance penetration rates in UAE in order to contribute to increasing economic sustainability.

2- Search for measures that will continuously enhance the level of insurance capital adequacy which indicates weak positive correlation with economic sustainability.

3- Develop measures and strategies that will lead to improvement of return on equity and asset pricing in the insurance industry.

4- Explore and set national development initiatives to achieve sustainable outcomes in the UAE economy.

5- Conduct future research that will deal with other independent variables which will increase profitability in the insurance industry and will continue to support the national goal for economic sustainability.
6- Improvement in the capital management and risk management practices in the industry to create more profitable firms that can compete and increase insurance market efficiency.

7- Consolidation of firms in the sector to improve profitability of firms identified to have low performance.

References


