

Investigating the Interrelationship between Profit and Premium in the Insurance Companies: Case Study

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Abstract: Insurance Companies provide coverage in the form of compensation resulting from loss, damages, injury, treatment or hardship in exchange for premium payments. Insurance as an industry involves pooling funds from many insured entities (known as exposures) to pay for the losses that some may incur. Insurance as a financial intermediary is a commercial enterprise and a major part of the financial services industry. The Growth of insurance companies usually measured through certain Indicators such as the increment percentage in: net profit, total premium written, shareholders equity, total assets, net underwriting income, and net investment. Insurance industry established in UAE at early 70th of the last century (the first insurance company was El Sharjah Company which established at 1970). Now (after almost 40 years) there are more than sixty insurance companies playing a crucial role in both the UAE financial market and society. In this article the net profit and total premium written growth indicators will be investigated for a selected group of insurance companies in UAE that established before 2000. Using descriptive statistical tools, graphical presentations and control charts, Pareto Analysis which is a technique used for decision making based on the Pareto Principle. Investigation of interrelationship between the two factors will be through the calculation of the correlation coefficient and conduct a regression analysis between the profit and the premium written to analyze the expected interrelationship between them to determine to which degree the premium written affect the profit.

Keywords: Insurance companies, Growth indicators, Pareto Analysis, premium payments, performance analysis, financial performance.

1. INTRODUCTION

UAE has emerged as a global country of the Gulf region and it is increasingly developing as a business hub for service industries such as IT, Finance and insurance. The Emirate's Western-style model of business drives its economy, and more than 90% of the main revenues currently coming from various aspects rather than financial services [22].

Insurance is the equitable transfer of the risk of a loss, from one entity to another in exchange for payment. It provides coverage in the form of compensation resulting from loss, damages, injury, treatment or hardship in exchange for premium payments. [34]. Insurance as an industry involves pooling funds from many insured entities (known as exposures) to pay for the losses that some may incur. Insurance as a financial intermediary is a commercial enterprise and a major part of the financial services industry. It is a form of risk management primarily used to hedge against the risk of a contingent, uncertain loss. An insurer, or insurance carrier, is selling the insurance; the insured, or policyholder, is the person or entity buying the insurance policy. The amount of money to be charged for a certain amount of insurance coverage is called the premium. Risk management, the practice of appraising and controlling risk, has evolved as a discrete field of study and practice [11].

Methods of insurance: In accordance to the Chartered Insurance Institute, there are four main types of insurance: The Co-insurance – in this type the risks shared between insurers & the Dual insurance – in this case the risks having two or more policies with same coverage & the Self-insurance – situations where risk is not transferred to insurance companies and

solely retained by the entities or individuals themselves & the Reinsurance – situations when Insurer passes some part of or all risks to another Insurer called Reinsure.[12, 33].

Types of insurance: Insurance can have various effects on society through the way that it changes who bears the cost of losses and damage. On one hand it can increase fraud; on the other it can help societies and individuals prepare for catastrophes and mitigate the effects of catastrophes on both households and societies [13, 35, 29]. In the literature there are different types of insurance like the Auto insurance that protects the policyholder against financial loss in the event of an incident involving a vehicle they own, the Gap insurance which covers the excess amount an auto loan, and the Health insurance to cover the cost of medical treatments. Also the Income protection insurance to cover the Workers' compensation, or employers' liability insurance, Casualty insurance insures against accidents, not necessarily tied to any specific property, the Life insurance provides a monetary benefit to a decedent's family or other designated beneficiary, the Property insurance provides protection against risks to property, and the Liability insurance is a very broad superset that covers legal claims against the insured. [7, 9, 10]

2. INSURANCE INDUSTRY IN UAE

Insurance industry established in UAE at early 70th of the last century (the first insurance company was El Sharjah Company which established at 1970). Now there are sixty one insurance competitors in the insurance field playing an important role in both the UAE financial market and society. The insurance industry, which grew 9.5% in 2012, is forecasted to expand up to 10.5 % during the year 2015 in the wake of strong recovery on economic front [33, 34].

It is mentioned in the Insurance authority report (IAR) that: " The insurance sector contributes to 1% of the gross domestic product during the issued year 2014, is targeted to contribute with more than 3% in 2020, and the Emiratization in the insurance industry, which stands at 8% is expected to be almost doubled to reach 15% by the end of year 2015.

A released report, by the AUE insurance authority, asserts the significance of this sector and its substantial role in the national economy due to the considerable funds invested amounted to Dh 28.7 billion in 2012 that increased by 30% during 2013 to reach almost the Dh 38 billion, while the underwritten premiums amounted to Dh 26.3 billion that increased by only 12% during 2013 (almost 75 % for property & liability insurance and 25% for life insurance & operations fund formation). Also the report includes the following classification (table 1) for the insurance types [34]. It is clear from figure 1 that around forty percent related to the accidents and liability while almost 30 percent related to the medical insurance. [8, 33]

The IAR report classify the existing 61 insurance companies into three main categories, National (56%), Foreign (28%), and Islamic (16%) (see table 2), and the classification distributed among the different insurance activities [33, 34].

TABLE 1: Percentage of Insurance Types according to the IAR

Type of Insurance	Share
Accidents and Liability	39.3 %
Medical	32.1 %
Sea and Air transport	11.9 %
Fire	11.4 %
Other Risks	5.3 %

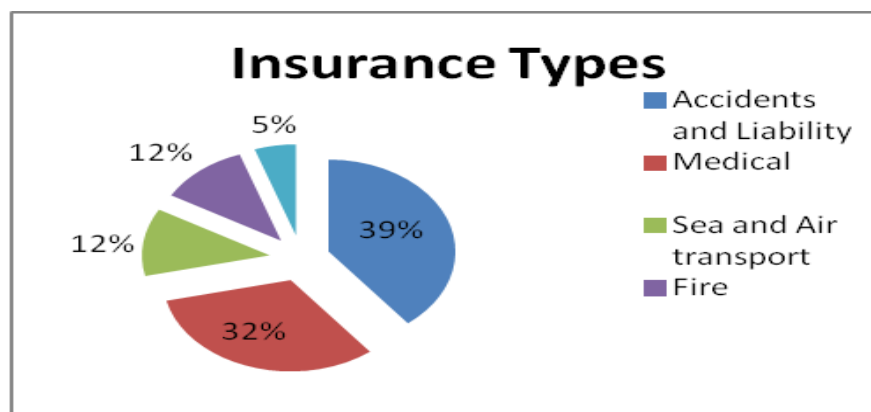


Figure 1: Graphical representation for the Percentage of Insurance Types according to the IAR

TABLE 2a: Classification of Insurance Types according to the IAR

Insurance Company Name	Number of Companies
National	34
Foreign	17
Islamic	10

TABLE 2b: Classification of Insurance Activities according to the IAR

Insurance Company Name	Insurance Activities			
	All	life insurance and operations of fund formation	property and liability	Others
National	11	20	2	1
Foreign	0	17	0	0
Islamic	2	0	8	0

3. INSURERS' BUSINESS MODEL

Insurance companies may be classified into two groups: the Life insurance companies, which sell life insurance, annuities and pensions products and the Non-life or property/casualty insurance companies, which sell other types of insurance [32]. In most countries, life and non-life insurers are subject to different regulatory regimes and different tax and accounting rules. The main reason for the distinction between the two types of company is that life, annuity, and pension business is very long-term in nature – coverage for life assurance or a pension can cover risks over many decades. By contrast, non-life insurance cover usually covers a shorter period, such as one year.

The business model is to collect more in premium and investment income than is paid out in losses, and to also offer a competitive price which consumers will accept. Profit can be reduced to the following simple equation [35]:

$$\text{Profit} = \text{Earned premium} + \text{Investment income} \\ - \text{Incurred loss} - \text{Underwriting expenses.}$$

It is known that any Insurers company can make its profits in the following two ways. The first way through underwriting (The process by which insurers select the risks to insure and decide how much to charge in premiums for accepting those risks). The second way by investing the premiums they collect from insured parties.

4. CONTROL CHARTSPARETO CHARTS/REGRESSION ANALYSIS

A **control chart** is a statistical tool used to distinguish between variation in a process resulting from common causes and variation resulting from special causes. It presents a graphic display of process stability or instability over time. Every process has variation. Some variation may be the result of causes which are not normally present in the process. This could be special cause variation. Some variation is simply the result of numerous, ever-present differences in the process. This is common cause variation. Control Charts differentiate between these two types of variation. One goal of using a Control Chart is to achieve and maintain process stability. Process stability is defined as a state in which a process has displayed a certain degree of consistency in the past and is expected to continue to do so in the future. This consistency is characterized by a stream of data falling within control limits based on plus or minus 3 standard deviations (3sigma) of the centerline.

There are two main **categories of Control Charts**, those that display attribute data, and those that display variables data. The **types of control charts** are often classified according to the type of quality characteristic that they are supposed to monitor: there are quality control charts for variables and control charts for attributes.

The most famous control charts are: **\bar{X} chart**. The sample means are plotted in order to control the mean value of a variable. **R chart**. The sample ranges are plotted in order to control the variability of a variable. **S chart**. The sample standard deviations are plotted in order to control the variability of a variable.

Pareto Analysis is a technique used for decision making based on the Pareto Principle, known as the 80/20 rule. It is a decision-making technique that statistically separates a limited number of input factors as having the greatest impact on an outcome, either desirable or undesirable. Pareto analysis is based on the assumption that, in most of the situations, 20% of causes determine 80% of problems or 80% of a project's benefit can be achieved by doing 20% of the work.

Pareto charts is one of the famous seven quality tools and it is useful where many possible courses of action are competing for attention, and it is a creative way of looking at causes of problems because it helps stimulate thinking and organize thoughts.

Regression analysis is used when there is a need for predicting a dependent variable (sometimes called the response variable) from a number of independent variables (sometimes called the explanatory or predictor variable). In the regression analysis usual relationships among the two interpreted variables cannot be determined, and one can say that X (the independent variable) "predicts" instead of "causes" Y (the dependent variable). The scatter diagram or scatter plot is often used to investigate the relationship between variables. The independent variable is normally plotted on the X axis, while the dependent variable is normally plotted on the Y axis.

The general linear regression equation is given by:

$$\hat{Y} = b_0 + b_1 X$$

The values for the slope (b_1) and intercept (b_0) are not known so they are estimated using sample data using the following equations:

$$b_1 = \frac{\sum (X - \bar{X})(Y - \bar{Y})}{\sum (X - \bar{X})^2}$$

$$b_0 = \bar{Y} - b_1 \bar{X}$$

To measure the fitness for the obtained regression line, there are three different measures:

- The Sum of the squares total (distances from the observed point to the average)

$$SST = \sum (Y - \bar{Y})^2$$

- The Sum of the squares error (distances from the observed point to the expected point)

$$SSE = \sum e^2 = \sum (Y - \hat{Y})^2$$

- The Sum of the squares due to regression (distances from the expected point to the average)

$$SSR = \sum (\hat{Y} - \bar{Y})^2$$

- The following control relationship is very useful in the regression model

$$SST = SSR + SSE$$

Correlation Analysis is the study of the relationship between variables. It is also defined as group of techniques to measure the association between two variables

The **correlation coefficient** ranges from -1 to 1 . A value of 1 implies that, there is a perfect positive linear relationship between the described variables, with all data points lying on a line for which y increases as x increases. A value of -1 implies that all data points lie on a line for which y decreases as x increases. A value of 0 implies that there is no linear correlation between the two variables.

More generally, note that the product of the deviations (for the two variables and its means) is positive if and only if x_i and y_i lie on the same side of their respective means. Thus the correlation coefficient is positive if x_i and y_i tend to be

greater than, or less than, their respective means. The correlation coefficient is negative if x_i and y_i tend to lie on opposite sides of their respective means.

The **Coefficient of Determination** (r^2) is the proportion of the total variation in the dependent variable (Y) that is explained or accounted for by the variation in the independent variable (X). It is the square of the coefficient of correlation. It ranges from 0 to 1. It does not give any information on the direction of the relationship between the variables.

The equations of the determination and correlation parameters are:

$$r^2 = \frac{SSR}{SST} = 1 - \frac{SSE}{SST}$$

$$r = \sqrt{r^2}$$

5. DATA ANALYSIS

In this article we study the case of eleven insurance companies established before 1985 according to the domestic capital markets group report posted on 2008. The data related to the investigated period (2000 to 2007) were extracted from the mention catalogue and tables 1a & 1b showed the summaries of the Growth in the Net Profit and the Growth in the Total Premium Written.

Three types of analysis are conducted in this section, the first analysis done by applying the control charts to analyze the type of variation for the two parameters, and in the second analysis the Pareto charts and its cumulative curves are applied to analyze the different contributions for the investigated insurance companies. The third technique is the regression analysis to explain the relation between the two variables from the statistical point of view.

5.1 CONTROL CHARTS:

By applying the following formulas in the calculations of the upper and the lower limits of the control charts (based on the decision tree for the control charts):

$$UCL = \bar{X} + 3 \frac{\bar{s}}{c_4\sqrt{n}} \quad \& \quad LCL = \bar{X} - 3 \frac{\bar{s}}{c_4\sqrt{n}}$$

The obtained results are summarized as follows: for the Profit: **UCL** = 193.71 & **CL** = 52.41 & **LCL** = -88.88 and for the **Total Premium Written** **UCL** = 29.66 & **CL** = 17.32 & **LCL** = 4.98

Where C_4 is a tabulated constant that equals to 0.981 (for $n = 14$) & $\sqrt{n} = \sqrt{14} = 3.742$ and the results included in tables 3a & 3b that showed the statistical summaries of the Growth in the Net Profit and the Growth in the Total Premium Written.

TABLE 3a: Growth in Net Profit Statistics

Insurance Company	Establishment Year	Growth in Net Profit	
		Average	SD
1970	Sharjah	65.84	241.79
1970	Dubai	-24.43	133.17
1972	AD National	13.85	26.17
1975	Al Ain	39.82	60.63
1975	Alliance	-129.68	311.16
1976	Oman	90.12	118.84
1976	United	75.46	255.17
1978	Al Buhairah	44.06	64.29
1979	Al Dhafra	33.99	86.77
1982	Emirates	56.69	136.99
1991	Dubai National	197.55	310.66
1996	Al Wathba	181.74	82.42
1996	Al Khazna	36.36	419.37
1998	Union	-25.30	228.27

The grand average = 52.41 and the average stander deviation = 17.32

Figures 2a - 2b discusses the control charts for the growth ratios in both the net profit and the total premium during the period under investigation for each year (2000 – 2007).

The average Growth in the net profit represented in figure 2a, and it is noticed from the figure that the upper control limit UCL (193.71) lies below the growth ratios of Dubai National Company, Al Wathba Company also near to the UCL (181.74), and this reflects that, the two Companies are extreme comparing with the others (the nearest Company is Oman Company 90.12 which represents only 50% of Al Wathba). Also Alliance Company lies below the lower LCL (-88.88), and almost 60% of the companies below the central line (grand average 52.41), this percentage could be interpreted according to control charts rules as an irregularity in the performance (special cause variation).

The average Growth in the total premium written represented in figure 2b, and it is noticed from the figure that the upper control limit UCL (29.66) is near to both Oman Company and Al Wathba Company, there is no companies below the lower LCL (4.98), also almost 50% of the companies below the central line (grand average 17.32) and this indicates the regular performance (common cause variation)

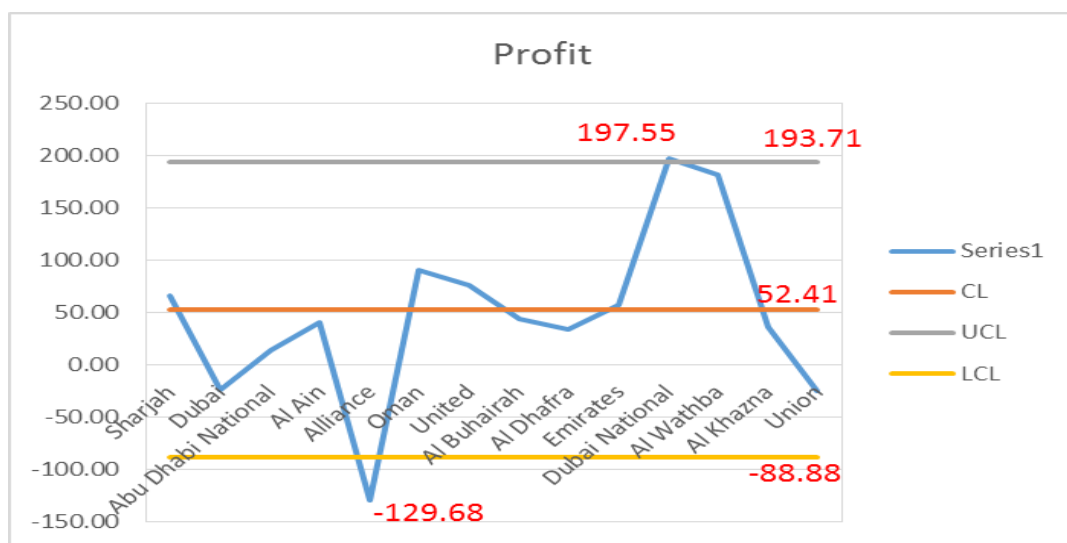


Figure 2a: Average Growth ratio in Net Profit with the trend line

TABLE 3b: Growth in Total Premium Written Data

Insurance Company	Established Year	Growth in Total Premium Written	
		Average	SD
1970	Sharjah	15.69	15.28
1970	Dubai	10.75	22.67
1972	AD National	14.70	8.28
1975	Al Ain	24.02	13.58
1975	Alliance	5.56	10.66
1976	Oman	31.33	14.82
1976	United	20.49	21.22
1978	Al Buhairah	22.03	12.33
1979	Al Dhafra	9.74	8.25
1982	Emirates	20.36	15.47
1991	Dubai National	6.26	30.12
1996	Al Wathba	33.86	9.60
1996	Al Khazna	10.36	14.04
1998	Union	25.19	46.86

The grand average = 172.88 and the average stander deviation = 15.10

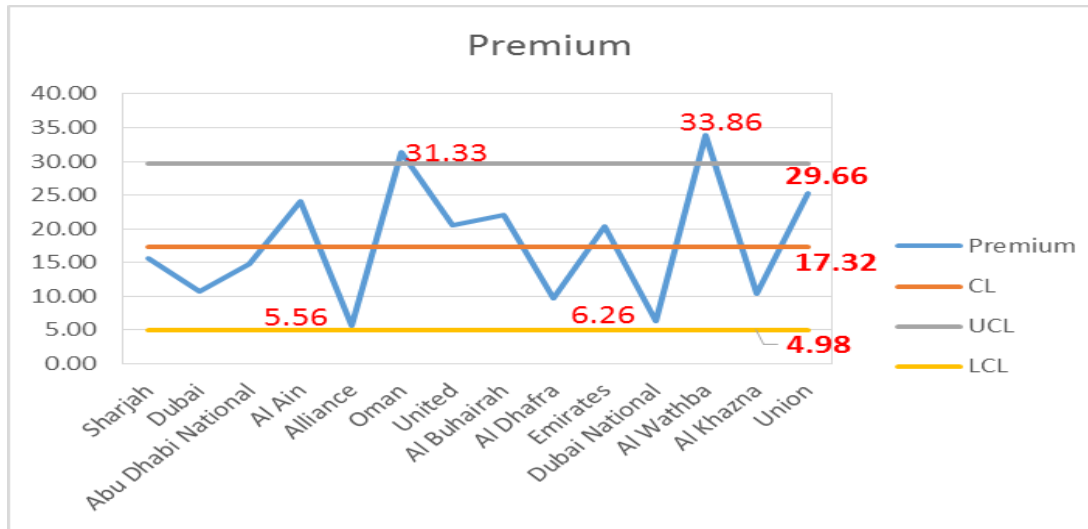


Figure 2b: Average Growth ratio in Total Premium Written with the trend line

5.2 PARETO ANALYSIS:

In this section, the data for the selected 14 insurance Companies are tabulated and represented graphically by the Pareto graphs, and some comments on the performance of the banks are discussed.

Figures 3a,b and 4a,b illustrate the Pareto distributions for the two different chosen parameters of the underlined study (Profit, and Premium), the Pareto graphs considered the average during the eight years. There are some observations could be interpreted from the figures, those observations will summarized in the next paragraphs of the current section.

The first observation is that there are two companies (Dubai National and Al Wathba) exceed the level of 180 million in average within the eight years (2000 – 2007). Oman Company come in the third place with only 90 Million in average which represents 50% of the second company, Oman satisfies the second place in the Premium group to exceed the UCL for its control chart.

More observations could be extracted from the Pareto presentaion of the two parameters, there are three insurance companies satisfy average losses during the eight years (Dubai & Union & Alliance), these three companies reduce the profits for the selected companies by almost 1.6 Billion dollars during the investigated period. It is noticed that 50% of the companies satisfy only 75% of the two big companies and 40% of the companies cover the obtained losses from the last three companies.

The average premium for the selected group of companies varies from 5 to 35 million per year. The 20 Million in average represents the median for the selected group of companies. Oman and AlWathba companies exceed in average the 30 million dollars per year during the selected period.

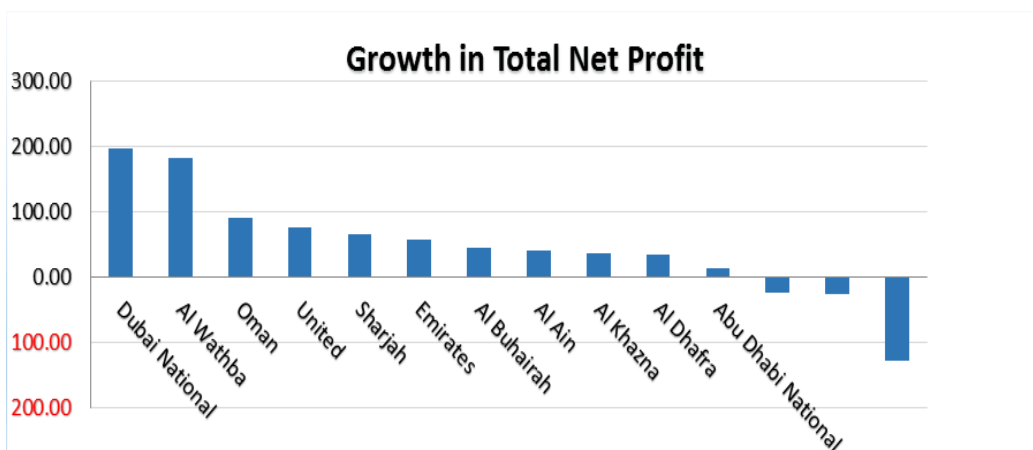


Figure 3a: Pareto presentation for the average Growth ratio in Net Profit

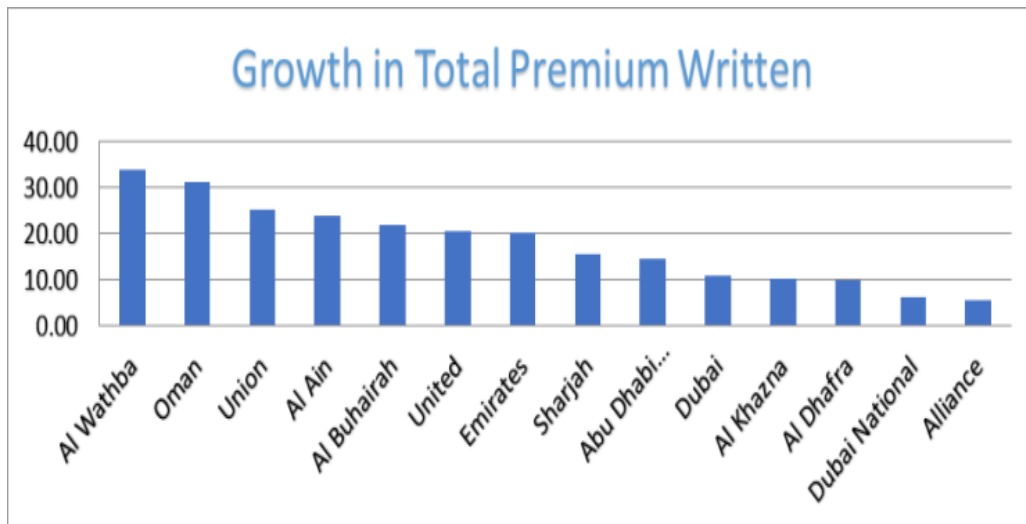


Figure 3b: Pareto presentation for the average Growth ratio in Total Premium Written

TABLE 4a: Growth in Net Profit Data (Percentage and Cumulative)

Company	Premium	Profit %	Cumulative %
Al Wathba	33.86	13.5%	13.5%
Oman	31.33	12.5%	26.0%
Union	25.19	10.1%	36.1%
Al Ain	24.02	9.6%	45.7%
Al Buhairah	22.03	8.8%	54.5%
United	20.49	8.2%	62.7%
Emirates	20.36	8.1%	70.8%
Sharjah	15.69	6.3%	77.1%
AD National	14.70	5.9%	83.0%
Dubai	10.75	4.3%	87.3%
Al Khazna	10.36	4.1%	91.4%
Al Dhafra	9.74	3.9%	95.3%
Dubai National	6.26	2.5%	97.8%
Alliance	5.56	2.2%	100.0%

TABLE 4b: Growth in Total Premium Written Data (Percentage and Cumulative)

Company	Profit	Profit %	Cumulative %
Dubai National	197.55	23.6%	23.6%
Al Wathba	181.74	21.8%	45.4%
Oman	90.12	10.8%	56.2%
United	75.46	9.0%	65.2%
Sharjah	65.84	7.9%	73.1%
Emirates	56.69	6.8%	79.9%
Al Buhairah	44.06	5.3%	85.2%
Al Ain	39.82	4.8%	89.9%
Al Khazna	36.36	4.4%	94.3%
Al Dhafra	33.99	4.1%	98.3%
AD National	13.85	1.7%	100.0%
Dubai	24.43	-2.9%	97.1%
Union	25.30	-3.0%	94.0%
Alliance	129.68	-15.5%	78.5%

5.2 REGRESSION ANALYSIS:

To analyze the relation between the two selected parameters, a scatter diagram was plotted to illustrate the relation graphically and the linear regression equation is presented Figure 5. The calculated parameters are as follows: the slope of the equation is positive and equals 3.32, the intercept with the Y axis is negative and equals -12.54, the correlation coefficient is positive and equals 0.36, and the determination coefficient equals 0.13

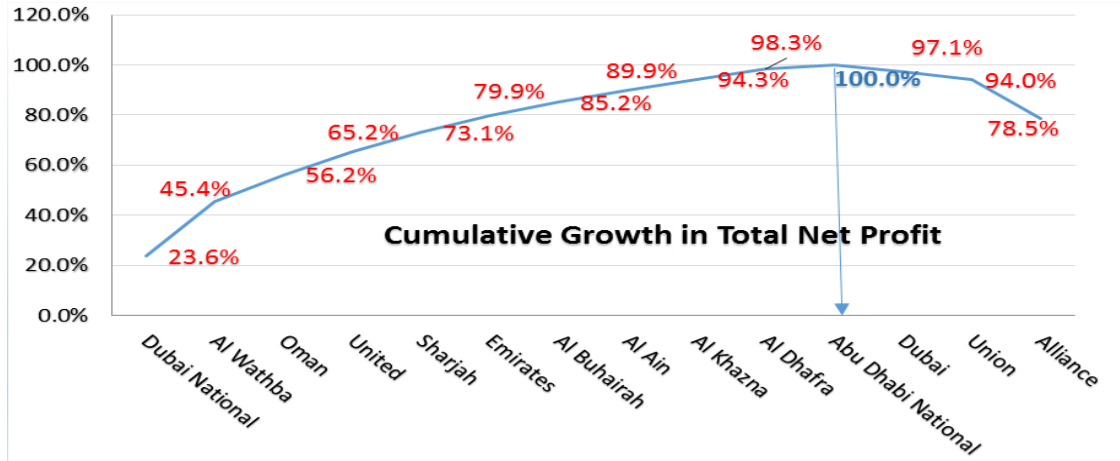


Figure 4a: Cumulative Pareto presentation for the average Growth ratio in Net Profit

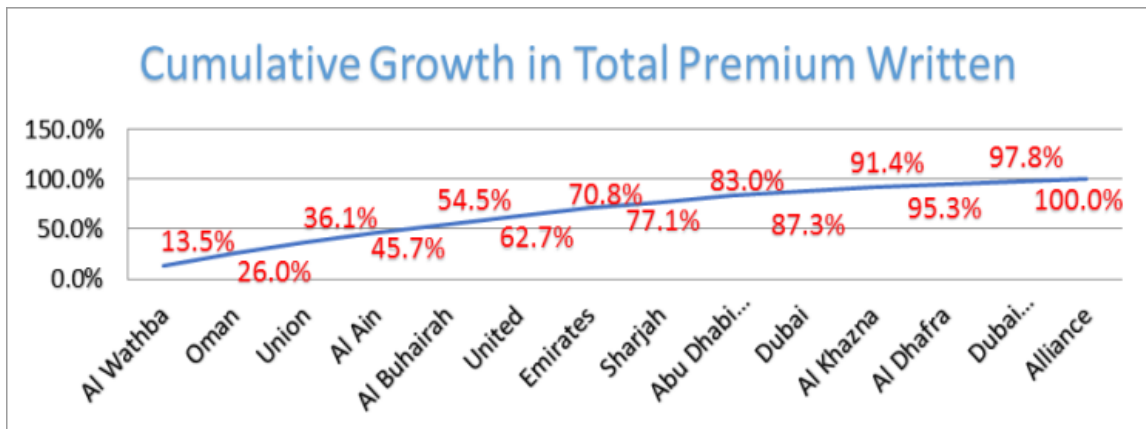


Figure 4b: Cumulative Pareto presentation for the average Growth ratio in Total Premium Written

The calculated parameters indicating that we have a very weak positive (direct) relationship between the two parameters, the premium as an independent variable, and the profit as a dependent variable (since the correlation equals 0.36 only). Also we can conclude that the premium explains 13% only from the profit perturbations (+ve or -ve changes) which an unexpected result of the analysis, and the remaining 87% should be explained by different factors.

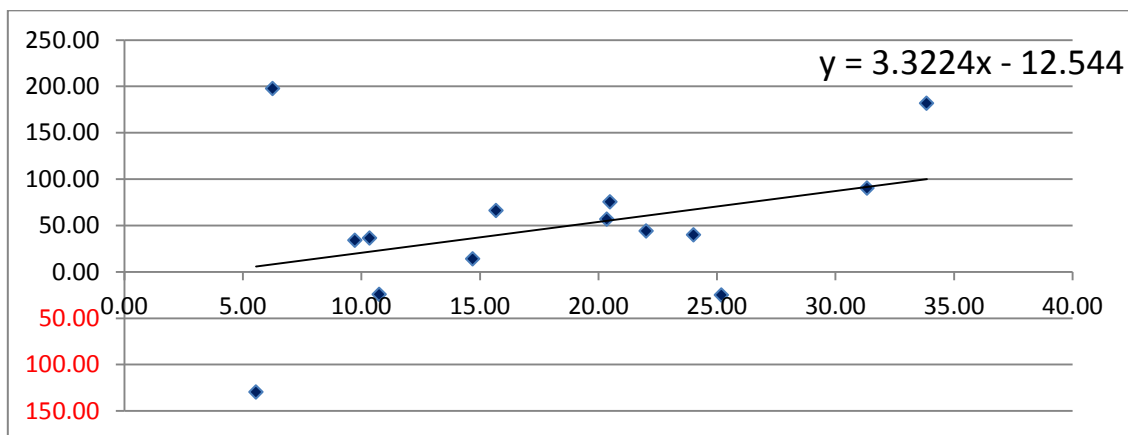


Figure 5: Scatter diagram for the Profits and the Premium with the regression equation

The measures of fitness for the obtained regression line, are calculated as follows:

SST: The Sum of the squares total = 86,925

SSE: The Sum of the squares error = 75,521

SSR: The Sum of the squares due to regression = 11,404

Which satisfy the control rule and indicating that the difference between the observed values and the expected values are so far which leads to the conclusion that, you can't rely on the obtained line to predict the profit using a new premium data.

6. CONCLUSIONS

In this article the net profit and total premium written growth indicators were investigated for a selected group of insurance companies in UAE that established before 2000.

Two tools from the total quality tools were used to analyze the investigated data, which the control charts and the Pareto Analysis to help the managers in the decision making process. Investigation of interrelationship between the two factors was done by using the regression analysis and the correlation/determination coefficients.

The upper control limit UCL (193.71) for the average Growth in the net profit lies below the growth ratios of Dubai National Company, Al Wathba Company (181.74) also near to the UCL, Alliance Company lies below the lower LCL (-88.88), and almost 60% of the companies below the central line (grand average 52.41), this percentage could be interpreted according to control charts rules as an irregularity in the performance (special cause variation).

The upper control limit UCL (29.66) for the average Growth in the total premium written is near to both Oman Company and Al Wathba Company, there is no companies below the lower LCL (4.98), also almost 50% of the companies below the central line (grand average 17.32) and this indicates the regular performance (common cause variation)

There are two companies (Dubai National and Al Wathba) exceed the level of 180 million in average within the eight years (2000 – 2007). There are three insurance companies satisfy average losses during the eight years (Dubai & Union & Alliance), these three companies reduce the profits for the selected companies by almost 1.6 Billion dollars during the investigated period.

The average premium for the selected group of companies varies from 5 to 35 million per year. The 20 Million in average represents the median for the selected group of companies. Oman and AlWathba companies exceed in average the 30 million dollars per year during the selected period.

There is a very weak positive (direct) relationship between the two parameters, the premium as an independent variable, and the profit as a dependent variable ($r = 0.36$). The premium explains 13% only from the profit perturbations, which an unexpected result of the analysis, and the remaining 87% should be explained by different factors.

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