Actuarial Profession and Factor Impacting on the Role of Partly Qualified Actuaries in Insurance Companies of Nepal

Om Prakash Bhatt

School of Mathematical Sciences, Tribhuvan University, Nepal

Email: bhattaom6@gmail.com

Abstract

Actuarial science is a discipline that assesses financial risks in the field of insurance and finance using mathematical and statistical methods. Actuaries are creative, curious and adaptable human resources and problem solvers, who need to possess different skills and knowledge to solve risk-related problems. Partly Qualified Actuaries (PQA) are semi-professional actuary. They are in the process of studying & appearing for the professional exams, while also garnering work experience & skills in an entry-level Actuary job. From analyzing the financial costs of risk and uncertainty to pricing and reserving, partly qualified actuaries are important in doing the basic to advanced actuarial tasks in these businesses. The research paper investigates the role of partly qualified actuaries in the insurance industry in Nepal and analyzes the factors impacting the role of PQA in Nepalese insurance companies. Basically, this research paper investigates the role of partly qualified actuary in Nepal and to studies the scenario of partly qualified actuary in Nepal. The research uses qualitative and quantitative data collected from PQA, insurance companies' staffs, policy makers and some academicians of Nepal who are well informed about actuary. The research shows that the number of PQA is increasing in Nepal every year and they are working in different insurance companies. The study shows that Partly Qualified Actuaries can reduce the need for foreign actuaries in Nepal.

Keywords: Actuarial profession, insurance, actuarial valuation, actuarial science, impact factor

Introduction

Actuarial science is a discipline that assesses financial risks in the insurance and finance fields, using mathematical and statistical methods. Actuarial science applies the

mathematics of probability and statistics to define, analyze, and solve the financial implications of uncertain future events. Traditional actuarial science largely revolves around the analysis of mortality and the production of life tables, and the application of compound interest. Actuaries are human resources and they are problem solvers, creative, curious and adaptable who need to have different skills and knowledge to risk related problems. They have knowledge about mathematics, statistics, computers, communication and management decision making. They could apply their skills, knowledge and abilities to create social impact, inform high-level strategic decisions and have a significant impact on legislation, businesses and people (IFOA, 2022).

Partly qualified actuaries are those who have not cleared all the requirements of fellowship set by an actuarial organization. Insurance companies and consulting firms are the primary recruiters of actuaries. These insurance companies and consulting forms demand partly qualified actuaries in huge number. From analyzing the financial costs of risk and uncertainty to pricing and reserving, partly qualified actuaries are important in doing the basic to advanced actuarial tasks in these businesses (SOA, 2022).

A Fully-Qualified Actuary, known as a Fellow Actuary, is a person who has cleared all the actuarial exams and has completed the required 3 years of work experience, called Personal & Professional Development (PPD), in the case of IFOA. Any other person who is yet to fulfill aforementioned qualifications is a Partially-Qualified Actuary, also known as a student or semi-professional actuary. Student Actuaries are in the process of studying & appearing for the exams, while also garnering work experience & skills in an entry-level Actuary job (IFOA, 2022).

Insurance is a contract, represented by a policy, in which an individual or entity receives financial protection or reimbursement against losses from an insurance company. The company pools clients' risks to make payments more affordable for the insured. Life insurance is a contract between an insurer and a policy owner. A life insurance policy guarantees the insurer pays a sum of money to named beneficiaries when the insured dies in exchange for the premiums paid by the policyholder during their lifetime. For the contract to be enforceable, the life insurance application must accurately disclose the insured's past and current health conditions and high-risk activities (Goel, 2014)

In Nepal, insurance was introduced during 1930s by Indian insurance companies. First domestic non-life insurance company was established in 1947. Government of Nepal established a composite insurer in 1968. The number of insurance companies reached to 41 including 19 life insurance, 20 non-life insurance and 2 Re- insurance companies at present in Nepal (Insurance Board, 2021).

According to Insurance Act 2049 section 2 (j) "Actuary" means a person having the qualification as prescribed and is appointed by the Insurer for assessing and calculating the liabilities of the Insurance Business. Similarly, section 26 of Insurance Act 2049 has clarified the role of Actuary in the Valuation. As per this clause, The Insurer, who deals with the Life Insurance Business, shall have to assess the financial position and the valuation of liabilities by an Actuary once in every three years. The Insurer shall submit a copy of the report submitted by the Actuary. A profession serves a public purpose. Consequently, an outline of the history of the actuarial profession must follow the public purposes served by actuaries in applying their basic science. This profession has been developed 1762 AD in London. There are around more than one lakh qualified Actuaries in the world at present and it is one of the top professions.

In Nepal, there was not so proper knowledge of actuarial science and study of actuaries before 2017. In 2017 there was school established to study the course of actuarial science. Now in Nepal there are so many PQA studying and working in different insurance companies. So, the research is focused to know the role of PQA in Nepal and to know the factors that impact on the role of PQA in Nepal. Currently, actuaries are scarce in Nepali insurance sectors which have caused huge loss of the foreign currency. Insurance market is competitive and technical. So there are high possibilities of actuaries' profession in Nepalese insurance industries and other financial sectors. The specific objectives of the research study are, to study about the roles of partly qualified actuaries in Insurance Companies of Nepal, to examine the factors that impact on the role of partly qualified Actuaries in Insurance Companies of Nepal, to study the professional scenario of partly qualified actuaries in Nepal.

Literature review

Conceptual review is basically a stock of previous knowledge obtained from different sources available and it provides the study of the knowledge of the field of research. It is an important tool to find out what related research works have been carried out in the related study areas. A critical review of literature helps the researcher to develop a throughout understanding and insight into previous research works that relates to the present study.

Demographics and insurance pricing

Demographics consist of various types of high risk and observable characteristics (Hendren, 2013) which include age, gender, and occupation and health status. These aspects provide the basis for risk classification purposes of different potential policy holders with age and gender being the most used factors. Generally, an (insurance) company possesses and utilizes different (premium rate) tables for each age, sex, major line of business among

others (Cox, Lin, Tian &Zuluaga, 2013). These classifications enable insurers to determine to a certain degree the anticipated claim price for each possible policy holder and thus set accordingly risk-reflective premiums. For life insurance products, insurers utilize an assortment of risk-rating features to determine the risk profile for each client. Insurers can divide policy holders into different risk groups and is referred to as risk pooling. Members within the same group will possess identical risks in the insurance pool and will thus be priced within the same premium category. Therefore, the prices indicate the costs of the expected risk associated with the insured pool (Handel, 2013).

For demographics to be considered ideal as a rating factor, it must meet the actuarial and operational criteria (Arrow, 2009). The actuarial criteria stipulate that the factor considered in risk-classification must be precise in measuring risk as well as be statistically dependable.

According to annual report, 2020-21of Beema Samiti, USA, UK and India have been continuously developing this profession. There are about 485 Fellowship qualified Actuary in India at present. Most of the developed countries have Actuary regulator, but there is no provision in Nepal yet. It is mandatory in insurance sector (Insurance act 2049) and social security's sector; however, we have not developed this profession in Nepal either from the government or from the universities site. So, the researcher selected the topics for the research purpose. Similarly, there is less or no knowledge among different professionals about the Actuarial profession or they know and ignore it.

Pricing of insurance products is a process that should ideally be guided by recommendations of actuaries, the insurer's claims, non-claim expense, financial strength and the market demand. However, market dynamics tend to have a bearing on premium pricing. These dynamics include poor underwriting, premium undercutting, insurance fraud, lack of technology adoption in service delivery, misspelling by agents, underdevelopment of the agency force, ballooning management expenses (2013 IRA Insurance Outlook Report). This means that insurers cannot just solely settle for theoretical approaches when it comes to pricing insurance products. They must adapt to the market dynamics as listed in order to survive.

Laas, Schmeiser, and Wagner (2016), state that "in contrast to the field of actuarial (insurance) pricing, the areas of customer-specific and market-based pricing and the integration of the sales channel are scarcely considered in academic literature." In Kenya, studies have been very few with regard to factors influencing pricing of insurance products by insurers. Most of the studies with regard to the Kenyan insurance industry are focused

on marketing of insurance products (Kihanya, 2013), market penetration (Ayishashe 2015), uptake of insurance products or consumer behavior. Therefore, this study seeks to highlight the market pricing approach in relation to the Kenyan life insurance industry by focusing on ICEA Lion Life Assurance Company Ltd. The goal of the study is to understand how such as regulation, demographics and socioeconomic factors affect determination of premium or product prices.

Among the different losses which bring about expenses in insured's life, there is the expense of maintaining good health. We all know that health is wealth. Health is a human right. Its accessibility and affordability have to be ensured. The escalating cost of medical treatment is beyond the reach of the common man (Goel, 2014). So, we have a type of insurance that covers the whole or part of the risk of the person incurring medical expenses. Health insurance provides benefits of payment losses from accident, disability, or accidental death, dismemberment and it also bears medical expenses. By estimating the overall risk of health and health system expenses over the risk pool, an insurer can develop a routine finance structure, such as a monthly premium or payroll tax, to provide the money to pay for the health care benefits specified in the insurance agreement (Pekerti,Vuong& Ho, 2017). The benefit is administered by a central organization, such as a government agency, private business, or not-for-profit entity. Life insurance is a great invention of human civilization. It established the concept of "human life value" which is regarded as the economic and philosophical framework of life insurance.

In large and very competitive insurance markets, there are two main ways in which insurance companies competitively price their policies. An insurer can, after considering past performance of the risk, assess its own ability to undertake that particular risk entirely with or without an agreement with reinsurers, who underwrite on behalf of the insurer for a premium any excess risk beyond the insurer's capacity to take on. It may alternatively evaluate the price points of its competitors to determine the right price level to charge for a risk. The insurer that quotes the lowest price among its peers ends up clinching the business, however, this may lead to underpricing. This aspect has led to the undercutting phenomena witnessed in the Kenyan insurance industry. Hence, competition can lead to decline in premium incomes if premium rates are too low and thus it is imperative for insurance companies to ensure that they are maintaining decent underwriting profits despite the competitive environment they operate in. To this end, insurers tend to charge lower premiums under their competitive lines while compensating for lower incomes by charging higher premiums for their other less price sensitive business lines (Berry-Stolzle & Born, 2012).

Factors Impacting on the product pricing of insurance

There are different factors that directly impact on the product pricing of insurance. Basically, these are as follows:

Age of People: There is overwhelming evidence that points to the fact that life expectancy decreases as age increase. Therefore, age is more often used as a risk factor for life insurance and pensions pricing (Fong, 2015). Age is a risk factor assists insurance to minimize adverse choice selection since it can be quantified, as easy and inexpensive to collect and required little effort to validate. Age supports the provision of reasonable and available insurance because the belief is that younger people have a lot longer to live than older people and thus have less health issues that may lead to death.

Gender: In life insurance pricing, gender is mainly used in the pricing structure for pension product and is thus applied in a less complex manner than how it is applied, for example, in motor insurance, where a varied number of gender rating factors are used to price insurance. The simple pricing structure in life insurance works because it is combined with more detailed medical underwriting (Association of British Insurers, 2010).

Socio-economic factors and insurance pricing: Socio-economic factors do affect how insurance products are priced and packaged because they affect the demand customers have for and the ability to access those products. When it comes to developing countries, life insurance uptake is limited by virtue of the financial and social cultural hurdles faced by local communities (Amu & Dickson, 2016).

Wealth status: Following an unanticipated and catastrophic event such as the death of a breadwinner occurring within poor households, spending on food and clothing reduces significantly while other members of the family are forced to look for work in order to sustain the family. Given that this is the general social and economic landscape for many households' insurers have stepped up to cater to this demographic by introducing microinsurance.

Cultural influence: The norm for most insurers is that standard premiums charged for women are lower than that for men because the mortality rate for women, in general, is lower than men since women have longer lifespans. However, there is still a huge risk associated with women when viewed from a cultural standpoint (Mishra, 2010).

Economic status: From an economic perspective, insurance premium is affected by inflation existing in the economy. When inflation rates increase, they result in a decline in both consumption and price adequacy in the insurance sector (Kwon, 2013). Premiums are collected with the aim of investing them in capital generating assets such that income or returns generated from those investments are utilized to meet future claim payouts.

Health and occupational influence: Health and lifestyle information is also important in determining pricing of insurance premiums. Ideally insurance applicants usually complete an application form that authorizes and contains questions whose responses insurers can verify (Ngueng Feze & Joly, 2014).

Ideological influence: Terrorism, which is viewed as an ideological and/or political stance, has become both a social and economic issue the world over that has forced countries, businesses and individuals to adapt accordingly to the impact it has on their activities. Following the attacks of 11 September 2001 in New York, USA, terrorism has become a threat worldwide that pushed countries to form (insurance) schemes that insure against terrorism (Mushai & MacGregor, 2016).

Insurance market and actuarial profession in Nepalese context

Nepal Insurance Company Limited, a pioneer non-life insurance company of Nepal was established on 1947 A.D. by Nepal Bank Limited (the first commercial Bank) and the general public with 51% and 49% shares respectively. In the beginning, the name of this company was "Nepal Malchalani Tatha Beema Company" and had changed its name as "Nepal Insurance & Transport Company Ltd." in 1959 A.D. Now its name is "Nepal Insurance Company Ltd." since 1991 A.D. Similarly, Rastriya Beema Sansthan was established in 1967. After the establishment of RBS, then the life insurance corporation of India transferred its business to RBS and closed its offices in Nepal from 1972. In 1967 RBS was established under the company Act 2021 and it was converted into corporation in the following year under Rastriya Beema Sansthan Act 2025. This is government owned organization even now and has been operating both life and non-life insurance business. Prior to the enactment to insurance Act 1968 there was no regulatory body that supervise insurance business in the country. Under the insurance Act 1968, Beema Samiti (insurance board) was established as the insurance supervisory authority.

Nepal reinsurance company limited (Nepal Re), the successor of insurance Pool that was set up on 2003 with the aim to cover damages caused by the terrorism, was incorporated on 7 November 2014, under the company act 2006 of Nepal in accordance to the decision of Council of Ministers. The government issued the license for 9 life and 3 nonlife insurance companies. Then, there are altogether 41 insurance companies in Nepalese insurance industry. Among them 19 are life and 20 nonlife and 2 Reinsurance Company (Nepal Beema Samiti, 2022).

Present Status of Nepalese Insurance Companies

The insurance companies of Nepal have grown and increased in numbers day by

day due to increasing volume of business. Insurance is very important to minimize the future risk of uncertainty. The insurance business trends are represented in the given table.

Insurance Companies have made steady progress in Nepal which was only 5 in 1990 and now it has increased up to 41 in 2021 including re-insurance companies. Among these, 19 companies are life, 20 companies are nonlife and 2 companies are Reinsurance Company. It is big market in the field of insurance where there is high risk. So to manage and reduce such risk there need to qualified human resources i.e., actuaries but now there is not fellow actuaries. In the absence of actuaries, PQA are working effectively in the insurance companies in Nepal.

Table 1

Ownership Structure of Insurances Companies

Ownership	Non-life	Life	Reinsurance	Total
Government	1	1	-	2
Private	15	15	1	30
Foreign	2	1	-	3
Joint Venture	2	2	1	5
Total	20	19	2	41

(Source: Beema Samiti, 2021)

Research Method

Research methodology is a systematic way to solve the research problem. In other words, research methodology describes the methods and process applied in the entire aspect of the study. It refers to the various sequential steps to be adopted by a researcher in studying a problem with certain objectives in view (Kothari, 2008).

A research design is simply a part or section of research methodology; however, it shapes the research in a fixed standard. It is the overall operational pattern of framework for the project that stipulates what information is to be collected, form which sources and by what procedures (Kothari, 2008). The research design is descriptive as well as exploratory in nature and various factors will be considered for understanding the roles of actuaries in life insurance of Nepal. The prime focus of the research is estimating and testing casual relationships between the variables that influence the roles of actuaries in insurance of Nepal. The research is based on qualitative research and survey is conducted to collect primary data. Self-administered questionnaires are provided to the sample population for completing the survey.

A sample is the subset of the sampling frame that is selected using sampling techniques and conclusions from which are inferred to the general population (Kothari, 2008). Given the small sampling frame that was utilized, the entire frame was analyzed in the study instead of just a sample from it. The questionnaire is distributed to 100 individuals to know the Role of Partly qualified actuaries and factors that impact the role of PQA in insurance companies of Nepal. They are 60 numbers of PQA who are working in insurance companies as semi- professional and qualified human resources, about 30 numbers are insurances companies and about 10 numbers are academicians who are familiar and known about PQA. Once the data is collected, it will be cleaned and tabulated according to the related identification of variables. The relevant data will be coded to enable classification so as to guarantee that when it will be keyed into the Statistical Package for Social Sciences (SPSS) and STATA it was ideal for analysis. The data will be analyzed through different descriptive statistical tools and nonparametric statistical too.

\Conceptual Framework of the Study

There are some equations used in research analysis which are relating to SEM

$$A1 = \lambda_{A1} A1 + \varepsilon_{A1} \qquad (i)$$

$$A2 = \lambda_{A2} A2 + \varepsilon_{A2} \qquad (ii)$$

$$A3 = \lambda_{A3} A3 + \varepsilon_{A3} \qquad (iii)$$

$$A4 = \lambda_{A4} A4 + \varepsilon_{A4} \qquad (iv)$$

$$A5 = \lambda_{A5} A5 + \varepsilon_{A5} \qquad (v)$$

Where,

A1, A2, A3, A4, A5 = measurement variables

λ = are the path coefficients

ε = error term

A = latent variables

$$B1 = \lambda_{B1} B1 + \varepsilon_{B1} \qquad VI)$$

$$B2 = \lambda_{B2} B2 + \varepsilon_{B2} \qquad VII)$$

$$B3 = \lambda_{B3} B3 + \varepsilon_{B3} \qquad (VIII)$$

$$B4 = \lambda_{B4} B4 + \varepsilon_{B4} \qquad (IX)$$

$$B5 = \lambda_{B5} \, B5 + \varepsilon_{B5}$$

<div align="right">(X)</div>

Where,

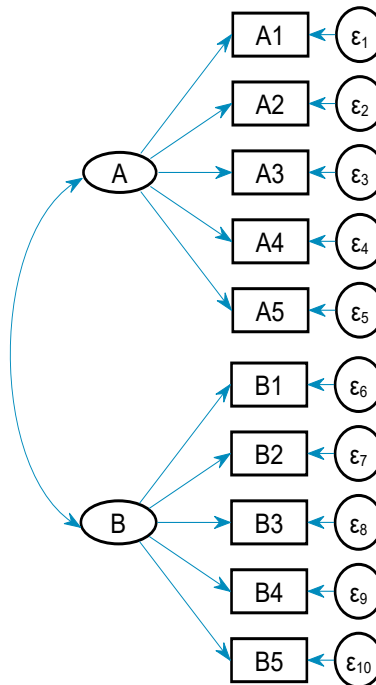B1, B2, A3, B4, B5 = measurement variables

λ = are the path coefficients

ε = error term

B= latent variables

Figure of path coefficient framework with covariance is presented in figure 1.

Figure 1: Path Coefficient Framework

Where,

A = Role of PQA
A1 = Product pricing
A2 =Reserving

A3 = Profitability Measurement

A4 = Reporting

A5 =Employee Benefit Valuation

B = Factors Impact on the role of PQA

B1 = Professional papers cleared

B2 = Professional exposure

B3 = Academic Degree

B4 = Experience

B5 = Mentorship

The factors impact on the role of PQA is latent variable whereas Professional papers cleared, Professional exposure, Academic Degree, Experience and Mentorship are the explanatory variables in the conceptual framework.

Analysis of the Role of Partly Qualified Actuaries

Table 2 Present the Friedman statistics test result including chi-square and significant value.

Table 2

Test Statistics

Test Statistics	
N	100
Chi-Square	16.976
Df	4
Asymp. Sig.	.037
Friedman Test	

Source: Field Survey, 2022.

According to tabled value of chi- square is 16.976 and Asymp. Significant value is 0.037. The value of Chi-Square is slightly lower and significant value is higher than 0.01, these values indicate that fitted Friedman mean rank is statistically significant about 95% confidence level. On the basis of above table there is only 5% error.

Table 2 Present the Friedman mean rank statistics test results is presented. The mean rank value is ordered into the smallest to the largest order according to structured questionnaire.

Table 3

Statistical Value of Ranking of Objectives

Role of Partly Qualified Actuary	Mean Rank
Product Pricing	2.66
Employees Benefit Valuation	2.93
Reserving	3.05
Reporting	3.16
Profitability Measurement	3.21

Source: Field Survey, 2022.

According to the respondents, the most important role of partly qualified actuaries is product pricing of different products in insurance companies because the mean value of ranking is lowest than others i.e., 2.66 as per above mentioned table.

Similarly, according to the respondents, the second important role of partly qualified actuaries is employees benefit valuation in the insurance companies because the mean value of employees' benefit valuation ranking is 2.93 i.e., higher than product pricing. So, the second important role of partly qualified actuaries is employees benefit valuation in the insurance companies of Nepal.

Moreover, according to the respondents, the third important role of partly qualified actuaries is reserving in the insurance companies because the mean rank value is 3.05 which is higher than product pricing and employees benefit valuation as per above mentioned table.

According to the respondents, the fourth and fifth important role of partly qualified actuaries are reporting and profitability measurement i.e., represent the mean rank value are 3.16 and 3.21 i.e., more than the above-mentioned 1st, 2nd and 3rd role of partly qualified actuaries in the context of Nepalese insurance companies. All statistical data analysis results show the positive and significant and thus the role of PQA expected to the positive role in insurance companies of Nepal.

Analysis of the Impact Factor on Role of PQA

Table 4 Present the Friedman statistics test result including chi-square and significant value.

Table 4

Test Statistics of Impact Factors

N	100
Chi-Square	41.153

Df	4
Asymp. Sig.	.000
Friedman Test	

Source: field Survey, 2022.

According to tabled value of chi- square is 41.153 and Asymp. Significant value is 0.000. The value of Chi-Square is high and significant value is less than 0.01, this value indicates that fitted Friedman mean rank is statically significant about 99% confidence level. On the basis of above analysis table there is only 1% error.

Table 5 Present the Friedman mean rank statistics test results is presented. The mean rank value is ordered into smallest to largest order according to structured questionnaire.

Table 5

Statistical Value of Ranking of Factors

Impact factors on the role of Partly Qualified Actuary	**Mean Rank**
Professional Paper Cleared	2.27
Professional exposure	2.79
Experience	3.06
Academic Degree	3.42
Mentorship	3.53

Source: field Survey, 2022.

According to mean rank value, professional paper cleared is the most important impact factor of partly qualified actuaries to the risk management of insurance companies in Nepal. The mean rank for the professional paper cleared is 2.27 which is the lowest value out of five mean rank values. In the same way the second most important impact factor according to mean rank value is professional exposure that is 2.79 which is the second lowest value out of five mean rank value mentioned in the table above. Similarly, experiences, academic degree and mentorship are the 3rd, 4th and 5th rank impact factor on the basis of mean rank value 3.06, 3.42 and 3.53 respectively. So, on the basis of data analysis, the most impact factor is Professional Paper Cleared and the least impact factor is Mentorship to improvement the performance and to manage the risk by partly qualified actuaries in the insurance companies of Nepal. These impacting factors directly impact on the role of partly qualified actuaries to the risk management of insurance companies in Nepal.

All the statistical data analysis results of impact factors on the role of PQA shows the positive and significant and thus the role of impact factors on PQA expected to be positive role to increase the performance and risk management in the insurance companies in Nepal.

Reliability test statistics

Reliability refers to how consistently a method measures something. If the same result can be consistently achieved by using the same methods under the same circumstances, the measurement is considered to be reliable. On the basis of research data analysis, the following Cronbach alpha is calculated by using SPSS.

Table 6

Result of Research Cronbach Alpha

Reliability Statistics	
Cronbach' Alpha	**Number of Items**
0.825	30

Source: field Survey, 2022.

Perhaps the most common measure of internal consistency used by researchers in psychology is a statistic called **Cronbach's α** (the Greek letter alpha). Conceptually, α is the mean of all possible split-half correlations for a set of items.

On the basis of research data analysis, the Cronbach alpha is .825 which is under the group $0.9 > a \geq 0.8$ that is good so the calculated Cronbach alpha i.e., Reliability Statistics is good and there is internal consistency between statements of research analysis.

Summary of mean of the mean measurement

In table 7 presents the summary of the mean statistical measurement of the explained variables.

Table 7: Summary of mean Statistical Measurement

Variable	Obs.	Mean	% of Mean	Std. Dev
A1	100	3.92	78.40	0.98
A2	100	4.03	80.60	0.99
A3	100	3.17	63.40	0.84
A4	100	3.93	78.60	0.80
A5	100	4.13	82.60	0.93
B1	100	4.05	81.00	0.97
B2	100	3.65	73.00	0.85

B3	100	3.86	77.20	0.89
B4	100	3.97	79.40	0.99
B5	100	4.18	83.60	0.90

Source: field Survey, 2022.

The mean value for the A1 variable is 3.92 with 0.98 Std. Dev, which indicates that about 78.4% respondents are agree with the changing variable and 19.60% data are considered to be error. This indicates that when positive change in the role of PQA increases, all explanatory variables give positive changes. Similarly, the mean value of A2 is 4.03 with 0.99 Std. Dev., which indicates that about 80.60% respondents agree with the changing variables and 19.40% data are considered to be error. This indicates that the positive change in PQA increases all explanatory gives positive changes. The mean value of A3 is 3.17 with 0.84 standard deviation, indicates that about 68.40% respondents agree with the changing variable and 31.60% data are considered to be error. Similarly, the mean value, standard deviation and respondents' response of A4 and A5 are also positive.

Similarly, the mean value of B1 is 4.05 with 0.97 standard deviation, which indicates that about 81% respondents are agree with the changing variable and 19.00% data are considered to be error. This indicates that when positive change in the factors that impact on the role of PQA increases all explanatory gives positive change. Similarly, the variables B2, B3, B4 and B5 have positive result as per above table. This indicates that when positive change in the factors that impact on the role of PQA increases all explanatory gives positive change.

Table 8

Root mean squared error of approximation

Fit statistic	Value Description
Population error: RMSEA	0.005
90% CI, lower bound	0.070
upper bound	0.139
Pclose	0.007
Probability RMSEA <= 0.05	

Source: field Survey, 2022.

Goodness of Fit Index value with two conditions identifies better fit the model to the observed data. The value of RMS model is 0.005 in both observations. So, the research value of the study indicates that the model is exact fit. The output data of PCLOSE and RMSEA

are less than zero and Probability RMSEA <= 0.05, the figure indicates exact fit of the model.

Table 9

Equation-level goodness of fit

Variables Observed	Fitted	Variance Predicted	Residual	R-squared	MC	MC2
A1	0.95	0.30	0.68	0.31	0.84	0.71
A2	0.97	0.30	0.68	0.37	0.52	0.27
A3	0.70	0.14	0.56	0.20	0.50	0.25
A4	0.63	0.22	0.41	0.35	0.58	0.34
A5	0.85	0.25	0.61	0.29	0.42	0.17
B1	0.93	0.50	0.43	0.54	0.61	0.37
B2	0.71	0.07	0.65	0.09	0.30	0.09
B3	0.78	0.11	0.67	0.15	0.33	0.11
B4	0.99	0.46	0.53	0.47	0.72	0.52
B5	0.81	0.48	0.33	0.59	0.87	0.76
Overall				0.92		

Source: field Survey, 2022.

Fitted reports shows that the fitted variance of each of the endogenous variables, whether observed or latent. In this case, it is observed endogenous variables to predict the variance of the predicted value of each endogenous variable. R-squared reports, the fraction of variance explained by each indicator. The fraction of the variance of affective explained by A1 is 0.95, and B1 is 0.927 in this section. The overall R^2 is also called the coefficient of determination. MC stands for multiple correlations, and MC2 stands for multiple-correlation squared. R-squared, MC, and MC2 all report the similarity of the indicated dependent variable with the model's linear prediction. In recursive models, all three statistics are really the same number. MC is equal to the square root of R-squared, and mc2 is equal to R-squared. There are not recursive models, if these three statistics are different and each can have problems and R-squared and mc can actually become negative. Considering the value of Equation-level goodness of fit overall R squared is about .92, which means 92 % explained with the variable and only 8% data considered to be error.

Table 10

Linear Hypothesis Test: Direct and total effects Measurement

Variables	Coefficient	Std. Err.	Z	P>|z|	[95% Conf. Interval]
A1	A 1 (constrained)				
A2	A 0.73	0.15	4.83	0.000	.43 1.10
A3	A 0.51	0.12	4.05	0.000	.26 .75
A4	A 0.63	0.12	5.23	0.000	.39 .86
A5	A 0.67	0.16	4.20	0.000	.36 .98
B1	B 1 (constrained)				
B2	B 0.36	0.14	2.65	0.008	.092 .62
B3	B 0.48	0.15	3.49	0.000	.21 .75
B4	B 0.96	0.19	5.15	0.000	.59 1.33
B5	B 0.97	0.18	5.47	0.000	.63 1.32

Source: field Survey, 2022.

The total effect coefficient is (.73) is not equal to the zero-order correlation between A and A2. Instead, the total effect is defined as the sum of the direct effect plus all indirect effects (where the indirect effects are defined as the products of the path coefficients from X (A) to Y (A1) and then X to Y). Since the direct effect and total effect is positive and all indirect effects are positive. Then, the total effect and the point estimates and standard errors of the remaining significant path of coefficient estimated in a more precise way and also p value is less than 0.00 this, allowing for better statistical inference.

Table 11

Structural equation model and Estimation method of maximum likelihood

Measurement	Coef.	Std. Err	z	P>|z|	[95% Conf. Interval]
A1					
A	1				
_cons	3.92	0.10	40.14	0.000	3.73 4.11
A2					
A	0.74	0.15	4.83	0.000	.43 1.03
Cons	4.03	0.10	40.94	0.000	3.84 4.22
A3					
A	0.51	0.125	4.05	0.000	.26 .74
Cons	3.17	0.084	37.86	0.000	3.01 3.33
A4					

A	0.63	0.12	5.23	0.000	.39	.86
Cons	3.93	0.08	49.71	0.000	3.77	4.08
A5						
A	0.67	0.166	4.2	0.000	.36	.98
Cons	4.13	0.09	44.71	0.000	3.94	4.31
B1						
B	1					
Cons	4.05	0.10	42.05	0.000	3.86	4.24
B2						
B	0.35	0.14	2.65	0.008	092	.62
Cons	3.65	0.08	43.39	0.000	3.48	3.81
B3						
B	0.47	0.14	3.49	0.000	.21	.75
Cons	3.86	0.09	43.69	0.000	3.69	4.03
B4						
B	0.96	0.19	5.15	0.000	.60	1.32
Cons	3.97	0.10	39.92	0.000	3.77	4.16
B5						
B	.975	0.18	5.47	0.000	.62	1.32
Cons	4.18	0.09	46.51	0.000	4.01	4.36

Source: field Survey, 2022.

The Maximum likelihood estimation of all the parameters is highly significant. In other words, all the variables are significantly different from zero. When change or increase the role of PQA, change or increase all the explanatory factor which goes up by 0.73, 0.50, 0.60, and 0.66, and the average regression weights to estimate is 0.63, has a standard error of less than .070. The regression estimate of its p value is less than 0.01. These statistical values indicate the change the Role of PQA and then positive impact to all other variable i.e., Product pricing, Reserving, Reporting, Profitability Measurement, and Employee Benefit Valuation.

Likewise, the Maximum likelihood estimation of all the parameter is highly significant. In other words, all variables are significantly different from zero. When change or increase the Factors Impact on the role of PQA, change or increase all the explanatory factor which goes up by 0.36, 0.46, 0.96, and 0.97, and the average regression weights to estimate, is 0.66, has a standard error of less than .070. The regression estimate of its p value is less than 0.01. These statistical values indicate the change the Factors Impact on the role of PQA

and then positive impact to all other variable i.e., Professional papers cleared, Professional exposure, Academic Degree, Experience and Mentorship.

Table 12

Likelihood ratio test (LRT) is a statistical test of the goodness-of-fit of model

Coefficient	Std. Err.		Z	P>(z)	[95% Conf. Interval
var (e. A1)	0.41	0.09	0.25		0.64
Var (e. A2)	0.67	0.117	0.49		0.93
Var (e. A3)	0.56	0.09	0.42		0.76
Var (e. A4)	0.41	0.07	0.30		0.57
Var (e. A5)	0.61	0.10	0.44		0.84
Var (e. B1)	0.43	0.09	0.28		0.66
Var (e. B2)	0.65	0.09	0.48		0.86
Var (e. B3)	0.67	0.10	0.50		0.89
Var (e. B4)	0.53	0.10	0.36		0.77
Var (e. B5)	0.33	0.08	0.20		0.54
Var (A)	0.56	0.15	0.33		0.92
Var (B)	0.50	0.14	0.29		0.86

Source: field Survey, 2022.

The likelihood ratio test (LRT) is a statistical test of the goodness-of-fit of model vs. saturated. A saturated model has the best fit possible since it perfectly reproduces all of the variances, covariance and means: chi2 = 70.98, Prob.> chi2 = 0

Figure 2

Structural Equation Model of Path Coefficient Measurement Framework
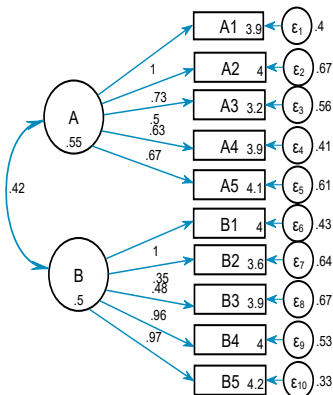
Figure 2 present the Structural Equation Model of Path Coefficient Measurement Framework. The figure shows that the two latent variables and ten explanatory variables including all values of parameters. These results are same as the tabulated value which is discussion above.

Conclusion

Actuarial science is a discipline that assesses financial risks in the insurance and finance fields, using mathematical and statistical methods. Actuaries solve risk related problems. They have knowledge about mathematics, statistics, computers, communication and management decision making. The research shows that there are five important roles of PQA in the insurance, they are Product pricing, Employees Benefit Valuation, Reserving, reporting and Profitability Measurement. Among these different roles, pricing is the most important role of PQA in the insurance companies and the least important role is profitability measurement in the insurance companies that are important to risk management in the insurance companies.

Likewise, there are different impact factors which directly impact on the role of PQA in the insurance companies of Nepal. These impact factors are Professional Paper cleared, Professional exposure, Experience, Academic degree and Mentorship. On the basis of research, the most important impact factor is professional paper cleared and the least important impact factor is mentorship on the role of PQA in insurance companies of Nepal. These all the impact factors are important in risk management in the insurance companies of Nepal. These are also very important to increase the efficiency of PQA in the insurance companies. The study concludes that the present scenario of PQA in Nepal is very good and the number of PQA is increasing in Nepal every year due to SMS TU. They are taking professional examinations gradually and have cleared some papers. PAQ's are building their confidence to risk management and developing their performance in the insurance companies in Nepal.

The study is important for policy makers and it shows that partly qualified actuaries can reduce the payment that Nepal makes on hiring foreign actuaries. The research is equally important to Beema Samiti for decision making about actuarial valuation of different insurance companies by the help of Nepalese PQA. On the basis of the research, the government can make plan and policies to increase the numbers of PQA and Associate as well as fellow Actuaries in coordination with School of Mathematical science, TU.

References

Amu, H., & Dickson, K. S. (2016). Health insurance subscription among women of reproductive age in Ghana: Do socio-demographics matter? *Health Economics Review, 24.*

Arrow, K. J. (2009*).* Alternative approaches to the theory of choice in risk taking situations. *Economics Inquiry, 19*(4), *404-437.*

Association of British Insurers. (2010). *The Use of Gender in Insurance Pricing, 24*,11-34.

Ayishashe, T. T. (2015). *Market penetration challenges by insurance companies in Kenya.* Retrieved from USIU Africa: www.usiu.ac.ke

Beema Samiti (2014). *Strategic Plan 2014-2019.* Insurance Regulatory Authority of Nepal.

Beema Samiti (2071/72). *Annual Report.* Beema Samiti.

Berry-Stolzle, T. R., & Born, P. (2012)*.* The effect of regulation on insurance pricing: The case of Germany. *The Journal of Risk and Insurance*, *43*, 129-164.

Cox, S. H., Lin, Y., Tian, R., & Zuluaga, L. F. (2013*).* Mortality portfolio risk management*. The Journal of Risk and Insurance*, 853-890.

Goel, S. (2014). Health insurance: An empirical study of consumer behavior in Rohtak District of Haryana. *International Journal of Research in Management Science & Technology, 2*(2), 69-72.

Handel, B. R. (2013). Adverse selection and inertia in health insurance markets: When nudging hurts. *The American Economic Review*, *103*(7), 2643-2682.

Hendren, N. (2013). Private information and insurance rejections*. Econometrica*,1713-1762.

IFOA, (2021-2022). *Qualification handbook*. www.theactuaty.com

IRA-U. (2014). *Uganda insurance industry annual report*. Available at: ira.go.ug

Fong, J. H. (2015). Beyond age and sex: Enhancing annuity pricing*. The Geneva Risk and Insurance Review*, *40*, 133-170.

Kihanya, K. (2013*). Effects of integrated marketing communication on business performance in the insurance industry: A case of the Kenya orient insurance*

Limited. Unpublished master's thesis. United States International University, Nairobi.

Kothari, C. R. (2008). *Research methods: Methods and techniques (2nd Edition).* New Age
        International.

Kwon, W. J. (2013). The significance of regulatory orientation, political stability and

culture on consumption and price adequacy in insurance markets. *Journal of Risk Finance,*
        320-343.

Laas, D. Schmeiser, H., & Wagner, J. (2016). Empirical findings on motor insurance
        pricing in Germany, Austria and Switzerland. *The Geneva Papers,*   398-431

Mishra, K. (2010). *Fundamentals of life insurance: Theories and applications.*

PHI Learning Private Ltd.

Mushai, A., & MacGregor, A. (2016). Insurance of politically motivated risks including

terrorism*:* The case of South Africa. *Economic History of Developing Regions*, *31*, 277-302.

Ngueng Feze, I., & Joly, Y. (2014). Can't always get what you want? Try an indirect

route you just might get what you need: A study on access to genetic data by Canadian life
        insurers. *Current Pharmacopeias and Personalized Medicine*, *12*, 56- 64.

Pekerti, A., Vuong, Q. H., Ho, T. M., &Vuong, T. T. (2017*).* Health care payments in
        Vietnam: Patients' quagmire of caring for health versus economic destitution.
        International Journal of Environmental Research and Public Health, 14(10).