CHAPTER 4

4.1 INTRODUCTION

This chapter focus on data analysis. We have two sets of data, each will be analysed differently using the following techniques:

1. Actuarial Technique
2. Predictive Analytics Technique.

4.2.0 ACTUARIAL TECHNIQUE

4.2.1 PRESENTATION OF DATA

The data to be analysed using this technique is a secondary data. The target populations are the policy holders of ... Insurance company. The original records gotten are summarized on the table below:

TABLE 1: MATURITY CLAIMS

S/N	SUM ASSURED	DATE OF EFFECT	DATE OF MATURITY	MATURITY PROCEEDS	DURATION (YEARS)
1.	12,000	1/11/1996	1/11/2001	12,860	5
2.	6,000	1/9/1996	1/9/2001	6,430	5
3.	12,000	9/3/1997	1/3/2001	12,860	4
4.	21,000	7/6/1992	1/6/2002	22,752	10
5.	75,000	1/1/1998	1/1/2003	80,675	5
6.	12,000	1/1/1998	1/1/2003	12,860	5
7.	150,000	1/9/1998	1/9/2003	161,250	5
8.	26,000	1/1/1998	1/11/2003	28,850	5
9.	18,000	1/11/1998	1/11/2003	19,290	5
10.	18,000	11/11/1998	1/1/2004	19,290	6
11.	18,000	1/1/1999	1/1/2004	19,290	5
12.	12,000	1/1/1999	1/1/2004	12,860	5
13.	18,000	1/1/1999	1/1/2004	19,290	5
14.	40,000	1/1/1999	1/1/2004	42,700	5
15.	18,000	1/1/1999	1/1/2004	22,200	5
16.	18,000	1/1/1999	1/1/2004	20,000	5
17.	60,000	1/1/1999	1/1/2004	80,000	5
18.	30,000	1/8/1999	1/8/2004	66,300	5
19.	30,000	1/8/1999	1/8/2004	33,533	5
20.	18,000	1/9/1999	1/9/2004	32,332	5
TOTAL	612,000			725,622	

Source: ... Insurance Company

4.2.2 ANALYSIS OF DATA ACCORDING TO RESEARCH QUESTIONS

The data will be used to answer the research questions and hence solve the stipulated problems. From the table above, we can see that there are twenty policy holders, the sum assured of each person, the date of effect I.e the date the policy was allocated to that policy holder, the date of maturity and the maturity proceeds.

The actuarial terms being used are defined below:

$\bar{A}^{i}_{x:\overline{n}\rceil}$	=	Actuarial present value of a term insurance payable at the moment of death for a life age (x) to n-years
b_t	=	The benefit function for a life age (x)
v^t	=	The discounting function for a life age (x)
tpx	=	The probability that a life age(x) will survive to (x + t) years
μ_{x+t}	=	The force of mortality for a life age(x) to age (x+t)
δ	=	The force of interest
APV	=	Actuarial Present Value

Due to Insufficient data, the following assumptions stand

${}_tP_x = 0.9$

$\mu_{x+t} = 0.06$

Interest rate = 7.5

POLICY HOLDER 1

$$\bar{A}^{i}_{x:\overline{n}\rceil} = E[Z]=E[Z_t]=\int_0^n b_t v^t {}_tP_x \mu_{x+t} dt$$

$$\delta = \ln(1+i)=0.07232$$

$$v^t = e^{-\delta t}$$

$$12000*0.9*0.06\int_0^5 e^{-0.07232} dt$$

$$= 2718.86$$

converting the Actuarial Present Value from continous to the descrete value

$$A^{i}_{x:\overline{n}\rceil} = \frac{i}{\delta}\bar{A}^{i}_{x:\overline{n}\rceil}$$

$$\frac{0.07232}{0.075}*2718.86$$

$$= 2,621.706$$

$$\bar{a}_{x:\overline{n}\rceil} = \int_0^n b_t v^t {}_tP_x dt$$

$$12000 * 0.9 \int_0^5 e^{-0.07232} dt$$

$$= \quad 45{,}314.461$$

converting the Actuarial Present Value for Temporary Life Annuity from continous to the descrete value

$$a_{x:\overline{n}|} = \frac{i}{\delta} \quad \bar{a}_{x:\overline{n}|}$$

$$\frac{0.07232}{0.075} * 45{,}314.461$$

$$= \quad 43{,}695.224$$

Benefit premium at the moment of death:

$$p_x = \frac{\bar{A}^i_{x:\overline{n}|}}{\bar{a}_{x:\overline{n}|}} \quad = \quad \frac{2{,}718.86}{45{,}314.461} = 0.05999$$

Benefit premium at the end of the year of death:

$$p_x = \frac{A^i_{x:\overline{n}|}}{a_{x:\overline{n}|}} \quad = \quad \frac{2{,}621.706}{43{,}695.224} = 0.05998$$

POLICY HOLDER 2

$$\bar{A}^i_{x:\overline{n}|} = \quad E[Z] = E[Z_t] = \int_0^n b_t v^t {}_tP_x \mu_{x+t} dt$$

$$\delta = \quad \ln(1+i) = 0.07232$$

$$v^t = \quad e^{-\delta t}$$

$$6000 * 0.9 * 0.06 \int_0^5 e^{-0.07232} dt \quad = \quad 1359.4337$$

converting the Actuarial Present Value from continous to the descrete value

$$A^i_{x:\overline{n}|} = \frac{i}{\delta} \quad \bar{A}^i_{x:\overline{n}|}$$

$$\frac{0.07232}{0.075} * 1359.4337$$

$$= \quad 1310.85$$

$$\bar{a}_{x:\overline{n}|} = \quad \int_0^n b_t v^t {}_tP_x dt$$

$$6000 * 0.9 \int_0^5 e^{-0.07232} dt$$

$$= \quad 1638.57094$$

converting the Actuarial Present Value for Temporary Life Annuity from continous to the descrete value

$$a_{x:\overline{n|}} = \frac{i}{\delta} \bar{a}_{x:\overline{n|}}$$

$$\frac{0.07232}{0.075} * 1638.57094$$

$$= 1580.00$$

Benefit premium at the moment of death:

$$p_x = \frac{\bar{A}^i_{x:\overline{n|}}}{\bar{a}_{x:\overline{n|}}} = \frac{1359.4337}{1638.57094} = 0.829645$$

Benefit premium at the end of the year of death:

$$p_x = \frac{A^i_{x:\overline{n|}}}{a_{x:\overline{n|}}} = \frac{1310.85}{1580.00} = 0.829$$

This same techniques will applied to all rows in the data to determine their corresponding premium. The table below shows the calculated results.

TABLE 2: TABLE SHOWING THE APV AT THE MOMENT OF DEATH AND AT THE END OF THE YEAR OF DEATH

S/N	APV at the moment of death for a term insurance	APV at the end of the year of death for a term insurance	APV of annuity at the moment of death for a term insurance	APV of annuity at the end of the year of death for a term insurance
1.	2,178.86	2,671.706	45,314.461	43,695.224
2.	1,359.4337	1,310.85	1,638.57094	1,580.00
3.	2,250.77	2,170.034	37,512.8991	36,172.43837
4.	8,072.2679	7,783.818	134,537.8053	129,730.3211
5.	16,992.92319	16,385.7094	20,482.13682	19,750.3211
6.	2,718.86	2,671.706	45,314.461	43,695.224
7.	33,985.84638	32,711.4188	566,430.773	546,190.3134
8.	426.0284	410.804	7,100.474074	6,848.750467
9.	294.94	284.40081	4,916.712821	4,740.05
10.	342.178	329.95	5,707.9817	5,499.195
11.	294.94	284.40081	4,915.712821	4,740.05
12.	2,718.86	2,621.706	45,314.461	43,695.224
13.	294.94	284.40081	4,915.712821	4,740.05
14.	9,062.8923	8,739.0449	10,923.8062	10,533.46219

15.	294.94	284.40081	4,915.712821	4,740.05
16.	294.94	284.40081	4,915.712821	4,740.05
17.	983.14256	984.011	16,385.7094	15,800.1933
18.	491.5712	474.00	8,192.854	7,900.09
19.	491.5712	474.00	8,192.854	7,900.09
20.	294.94	284.40081	4,915.712821	4,740.05

TABLE 3: TABLE SHOWING THE BENEFIT PREMIUM AT THE MOMENT OF DEATH AND AT THE END OF THE YEAR OF DEATH

S/N	Sum Assured	Benefit Premium at the Moment of Death	Benefit Premium at the End of Year of Death
1.	17,000	0.059998	0.059998
2.	6,000	0.82945	0.829
3.	12,000	0.0599	0.0599
4.	21,000	0.0599	0.0599
5.	75,000	0.8296	0.8296
6.	12,000	0.05999	0.0599
7.	150,000	0.06	0.059
8.	26,000	0.0599	0.0599
9.	18,000	0.0599	0.0599
10.	18,000	0.05999	0.0599
11.	18,000	0.0599	0.0599
12.	12,000	0.05999	0.0598
13.	18,000	0.059	0.0598
14.	40,000	0.82964	0.8296
15.	18,000	0.05999	0.0599
16.	18,000	0.05999	0.05999
17.	60,000	0.0599	0.05999
18.	30,000	0.059	0.05999316
19.	30,000	0.059	0.05999316
20.	18,000	0.059999	0.0599