Factors Affect for the Persistency of Life Insurance Policy in Sri Lanka: Empirical Evidence from the Life Insurance Policy Holders

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Abstract Life insurance is a contract between two parties. One party is the policyholder who pays a certain sum of money called premium and the other party is the insurer who obliged to give the financial support for the policyholder in any contingency. However the public awareness about the concept of life insurance is in very much lower level in Sri Lanka. Even though there are large number of insurance companies to issue life insurance policies none of them do not maintaining a persistent data base of life insurance policies. Moreover those who have been convinced to obtain an insurance policy do not understand the importance of maintaining their insurance policies in force by paying regular premium. This has resulted in high rate of lapse and surrender of the life policies. Therefore this study is mainly focused on to identify the factors affects for the persistency of life insurance policies in Sri Lanka. Statistical technique called Survival analysis was used to analyze data. Based on the findings, age, mode of payment, gender and marital status, occupation have been identified as the significant factors and also four survival analysis models were formulated to analyze the relationship between the duration of the life insurance policy with those identified variables.

Keywords Premium, Laps, Survival Analysis

1. Introduction

The uncertainty of death is a matter of concern that every human being faces. No one knows about their lifespan or in another word every individual is in a risk of having any sudden threat for their lives. Under these circumstances life insurance policies were introduced by state or private insurance companies to provide a secure to their customers or as an instrument to protect them in situation where they mostly need financial support without facing into financial hardships to his or her dependents.

Generally, around the world there are many reputed insurance companies maintaining different kind of life insurance policies, where they mainly focus on to maximize their profit while providing satisfactory service to their customers. Indeed, to give life coverage they only acquire a premium payment. Anyhow, if the premium payment is not persistent, the policy will either lapse or become surrendered or converted to reduce paid up or extended term insurance. Unfortunately this lapse rate is in a very higher level considering the past few years in Sri Lanka. Therefore, it is motivated to study about this sort of an issue and to identify the factors affects for the persistency of life insurance policies especially in Srilakan contest. Martin Eling et al (2012) have pointed out that more research has been published on the focuses on environmental variables (i.e., macro-economic indicators or company characteristics), but there is less work focusing on policyholder and product characteristics since individual data on policies are needed which is typically confidential. Moreover, in some cases the data might not be available at the company level because of system changes, migrations, or even the non-existence of an appropriate data warehouse [1].

Salami (1996) existing customers claimed that they allow the policies to lapse due to poor premium pricing and poor relationship marketing on the side of the life policy operators which are also environment variables. Furthermore, they stated that in Nigeria, premium charged in life assurance do not take cognizance of inflation rate. The Nigerian Reinsurance Corporation (1999) claimed that most life insurance markets in Nigeria do not develop their own mortality tables, as a result, the claims meant for life policy holders in Nigeria are still determined based on the mortality experiences of advanced countries which have different trends, patterns and causes of deaths from Nigerian experiences [3].

Buck (1961) analyzed the first-year lapse rates of Lincoln National and discovered a strong negative relationship between the number of years' experience of the salesman and withdrawal rates. He also found that withdrawal rates were significantly lower if the person had a previous policy with the company [4].

Other than environment variables a study done by Robert Lian et al (1993) have claimed that as an insight of the causes of lapsation and replacement on the Singapore experience has found that higher persistency is found among policy holder who are older in age, male and having the policies with the term converge, small size, premium paid less frequently, paid by pre-authorized methods and not serviced by agent [5].

Moreover, Renshaw and Haberman (1986) found an additional significant interaction between policy type and duration of policy. This finding can be interpreted to mean that lapse rates do not depend on one factor only, but on a combination of factors [6]. Cerchiara (2009) showed the importance of policy duration, calendar year, and product class [7]. Milhaud (2010) found the biggest surrender risks for policies that include a fiscality constraint (i.e., surrender charges apply only for a certain part of the contract duration). When the contract has reached the point at which the policyholder can surrender without penalty, the lapse risk increases significantly. Other relevant risk factors include policyholder age and method of payment [8].

Mojekwu (2011) stated that that dependency exists between the ages of life-policyholders and their modes of quitting the life policy contract. Hence, the mode of exit can be said to depend on the age of life policyholder. Furthermore, the statistics emphasis life policy holders seem to suggest that young people rush to take up life-insurance policy and withdraw almost immediately because of the harsh and difficult economic situations prevalent in the Nigerian business environment. Also the study revealed that life policyholders were more stable in maintaining their life policy contract in the late nineties than in the early nineties [9].

Hamming et al, (2012) have mentioned that as seen in previous studies of whole life lapse experience, lapse rates generally increase with the number of premium payments made each year. This exception to this rule is policies paid on direct monthly basis through electronic fund transfer method. Also the same study mentioned that policy lapse rate for males and females are about the same with lapse rates for females slightly higher than for males in the first three policy years and slightly lower in later years. By amount, lapse rates for females are slightly higher than males overall. The expectation, to this continues to be policies issued on individuals under the age of 20 whose lapse experience is more like those in the age 30-39 and 40-49 issue age group. This may be because premiums for these policies are paid by older adult family members rather than the insured themselves .

Renshaw and Haberman (1986) is the only study done considering data from more than one insurance company. All the other studies were relied on only one life insurer, but the findings from the empirical studies regarding product and policyholder characteristics are not directly comparable since they use different data samples and explanatory variables [6].

According to the past statistics most of the European countries have been focusing on life insurance policies as a main objective in their governing structure, where the each individual in the country should maintain an own life insurance policy which is regularly and directly monitored or supervised by state to carry out the development projects, or may be to facilitate them with health requirement specially where they need financial support. Therefore a life insurance policy is common tool among the people who live in developed countries, rather than the South Asian developing countries, where it can find with a completely different scenario.

In Sri Lanka, the concept of having a life insurance policy is not a widely spread topic among the people because most of them do not believe it is as a basic need of living. On the other hand even under these circumstances it can find millions of life insurance policy holders maintain by different life insurance companies both government and private offering attractive life insurance policies to their customers nowadays. But the strategy is, people used to get fed up with paying a premium payment add with taxes, inflation on the policy

values after few years they have started the policy. As a result of that, the life insurance policy will either lapse or become surrendered. So this idea creates an interest of investigating the current life insurance states inside the country and mainly to evaluate factors responsible for the persistency of a life insurance policy. In addition, survival models were interpreted to give much more information to the management as well as for the clients.

Materials and Methods

The secondary data of all the individual policies terminated between years 2009 to year 2016 due to non-payment of premium were selected from three main Insurance companies (say A, B and C) in Sri Lanka. These include the policies which have lapsed or surrendered but exclude policies terminated due to death, maturity or expiry. Fully paid-up policies and single premium policies are also excluded. There are about 1504 such policies issued by three companies. Furthermore all the insurance policies are endowment policies with direct cash premium payment to the company without any support of an agent. Data was analyzed using R 3.2.1 version.

In this study, the factors affect for the persistency of life insurance policies will be analyzed using a statistical technique called survival analysis. Generally, survival analysis is a collection of statistical procedures for data analysis for which the outcome variable of interest is time until an event occurs. Time can be years, months, weeks, or days from the beginning of follow-up of an individual until an event occurs. Event can be death, disease incidence, relapse from remission, recovery (e.g., return to work) or any designated experience of interest that may happen to an individual. In a survival analysis, usually time variable is refer as survival time, because it gives the time that an individual has "survived" over some follow up period. Also event is typically refers as a failure, because the event of interest usually is death, disease incidence, or some other negative individual experience. In this study the outcome random variable is the number of years of duration of policy (say T). Basically there are two quantitative terms considering in survival analysis such as survival function and hazard function.

Furthermore, a parametric survival model is one which survival time (the outcome) is assumed to follow a known distribution. Examples for distributions that commonly used for survival time are Exponential, Wiebull and Log-logistic. But, if the distribution of the function T is not known, it is applicable to use Cox proportional hazard model for the data analysis.

Results and Discussion

Table 1: Considered affected factors for persistency and their measures.

Factor	Measure of Factor	Name
Age	Age at purchase	AGE
Gender	M-Male	GENDER
	F-Female	
Marital status at purchase	M-Married	MS
	S-Single	
Mode of payment	A-Annual	MP
	S-Semi-annual	
	Q-Quarterly	
	M-Monthly	
Size of policy	Original sum assured in thousand basic plan	SA
Duration of policy	Number of completed years from inception	DP

In this study both parametric and nonparametric methods to analyze the distribution of T of the data were used. For parametric method log-linear regression models and Cox-proportional hazard methods were used and for nonparametric method life table was used to analyze the survival and hazard functions of T which are affected by different factors.

Analysis was done considering the records given by each company separately and all the records as one. Table 1 represents the considered factors and their measurements.

As a basic step the Kaplan Meier survival curve was obtained for the particular data sets, which helps to interpret the survival probabilities. The Figure 1 shows the estimated survivor function obtained for the data set, where it clearly represents a unique step function.
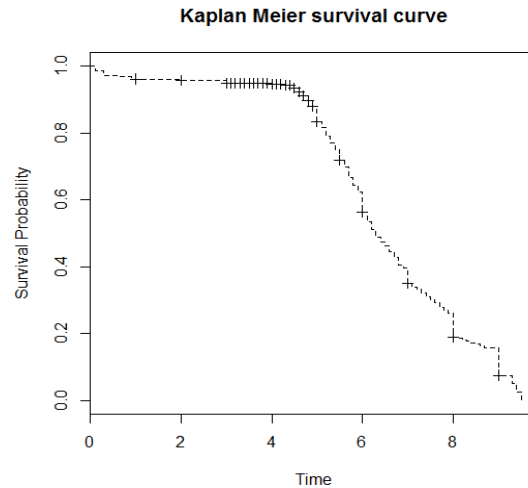
Figure 1: Kaplan Meier Survival curve

After obtaining the characteristic survival probability distribution curves for all the companies, the distribution of T was identified in each case. Hence, the models were developed and the significant factors were identified. According to the probability of a large chi-square value (Pr > Chi) examined whether the corresponding parameters are zero. Table 2 displays the resulting output.

Table 2: Statistically identified significant explanatory variables.

Company	Model type	Significant covariates	Estimate	P value
A (n=138)	Parametric model (Weibull)	Intercept	2.411134	0.000
		MP		
		Annual	0	0
		Semi-annual	- 0.026617	0.970
		Quarterly	- 0.710321	0.260
		Monthly	- 1.111053	0.037
B (n=400)	Cox semi-parametric model	Age	- 0.0204	0.033
		Gender		
		Male	0	0
		Female	0.1194	0.051
		MS		
		Married	0	0
		Single	- 0.4326	0.0460
		Occupation		
		Service	0	
		Industry	- 0.0044	0.980
		Other	0.4066	0.027
C (n=966)	Cox semi-parametric model	Gender		
		Male	0	
		Female	0.07565	0.0323
Sample of all policy holders (n=1504)	Cox semi-parametric model	MP		
		Annual	0	
		Semi-annual	-0.07722	0.0864
		Quarterly	0.33946	0.0288
		Monthly	-0.35015	0.0250
		Gender		
		Male	0	
		Female	-0.25541	0.000678

In effect the results suggests that mode of payment (MP) is a highly significant factor for the persistency of life insurance policies. For an instance, MP of company A can be interpreted as the monthly paid policies are 1.1111

year shorter than annual paid policies. Furthermore the higher persistency is found among the single females who are self occupied and premium paid frequently and directly to the company in cash. The Figure 2 provides a more visualized analysis of the variable mode of payment which indicates that the higher frequency is among the monthly paying mode.
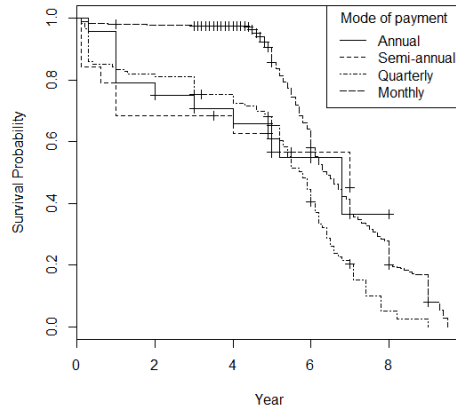

Figure 2: Comparison of the survival rates by mode of payment (MP)

From this point onwards the non parametric survival techniques can be used to examine whether it gives the same results as the parametric models. The nonparametric survival analysis technique can be derived from the life table analysis procedure. Estimation of survival distribution does not require that all sample policies start at the same point in the time and follow over a fixed period in time interval. Instead, survival analysis focuses on the length of duration, regardless of when the policies were bought. The life table provides more specific information about the survival experience of the sample. For instance Table 3 represents the constructed life table for Company A.

Table 3: Life tables Survival estimates for all policy holders

| Time	nsubs	nlost	nrisk	nevent	surv	pdf	hazard
0-1	138	0	138.0	50	1.0000000	0.36231884	0.44247788
1-2	88	1	87.5	12	0.6376812	0.08745342	0.14723926
2-3	75	1	74.5	3	0.5502277	0.02215682	0.04109589
3-4	71	1	70.5	12	0.5280709	0.08988441	0.18604651
4-5	58	1	57.5	6	0.4381865	0.04572381	0.11009174
5-6	51	3	49.5	4	0.3924627	0.03171416	0.08421053
6-7	44	17	35.5	2	0.3607485	0.02032386	0.05797101
7-8	25	23	13.5	2	0.3404247	NA	NA
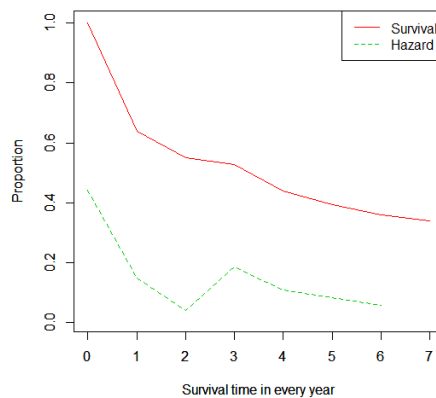
Figure 3: Survival and Hazard function for company A policy holders

However, the survival function rate (surv) which reflects the cumulative probabilities across time and the hazard function rate which is a conditional probability that policies will terminate in a specific time period given that they have survived to the beginning of that time period could be graphed in the same figure as follows. It is clearly showed that a characteristic survival curve and the hazard rate which has a peak in 3rd year indicates that there is a higher risk of termination of the policy in the third year after the inception of the life insurance policy. Survival analysis technique has the ability to examine the effect of time varying variables. Therefore studying persistency of life policy using the survival analysis model involves conceptually different way of examining the problem of lapsation. In this study the most important finding is that the monthly payment mode is a key variable in keeping the policy in force longer than the other modes of payment. In addition survival analysis not only identifies the key variables that can significantly affect the survival of the policy, it can also measure the magnitude and incidence if the policy would have a better or poorer chance of survival under the influence of a particular variable than other variables during the policy years.

In effect results suggests that there is a positive trend among single females who are self employed but not engaged in any monthly salary paying job willing to maintain their policies consistently than the others. The reason must be that, they exactly know, as they are not financially stable and living independently they have to undergo with financial hardships in an event of accident or may be death. On the other hand the lapsation of life insurance policies is higher among males, because the females are excellent in managing the house hold money without any in dispense than the mails. Overall the research findings are somewhat different with the related literature.

Furthermore survival analysis is not a new or controversial approach for most disciplines. However, the infrequent use of survival analysis in the field of insurance provides an opportunity for new research on insurance. In addition to that most of the insurance companies have the necessary data available but due to confidentiality there are not willing to provide the expected data. The survival analysis technique is more accurate if the sample data set is consists with at least extensive data over a long period of time.

Conclusion

According to this study, higher persistency rate was found among the female policy holders. Most of them are single and self employed who maintained a monthly premium paying life insurance policies. Furthermore mode of payment, age, marital status and employment are the identified factors for the persistency of a life insurance policy in Sri Lanka. The findings will definitely important for the customers as well as for the managerial level decision making and for the survival of the insurance market.

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Appendices
Definitions of Notations in Table 3
1st column the time period, 2nd column the number of subject who has not experienced the event, 3rd column number of policies lapsed, 4th column the estimated number of individuals at risk of experiencing the event, 5th column the number of individuals who experienced the event, 6th column represents the survival probabilities, 7th column represents the probability density function values and 8th column represents the hazard ratios.