



## ORIGINAL PAPER

# Determinants of Lapse and Surrender of Life Insurance Policies in India

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### Abstract:

Life insurance is a long-term contract in which company is committed to paying a specified death or maturity benefit provided that the premiums are paid by the insured. However, a policyholder can terminate the policy either through lapse or surrender at any point of time. influence the profitability and liquidity of insurance companies through acquisition cost, loss of income from renewal premiums etc., and hence needs to be controlled and managed carefully. In this research, an effort is made to identify factors leading to lapsation and surrender of life insurance products and statistically assess their importance based on primary data collected from life insurance policy holders. The data and information collected about reasons for lapsing/surrendering a life insurance policy were analysed using Gretl. A logit model was developed to test the marginal effect of various factors having association with the decision to lapse/surrender a life insurance policy. ofLogit model on lapsation have identified age, marriage, loss of job, debt, hospitalization of dependents, agents' poor service and poor return from policy as the drivers of lapsation. Similarly results of logit model on surrender activity has identified marital status, occupation, marriage of self and children, loss of job, debt, children's education, house construction and poor return from policy are the major reasons for surrendering a life insurance policy before the completion of the term.

**Key Words:** *Life insurance, Lapsation, Surrender, Maturity, Surrender value, Logit model, Marginal effect.*

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### **Introduction**

Insurance is a contract between two parties which would run to 10-20 years whereby one party undertakes to pay the other party a fixed amount of money on the occurrence of a certain event (death or attaining a certain age in case of human life or to pay the amount of actual loss when it takes place through the risk insured in case of property) in exchange for a fixed sum as a consideration of insurance contract (Vidyavathi et.al, 2018) The party who seeks protection against a particular risk is called the insured and the party who undertakes to protect the former is called the insurer. Insurers are insurance companies these days.

The document of an insurance contract is known as an insurance policy. The amount for which the event/risk is insured is the insured amount of policy and the fixed sum which is paid by the insured to the insurance company is called premium. Thus insurance is an economic device whereby an individual substitutes a small certain cost (premium) for a large uncertain financial loss (the contingency insured against) that would exist if it were not for the insurance.

Life insurance is designed to offer protection against two distinct risks: premature death and superannuation (living too long) and also to help to meet the long-term needs and aspirations of its customers (Vidyavathi et al, 2018). It is a long-term contract in which company is committed to paying a specified death or maturity benefit provided that the premiums are paid by the insured (Vidyavathi et al., 2022). However, a policyholder can terminate the policy either through lapse or surrender at any point in time. Lapsation of life insurance policy is a discontinuation of premium payment by the policy holder during the period of operation of the policy due to any reason other than the death of the policy holder (Vidyavathi 2013).

According to Life Insurance Marketing and Research Association International (LIMRA International) a policy lapses if its premium is not paid by the end of a specified period often called as the grace period. In India, Insurance Regulatory and Development Authority (IRDA) too follow the same definition. When a policy lapses, it negatively affects the policy holder, the company, the agent and the industry in terms of forfeiture of premiums paid, cost of acquisition not fully recovered, loss of renewal commissions and wastage of scarce resources (LoiSohLoi, Wu Yuan and Robert LianKengHeong).

Lapsation of life insurance policies has always been a worldwide concern (LoiSohLoi, Wu Yuan and Robert LianKengHeong 1993).A proper understanding of lapse dynamics is particularly important for insurance managers, regulators and customers (Dieter Kiesenbauer). Lapses influence the profitability and liquidity of insurance companies through acquisition cost, loss of income from renewal premiums etc., and hence needs to be controlled and managed carefully (Vidyavathi 2018). For regulators and policy makers it is of interest in designing an appropriate regulatory environment. For the customers lapse rates constitute one of the main indicators to assess the product and service quality of insuring firms. Lapsation is certainly an important phenomenon in life-Insurance markets. (Hanming Fang and Edward Kung 2012). Historically, the problem of lapsation of life insurance policies in India has been studied purely from a general approach. Different Committees, appointed by the government of India/IRDA studied the problem of lapsation based on secondary data. Hence, the objective of this paper is to identify factors leading to lapsation and surrender of life insurance products and statistically assess their importance based on primary data collected from life insurance policy holders.

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### **Literature Review**

LoiSohLoi, Wu Yuan and Robert Lian Keng Heong (1993) have analysed the effect of factors such as age at purchase of policy, sex, marital status at purchase, type of policy, mode of payment, status of policy, method of payment, service status and size of policy on the persistency/lapsation of policies and higher persistency is found among policy holders who are older in age, the policies with term coverage, smaller size, premium paid less frequently, paid by pre-authorized methods and not serviced by agents.

Purushotham Me (2006) stated that LIMRA International and Society of Actuaries conducted a study on U.S. Individual Life Persistency, where it is found that in terms of policy factors contributing to lapse were issue age, premium payment mode and underwriting method. The study found that persistency generally improves with increasing age at issue particularly for universal life and variable universal life insurance plans. Policy premiums paid on annual basis exhibited lower lapse rates of around 2.6 percent while policies that are paid on a quarterly basis exhibited higher lapse rates of over 6 percent. LIMRA persistency studies have shown that policies that use automatic bill payment methods tend to exhibit lower lapse rates than those are billed on a direct basis. An analysis in this study on the basis of underwriting method used, policies issued with full medical underwriting or on a paramedical basis exhibited the lowest rates of lapsation. Whole life, term and universal life policies issued on a non-medical basis or on a simplified issue basis registered a higher lapse rates especially during the first 10 policy years.

J.N. Mojekwu (2011) in his study stated that age of policy holder is the most important factor responsible for the increased lapsation of life insurance policies in the Nigerian insurance industry. His analysis clearly showed that those below 35 years of age who surrendered or allowed their policies to lapse constitute more than 50 per cent of the life policies considered during the study.

Stephen G Fier and Andre P. Liebenberg (2012) tested the emergency fund hypothesis (EFH) and the policy replacement hypothesis (PRH) associated with life insurance lapse behaviour while controlling life cycle factors that have an influence on lapse decision. The results of their study provided strong evidences in favour of both the EFH and PRH. The findings indicated that the probability of voluntarily lapsing a life insurance policy is high for households that suffered a large negative income shock and that reported greater amounts of household debt. The results of their study also provided support for policy replacement hypothesis stating that 13.7 per cent of households that lapsed a policy also purchased a new life insurance policy. Their study also established a link between the decision to lapse and important life cycle factors. Age as an important factor in the lapse decision is observable through the finding that the youngest households are more likely to lapse a policy than the oldest households in the sample. The study also found that recently retired households and recently widowed households are more likely to lapse policies than other households.

Fang, H and Kung E (2021) in their study indicated that a large fraction of life insurance policy lapsations are driven by idiosyncratic shocks which are uncorrelated with health, income and bequest motives when policyholders are relatively young. However, as the policyholders get older, the role of such idiosyncratic shocks gets smaller, and more of their lapsation is driven either by income, health or bequest motive shocks.

Gemmo and Martin (2016) through their working paper demonstrated that the demographic variables like Age, Marital Status, Birth of a child, number of children, acquisition of assets, influence the surrender of a life insurance policy.

Santosh Anagol, Shawn Cole and Shayak Sarkar (2013) in their study *Understanding the Advice of Commissions-Motivated Agents: Evidence from the Indian Life Insurance Market* evaluated the quality of advice provided by life insurance agents in India. They found that agents overwhelmingly recommend unsuitable, strictly dominated products, which provide high commissions to the agent. Agents in majority cases mis-sell the products to the informed consumers. Agents usually recommend those products which bring them high commission rather than recommending a product suitable to the needs of customers.

As per the study by N.V.Subramanian (2004) reasons for lapsation include wrong selling, forced selling, over selling, bogus selling, effect of competition, introduction of new plans, bad service, ignorance, lack of follow up by agent etc.,

Suresh Chandra CH and Jenda Ramesh (2011) considered lapsation as one of the critical problems faced by the life insurance companies in India. They calculated the lapse rates for various traditional and unit linked policies of life insurance companies for the 5 years period from 2002-03 to 2006-07 taking the data from annual reports of IRDA. The study found that the lapse rate is high for ULIPs as compared to traditional policies. Lapse rate is high for quarterly and monthly mode of premium payment and also for the policy term 0-10 years. Further the study found that the lapsation is more in case of sales done through brokers and corporate agents.

Sachin S. Surana and Amar K. Gaur (2013) identified the causes of lapsation based on the available literature and annual reports of IRDA, LIC etc., The causes identified by them lack of commitment and malpractice on the part of different distribution channels, financial burden suffered by the policy holder, poor service quality of agents and company, inadequate information and knowledge about the different insurance products particularly of ULIPs, delay in grievance redressal etc.,

As per the analysis of Monika, A.V Rao, R.Kannan, K.P.Sarma, A and S.K.Sarma (2008) based on the data collected by IRDA from all the life insurance companies regarding various factors affecting lapsation include age at entry, mode of premium payment, duration elapsed since policy inception, policy type and the type of underwriting.

Life insurance policy lapses are tested using macroeconomic data in most of the literature. Macroeconomic data analysis provides an insight into the general determinants of lapsation of life insurance policies (Vidyavathi et.al 2022). Very limited literature is available on analysis of micro economic and household specific factors that drive the lapse decision. Hence, an attempt has been made in this research to analyse whether the micro economic, household and life cycle factors influence the decision to lapse a life insurance policy before it attains a surrender value and surrender a policy before its maturity.

### **Objectives**

The first and foremost objective of this research is to identify and assess the statistical importance of various factors that drive a decision to lapse a life insurance policy before it attains a surrender value.

The second objective is to analyze the statistical importance of various factors that led to the surrender of a life insurance policy before its maturity.

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### Data and Methodology

In India, the secondary data sources on insurance in general and on lapsation of life insurance policies in particular are very limited unlike in developed countries. The lapse ratio and persistency ratio of insurance companies available with IRDAI are the only publicly available data on lapsation of life insurance policies. Moreover, insurance companies because of the confidentiality or non disclosure clause do not share any kind of information about the policyholders who have lapsed or surrendered their policy. Hence, for this study, we have collected the required data and information from the life insurance policy holders and enquired with them if they had lapsed or surrendered their policy before maturity and what are the factors responsible for such behavior. In this study, we randomly selected the respondents and used a structured questionnaire to collect the data and information in a face-to-face interview. More than 1000 people were approached, but, we could get the required data only from 537 people who owned life insurance policies after 2001. Of these, 128 respondents had lapsed their policies before the policies could attain the surrender value and 135 respondents had surrendered their policies before the maturity (Vidyavathi et al., 2022).

In this research study, we enquired about the factors that compelled the respondents to lapse/surrender their policies. The collected data and information on factors driving lapsing/surrendering a life insurance policy were analyzed using Gretl. A logit model was developed to find the marginal effect of various factors associated with the decision to lapse/surrender a life insurance policy.

In order to determine whether the policy is lapsed/surrendered, we mainly focused on the following two questions in the survey.

**Question 1:** Have you ever discontinued any of your policies (lapsed) before the policy attaining the surrender value?

**Question 2:** Have you ever surrendered any of your policies before its maturity?

Respondents who answered in affirmative to this question were classified as having lapsed/surrendered a policy and were asked several additional questions to probe into the reasons to lapse/surrender a policy (Vidyavathi et.al, 2022).

Additional questions asked to respondents related to life cycle events, income shock, company characteristics and agents to probe into the reasons to lapse/surrender a life insurance policy. Under life cycle events four questions were asked: whether (i) marriage (ii) divorce (iii) death of a spouse and (iv) retirement were reasons for lapsing/surrendering a life insurance policy. Under income shock seven questions were asked: whether (i) loss of job by self, (ii) unemployment in household, (iii) debt, (iv) hospitalization of self, (v) hospitalization of dependents, (vi) financial commitments towards children's education, (vii) financial commitments towards house purchase/construction were reasons for lapsing/surrendering a life insurance policy. Under agent related factors four questions were asked: whether (i) misinterpretation of policy by agent (ii) poor post sale follow up/service, (iii) agent leaving the company (iv) agent influencing the replacement of old policy by a new one were reasons for lapsing/surrendering a life insurance policy. Under company characteristics three questions were asked: whether (i) poor post sale follow-up/service, (ii) poor return from the policy and (iii) non availability of up to date information about policy were reasons for lapsing/surrendering a life insurance policy.

## Results and Discussion

### Logit model for lapsation of life insurance policy

During the survey, information was gathered about all the above mentioned factors that led to the lapsation/surrender of policies. Data and information so collected was subjected to logistic regression analysis. The status of life insurance policy (0=not lapsed and 1= lapsed) was the dependent variable. All the above mentioned 18 variables were independent variables which are also categorical and dichotomous. When both dependent and independent variables are dichotomous logit model is used. When Logit model was applied Gretl dropped 11 independent variables viz., divorce, death of spouse, retirement, unemployment in the household, hospitalization of self, financial commitments towards children's education, financial commitments toward house construction/purchase, agent leaving the company, agent influencing the replacement of old policy by a new one, poor post sale follow up & service and non-availability of up to date information on the policy. Gretl retained 7 variables namely marriage, loss of job by self (policy holder), debt, hospitalization of dependents, misinterpretation of the policy by agent, poor post sale service by agent and poor return from the policy for model construction as these variables are important in predicting the status of life insurance policies.

Thus finally seven independent variables namely marriage (0= marriage is not the reason and 1= marriage is the reason), loss of job by self (0=loss of job by self is not the reason and 1=loss of job by self is the reason), debt (0= debt is not the reason and 1=debt is the reason), hospitalization of dependents (0=hospitalization of dependents is not the reason and 1=hospitalization of dependents is the reason), misinterpretation of the policy by agent (0=misinterpretation of the policy by agent is not the reason and 1=misinterpretation of the policy by agent is the reason) and poor return from the policy (not the reason and reason) are included in the model. Logit model is constructed in gretl employing maximum likelihood method and the probability of lapsation of a policy by the policy owner is estimated on the basis of marriage, loss of job by self (policy holder), debt, hospitalization of dependents, misinterpretation of the policy by agent, poor post sale service by agent and poor return from the policy.

Logit model is estimated as follows:

$$\text{Lapse} = \beta_0 + \beta_1 \text{marriage}_i + \beta_2 \text{loss of job by self}_i + \beta_3 \text{debt}_i + \beta_4 \text{hospitalisation of dependents}_i + \beta_5 \text{misinterpretation of policy by agent}_i + \beta_6 \text{agent's poor post sale service}_i + \beta_7 \text{poor return from policy}_i + \mu_i$$

Where lapse is equal to one if individual  $i$  has lapsed the policy, zero otherwise, marriage is equal to one if individual  $i$  has lapsed the policy because of marriage, zero otherwise, loss of job by self is equal to one if individual  $i$  has lapsed the policy because of job loss by him/her, zero otherwise, debt is equal to one if individual  $i$  has lapsed the policy because of debt, zero otherwise, hospitalization of dependents is equal to one if individual  $i$  has lapsed the policy because of dependents' hospitalization, zero otherwise, misinterpretation of policy by agent is equal to one if individual  $i$  has lapsed the policy because agent misguided the policy holder at the time of purchase of policy, zero otherwise, agent's poor post sale service is equal to one if individual  $i$  has lapsed the policy because of agent's poor post sale service, zero otherwise, poor return from policy is equal to one if individual  $i$  has lapsed the policy because of poor return from policy, zero otherwise,

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Logit model is defined as:

$$\text{LN} (P_i/1-P_i) = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + \beta_5 X_{i5} + \beta_6 X_{i6} + \beta_7 X_{i7} + \mu_i \quad (1)$$

Our model is estimated as:

$$\text{LN} (\text{Lapse/No Lapse}) = \beta_0 + \beta_1 \text{marriage}_i + \beta_2 \text{loss of job by self}_i + \beta_3 \text{debt}_i + \beta_4 \text{hospitalisation of dependents}_i + \beta_5 \text{misinterpretation of policy by agent}_i + \beta_6 \text{agent's poor post sale service}_i + \beta_7 \text{poor return from policy}_i + \mu_i \quad (2)$$

**Model 1:** Logit, using observations 1-537

Dependent variable: PolicyLapse

Standard errors based on Hessian

	<i>Coefficient</i>	<i>Std. Error</i>	<i>Z</i>	<i>p-value</i>	
Const	-2.87757	0.215001	-13.38	<0.0001	***
Marriage	3.07185	1.31828	2.330	0.0198	**
Joblossbyself	5.06878	1.07350	4.722	<0.0001	***
Debt	4.75687	1.08890	4.369	<0.0001	***
Dependents' hospitalization	2.93318	1.39321	2.105	0.0353	**
MisinterpretationByagent	1.64647	1.64248	1.002	0.3161	
Agents' poor service	5.57264	1.05464	5.284	<0.0001	***
Poor return	5.44869	1.08118	5.040	<0.0001	***

Mean dependent var	0.238361	S.D. dependent var	0.426478
McFadden R-squared	0.640571	Adjusted R-squared	0.613444
Log-likelihood	-105.9999	Akaike criterion	227.9998
Schwarz criterion	262.2878	Hannan-Quinn	241.4130

Number of cases 'correctly predicted' = 514 (95.7%)

f(beta'x) at mean of independent vars = 0.426

Likelihood ratio test: Chi-square(7) = 377.823 [0.0000]

		Predicted	
		0	1
Actual	0	406	3
	1	20	108

Excluding constant, p-value was highest for variable 13 (misinterpretation by agent)

Logit estimates of equation (2) are obtained using gretl. Following is the logit equation of our lapse model:

Lapse = -2.87757 + 3.07185 marriage + 5.06878 loss of job by self + 4.75687 debt + 2.93318 hospitalisation of dependents + 1.64647 misinterpretation of policy by agent + 5.57264 agent's poor post sale service + 5.44869 poor return from policy.

(0.215001) (1.31828) (1.07350) (1.08890) (1.39321) (1.64248)  
(1.05464) (1.08118)

(Figures in parentheses are standard errors based on Hessian);

From the model, it is clear that the effect of marriage, loss of job by policyholder, debt, hospitalization of dependents, poor post sale service by agent and poor return from policy is statistically significant. However, the coefficients in the output are not interpreted as marginal effects. To obtain marginal effect we need to re estimate the model by selecting the option “show the slopes at mean” and we get logit model 2.

**Model 2:** Logit, using observations 1-537  
 Dependent variable: Policy Lapse  
 Standard errors based on Hessian

	<i>Coefficient</i>	<i>Std. Error</i>	<i>Z</i>	<i>Slope*</i>
Const	-2.87757	0.215001	-13.38	
Marriage	3.07185	1.31828	2.330	0.643064
Joblossbyself	5.06878	1.07350	4.722	0.790831
Debt	4.75687	1.08890	4.369	0.785188
Dependents' hospitalisation	2.93318	1.39321	2.105	0.621751
Misinterpretationbyagent	1.64647	1.64248	1.002	0.371177
Agents' poorservice	5.57264	1.05464	5.284	0.826059
Poorreturn	5.44869	1.08118	5.040	0.813126

Mean dependent var	0.238361	S.D. dependent var	0.426478
McFadden R-squared	0.640571	Adjusted R-squared	0.613444
Log-likelihood	-105.9999	Akaike criterion	227.9998
Schwarz criterion	262.2878	Hannan-Quinn	241.4130

\*Evaluated at the mean

Number of cases 'correctly predicted' = 514 (95.7%)

f(beta'x) at mean of independent vars = 0.426

Likelihood ratio test: Chi-square(7) = 377.823 [0.0000]

Predicted

0 1

Actual 0 406 3

1 20 108

Excluding constant p-value was highest for variable 13 (misinterpretation by agent)

The marginal effect of marriage is 0.64. On the event of marriage of self or dependents the probability of lapsing a policy by the policy holder will increase by 64 percent. In India Marriage is an expensive affair. So, there will be a high chance of using the funds that would otherwise go to premium payment for meeting the marriage expenses or repay the debt taken for marriage. In case of unmarried women policy holders after the marriage they require 6 months to one year to get the job after they quit their previous job (Vidyavathi et.al 2022). The marginal effect of loss of job by policy holder is 0.79. A policy holder losing the job will increase the probability of lapsing a by 79 percent.



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The marginal effect of debt is 0.78. In India people go for debt to meet the expenses of hospitalization, children's education, marriage, house construction/purchase and for the purpose of business etc., so a policy holder borrowing a loan will increase the probability of lapsing a policy by 78 percent.

The marginal effect of hospitalization of dependents is 0.62. In India unfortunately less than a quarter of the population is protected under any health insurance coverage and in majority of cases hospitalization results in high out of pocket expenditure at the time of hospitalization and can also lead to years of debt repayment. So hospitalization of dependents of a policy holder will increase the probability of lapsing a policy by 62 percent. The marginal effect of misinterpretation of the policy by agent is 0.37. In rural as well as urban India agents are the most significant source of information on insurance. So a misinterpretation of the policy by the agent at the time of sale will increase the probability of lapsing a policy by 37 percent. The marginal effect of poor post sale service by agent is 0.83. Since the dependency of policy holders on agents is high, poor post sale service by agent will increase the probability of lapsing a policy by 83 percent. However in the recent years with the introduction of various method of premium payment such as online payment, ECS etc., the dependency on agents has been decreasing.

The marginal effect of poor return from policy is 0.81. Increase in the number of avenues for investment and also an increase in the level of financial awareness policy holders prefer to discontinue policy rather than continue paying the premium if the return is low. So, a poor return from policy will increase probability of lapsing a policy by 81 percent. Over the entire model gives 96 percent correct prediction.

### **Logit model for Surrender Activity in Life Insurance**

Another objective of this research is to identify and assesses the statistical importance of various factors that drive a decision to surrender a life insurance policy before its maturity. The same factors considered for lapse are considered for the surrender of a life insurance policy too. During the survey, information was gathered about all these factors that led the surrender of policies before maturity. Data and information so collected was subjected to logistic regression analysis. The status of life insurance policy (0=not surrendered and 1= surrendered) was the dependent variable. All the above 18 variables considered were independent variables which are also categorical and dichotomous. When both dependent and independent variables are dichotomous logit model is used. When Logit model was applied Gretl dropped 10 independent variables and retained Eight independent variables namely marriage (0= marriage is not the reason and 1= marriage is the reason), loss of job by self (0=loss of job by self is not the reason and 1=loss of job by self is the reason), debt (0= debt is not the reason and 1=debt is the reason), financial commitment towards children's education financial cont towards children's education is not the reason and 1=financial commitment towards children's education is the reason), financial commitment towards house construction/purchase (0=financial commitment towards house construction/purchase is not the reason and 1=financial commitment towards house construction/purchase is the reason) agents' poor service (0= agent's poor service is not the reason and 1= agent's poor service is the reason) company's poor service 0= company's poor service not the reason and 1= company's poor service is the reason) and poor return from the policy (0= poor return is not the reason and 1= poor return is the reason) are included in the model.

Logit model is constructed in Gretl employing maximum likelihood method and the probability of surrendering a policy by the policy owner is estimated on the basis of marriage, loss of job by self (policy holder), debt, financial commitment towards children’s education, financial commitment towards house construction/purchase, poor post sale service by agent, poor service by company and poor return from the policy.

Logit model is estimated as follows:

$$\text{Surrender of policy} = \beta_0 + \beta_1 \text{marriage}_i + \beta_2 \text{loss of job by self}_i + \beta_3 \text{debt}_i + \beta_4 \text{financial commitment towards children's education}_i + \beta_5 \text{financial commitment towards house construction/purchase}_i + \beta_6 \text{agent's poor post sale service}_i + \beta_7 \text{company's poor service}_i + \beta_8 \text{poor return from policy}_i + \mu_i$$

Where surrender is equal to one if individual i has surrendered the policy, zero otherwise, marriage is equal to one if individual i has surrendered the policy because of marriage, zero otherwise, loss of job by self is equal to one if individual i has surrendered the policy because of job loss by him/her, zero otherwise, debt is equal to one if individual i has surrendered the policy because of debt, zero otherwise, financial commitment towards children’s education is equal to one if individual i has surrendered the policy because of children’s education, zero otherwise, financial commitment towards house construction/purchase is equal to one if individual i has surrendered the policy because of house construction/purchase, zero otherwise, agent’s poor post sale service is equal to one if individual i has surrendered the policy because of agent’s poor post sale service, zero otherwise, company’s poor service is equal to one if individual i has surrendered the policy because of poor service from company zero otherwise poor return from policy is equal to one if individual i has surrendered the policy because of poor return from policy, zero otherwise,

Logit model is defined as

$$\text{LN}(P_i/1-P_i) = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + \beta_5 X_{i5} + \beta_6 X_{i6} + \beta_7 X_{i7} + \beta_8 X_{i8} + \mu_i \quad \text{-----(1)}$$

Our model is estimated as

$$\text{LN (Surrender/No Surrender)} = \beta_0 + \beta_1 \text{marriage}_i + \beta_2 \text{loss of job by self}_i + \beta_3 \text{debt}_i + \text{financial commitment towards children's education}_i + \beta_5 \text{financial commitment towards house construction/purchase}_i + \beta_6 \text{agent's poor post sale service}_i + \beta_7 \text{company's poor service}_i + \beta_8 \text{poor return from policy}_i + \mu_i \quad \text{-----(2)}$$

**Model 3:**Logit, using observations 1-537

Dependent variable: policysurrender

Standard errors based on Hessian

	<i>Coefficient</i>	<i>Std. Error</i>	<i>Z</i>	<i>p-value</i>	
Const	-3.17399	0.249727	-12.71	<0.0001	***
Marriage	4.82989	1.11441	4.334	<0.0001	***
Joblossbyself	3.89593	1.71	3.148	0.0016	***
Debt	5.05080	1.09569	4.610	<0.0001	***
Children's education	3.45931	1.28656	2.689	0.0072	***
Houseconstruction	3.77294	0.893948	4.221	<0.0001	***
Agents' poorservice	2.62265	1.47347	1.780	0.0751	*
Companypoorservice	1.92380	1.82960	1.051	0.2930	
Poorreturn	5.84355	0.770760	7.582	<0.0001	***

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Mean dependent var	0.251397	S.D. dependent var	0.434221
McFadden R-squared	0.697320	Adjusted R-squared	0.667597
Log-likelihood	-91.64989	Akaike criterion	201.2998
Schwarz criterion	239.8738	Hannan-Quinn	216.3896

Number of cases 'correctly predicted' = 518 (96.5%)  
 f(beta'x) at mean of independent vars = 0.434  
 Likelihood ratio test: Chi-square (8) = 422.291 [0.0000]

Predicted

	0	1
Actual 0	397	5
1	14	121

Excluding the constant p-value was highest for variable 17(company poor service)

Logit estimates of equation (2) are obtained using Gretl.

Following is the logit equation of our lapse model

Surrender = -3.17399 + 4.82989marriage + 3.89593loss of job by self + 5.05080debt + 3.45931financial commitment towards children's education + 3.77294financial commitment towards house construction/purchase + 2.62265agent's poor post sale service + 1.92380company's poor service + 5.84355poor return from policy.  
 (0.249727) (1.11441) (1.23771) (1.09569) (1.28656) (0.893948)  
 (1.47347) (1.82960)

(Figures in parentheses are standard errors based on Hessian)

From the model it is clear that the effect of marriage, loss of job by policy holder, debt, financial commitment towards children's education, financial commitment towards house construction, dependents, poor post sale service by agent, poor service from company and poor return from policy is statistically significant. However the coefficients in the output are not interpreted as marginal effects. To obtain marginal effect we need to re estimate the model by selecting the option "show the slopes at mean" and we get logit model 4.

**Model 4:** Logit, using observations 1-537

Dependent variable: policysurrender

Standard errors based on Hessian

	<i>Coefficient</i>	<i>Std. Error</i>	<i>Z</i>	<i>Slope*</i>
Const	-3.17399	0.249727	-12.71	
Marriage	4.82989	1.11441	4.334	0.773206
Joblossbyself	3.89593	1.23771	3.148	0.721384
Debt	5.05080	1.09569	4.610	0.797664
Children's education	3.45931	1.28656	2.689	0.688842
Houseconstruction	3.77294	0.893948	4.221	0.724243
Agents'poorservice	2.62265	1.47347	1.780	0.575190
Companypoorservice	1.92380	1.82960	1.051	0.436818
Poorreturn	5.84355	0.770760	7.582	0.860643

Mean dependent var	0.251397	S.D. dependent var	0.434221
McFadden R-squared	0.697320	Adjusted R-squared	0.667597
Log-likelihood	-91.64989	Akaike criterion	201.2998
Schwarz criterion	239.8738	Hannan-Quinn	216.3896

\*Evaluated at the mean  
 Number of cases 'correctly predicted' = 518 (96.5%)  
 f(beta'x) at mean of independent vars = 0.434  
 Likelihood ratio test: Chi-square (8) = 422.291 [0.0000]

Predicted

0 1  
 Actual 0 397 5  
 1 14 121

Excluding the constant p-value was highest for variable 17(company poor service)

The marginal effect of marriage is 0.77. On the event of marriage of self or dependents the probability of surrendering a policy by the policy holder will increase by 77 percent. In India Marriage is an expensive affair. So there will be a high chance of using the funds that would otherwise go to premium payment for meeting the marriage expenses or repay the debt taken for marriage. In case of unmarried women policy holders after the marriage they require 6 months to one year to get the job after they quit their previous job. The marginal effect of loss of job by policy holder is 0.72. A policy holder losing the job will increase the probability of surrendering a by 72 percent.

The marginal effect of debt is 0.80. In India people go for debt to meet the expenses of hospitalization children's education marriage house construction/purchase and for the purpose of business etc., so a policy holder borrowing a loan will increase the probability of surrendering a policy by 80 percent.

The marginal effect of financial commitment towards children's education is 0.69. So, financial commitment towards children's education will increase the probability of surrendering a policy by 69 percent. The marginal effect of financial commitment towards house construction/purchase is 0.72. In India every individual has a dream of having an own house and around 50-60% of total cost of house construction/purchase is met by loan and the remaining is out of savings including money saved/invested in insurance. So a policy holder going for the construction/purchase of a house will increase the probability of surrendering a policy by 72 percent.

The marginal effect of poor post sale service by agent is 0.57. Since the dependency of policy holders on agents is high poor post sale service by agent will increase the probability of surrendering a policy by 57 percent. The marginal effect of poor service from company is 0.44. Poor service from company will increase the probability of surrendering a policy by 44 percent. The marginal effect of poor return from policy is 0.86. Increase in the number of avenues for investment and also an increase in the level of financial awareness policy holders prefer to surrender policy if the return is low. So a poor return from policy will increase probability of lapsing a policy by 86 percent. Over the entire model gives 96.5 percent correct prediction.

## Determinants of Lapse and Surrender of Life Insurance Policies in India

### Conclusions

Results of Logit model on lapsation have identified age, marriage, loss of job, debt, hospitalization of dependents, agents' poor service and poor return from policy as the drivers of lapsation. Similarly results of logit model on surrender activity has identified marital status, occupation, marriage of self and children, loss of job, debt, children's education, house construction and poor return from policy are the major reasons for surrendering a life insurance policy before the completion of the term. This is in confirmation with the results of earlier studies done by Carson, James, Randy E (1999), David T. Russell, Stephen G. Fier, James M. Carson and Randy E. Dumm (2013), Dieter Kiesenbauer (2011), Fang H and Kung E (2021), Kuo, W., Tsai, C., Chen, W.K., (2003) LoiSohLoi, Wu Yuan and Robert LianKengHeong (1993) and also in favour of emergency fund hypothesis and replacement.

Finally insurance companies have huge pool of data and information about their customers and they can use predictive analytics to identify the most probable factors driving lapsation and surrender activity. Companies can have remedial course of action from the stage of product design, sale and post-sale service, better return etc and this will go a long way in reducing the incidence of lapsation and surrender of life insurance policy before the completion of the term.

### Authors' Contributions:

The authors contributed equally to this work.

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