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The Vehicle Make-based Pricing Approach for Motor Insurance in Sri Lanka: Identifying the Efficacy of Vehicle Make on Pricing Decision

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Abstract

Insurance industry comes under financial sector facing more challenges from external environment and creating more innovative solutions for them. Motor insurance can be identified as one of the key components of the insurance business and deciding the prices for motor insurance policies is a massive challenge faced by underwriters. Therefore the present study made to evaluate efficacy of make-based pricing method for Sri Lankan insurance industry when compared to current approach of using purpose and vehicle category-based pricing approach.

70,475 motor insurance policies and 31,706 respective claims were selected as the sample and data were selected from insurance agents covering entire geographical area and from a motor engineer under the telephone conversation method. Data were analyzed using MS Office 2007 excel package and list downing points from the motor engineer.

The researcher identified varied claim ratios for different vehicle makes even if they use for the same purpose. Therefore vehicle's make is highly affected to total claim cost of a vehicle and thereby affect for insurance premium calculation/pricing decisions. Make-based pricing allowed to charge customized prices from clients by referring past claim history of particular vehicle makes.

Keyword: Claims, Motor Insurance, Pricing, Vehicle Make

Introduction

The concept of insurance started in Sri Lanka with tea and coffee industry. Before nationalization of insurance there were several foreign companies which operated as agents of overseas insurance companies. In 1938 Companies Act was passed and thereafter Sri Lankan insurance companies were established. Insurance industry was nationalized in 1961 and Insurance Corporation of Sri Lanka was established as a sole operator to transact life insurance in Sri Lanka. After around 25 years of nationalization Control of Insurance (amendment) Act No. 42 of 1986 permitted public companies to carryout insurance business in Sri Lanka. Currently (in 2012) there are 22 insurance companies are in operation and it has a rupees 68,493 million total premium income for 2010 which is 1.22% of Gross Domestic Production of Sri Lanka (IBSL Annual Report, 2010).

Communities became more aware of motor insurance only after motor traffic ordinance of 1938 which made third party insurance compulsory. That was the landmark incident for beginning of growth of motor insurance in Sri Lanka. Motor insurance contributes to 57% of Gross Written Premium (GWP) of general insurance business in the year 2010 with a growth of 19% with respective to previous year and it was value of rupees 21, 222 million in year 2010. Therefore it can be identified, motor insurance has a significant contribution to general insurance business and it has a more positive growth year by year. Therefore the study of motor insurance is very important to identify potential growth opportunities of the industry.

The main income from motor insurance is the premium income and currently it is calculated based on vehicle category (eg. car, bus, lorry, dual purpose, etc.) and the purpose (eg. hired, private) of the vehicle. Based on the quotations taken by insurance companies it can be identified insurers charge a higher rate from hiring

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vehicles such as motor cycles, containers and rent vehicles because of higher risk associated with those vehicles. In addition to that they adjust different risk factors specific to each client. Age, sex, marital status, zone, vehicle characteristics, prior loss experience and driver training are among the commonly used bases for establishing rate groupings (Haner, 1968).

In addition to above groupings, No Claim Bonus (NCB) discounts earned by the client, up front NCB given by insurance company, number of driving seats of the vehicle, whether duty free vehicle or not, whether hired/ leased vehicle or not, the amount of voluntary excess, multiple rebate and other special discounts offered to client, personal accident benefit cover, SRCC and TC covers, leaner driver or not, SRCC to vehicle, special windscreen covers, natural perils, extended towing charges, enhanced air bag(s) covers, administration fee charged by the insurance company, taxes (Stamp Duty, CESS, Road Tax, NBT, VAT) are considered when calculating the premium in Sri Lankan context.

When deciding the rate to be charged from clients, insurance companies use their past claim experience and decide the rate as a percentage of sum insured. Net rate should cover claim expense, reinsurance expense, SRCC premium, XOL expense, UPR adjustment, commission, IBNR, indirect expenses and profit margin of the company. The challenge is to set the premium so that expected claim costs are covered and a certain level of profitability is achieved (Yeo, Smith, Willis and Brooks, 2002).

The Research Problem

Majority of insurance companies in Sri Lanka mainly consider "category" (cars, lorries, and buses etc.) of the vehicle, the "using purpose" (private, hired, rented etc.) of the vehicle, and different risk factors specific to each client when arriving at the rate. It is noted that with the discussion with motor engineer, around 50% of vehicle repair expense include spare parts cost. Spare parts cost/ price depends on the make and model of the vehicle. It is generally believed that when the vehicle make is largely available in the market, the spare part cost is relatively lower than those of the makes and models which are not freely available in the market.

In Sri Lankan insurance practice, a few insurance companies have initialed on the make-based pricing approach. But there is a gap in the empirical knowledge with regard to efficacy of make-based pricing approach. Therefore to explore the efficacy of make-based pricing approach is an important research task in the field of insurance in Sri Lanka. This research is carried out with a view of fulfilling that knowledge gap to a certain extent.

Objectives of the Study

The objectives of this study are:

1. To assess the impact on "make" on claim expense in motor insurance in Sri Lanka.
2. To make suitable recommendations to calculate the rate in motor insurance pricing decisions addressing all relevant risk factors.

Review of Literature

Insurance is a risk transferring mechanism in which insurer undertakes potential risks associated with the assets for a charge called insurance premium. Insurance premium is the main income of the insurance business. This concept states that premium charged for policies written during a future time period should be appropriate to cover the losses and expenses expected for those policies while achieving the targeted profit (Werner and Modlin, 2010). It is more important to have a balance between premium income and claim expenses to ensure the sustainability of the business. Therefore pricing decision is very important technical factor for profitability as well as competitiveness.

Insurance industry is different from other industries like manufacturing, and the cost associated with insurance cannot be measured reliably at the time of issuing the insurance policy. Also analyze insurance premiums as a dependent variable (Edlin and Karaca-Mandic, 2006). Wang describes (Wang, 2002) for a given line of business, to calculate the insurance premium for each $1 ground-up expected loss, calculate the discount factor (use market risk-free interest rate and the ground-up loss payment pattern) and apply risk loading to derive a pure premium. The loss is calculated using claim ratio and it shows the ratio of net claims expense to Net Earned Premium (IAG Group, 2011). Insurance premium is decided based on this claim ratio and higher claim ratio will results in a high premium vise versa.

One of the ongoing challenges in insurance risk pricing is to determine an appropriate profit margin to include in an insurer's rates (Schnapp, 2004). Therefore a systematic

pricing mechanism is needed for correctly deciding the insurance price. For an insurance policy, the risk of an insured exposure is essentially static throughout the policy term (Schnapp, 2004). Since the premium charge from client to client is different even when they use same type of vehicle and therefore correct measurement is vital.

Biger and Kahane (1978) had done a research on risk considerations in insurance rate making and have examined pricing of insurance contracts and their regulation in the context of efficient capital markets. The aggregated make suggested a single solution pointed out earlier in the literature, with a generalization to the case where uncertain underwriting profits are correlated with returns on the market asset portfolio (Biger and Kahane, 1978). Under the current study researcher gives more emphasis on make of the vehicle on rate making.

Yeo et al. (2002) have done a study on mathematical programming approach to optimise insurance premium pricing within a data mining framework. In this paper they provide evidence of the benefits of an approach which combines data mining and mathematical programming to determine the premium to charge automobile insurance policy holders in order to arrive at an optimal portfolio (Yeo et al., 2002). Instead of mathematical programming approach, the researcher is interested to use make-based pricing approach for premium pricing.

Conceptualization

Methodology

The research for this study was both qualitative and qualitative approach and the target population includes all the active policies, and incurred and reported claims in Sri Lanka during the analyzing period (01/09/2010 to 31/08/2011). Data for both claims and underwritings were collected using the insurance portfolios of insurance agents covering entire country. For the purpose of study 70,475 insurance contracts were selected covering the period of one year from 01/09/2010 to 31/08/2011 and respective claims count to 31,706. According to the IBSL 2010 annual report, total motor GWP amounts to rupees 21,222 million and selected sample consists GWP of rupees 1,767 million which is 8% of total industry GWP. Researcher used MS- Excel 2007 package to analyze the data.

The Researcher calculated motor claim ratios based on "purpose of vehicle using" and based on "make of the vehicle" for the same portfolio. A backward calculation was done by adding estimated amount of 90% for expenses and for profit margin for each of two calculations. After adding claim expense and 90% margin, researcher plans to identify the amount to be recovered from pricing and to observe its pattern based on "purpose" and "make".

Results, Findings and Discussion

As stated in the outset, claim expense is the main expense associated in insurance business and which mainly affect to insurance pricing decisions. Claim ratio indicates incurred claims as a percentage of premiums. Therefore claim ratio is calculated for the entire sample based on the purpose of the vehicle usage and based on the make of the vehicle.

Figure 1: Conceptualization

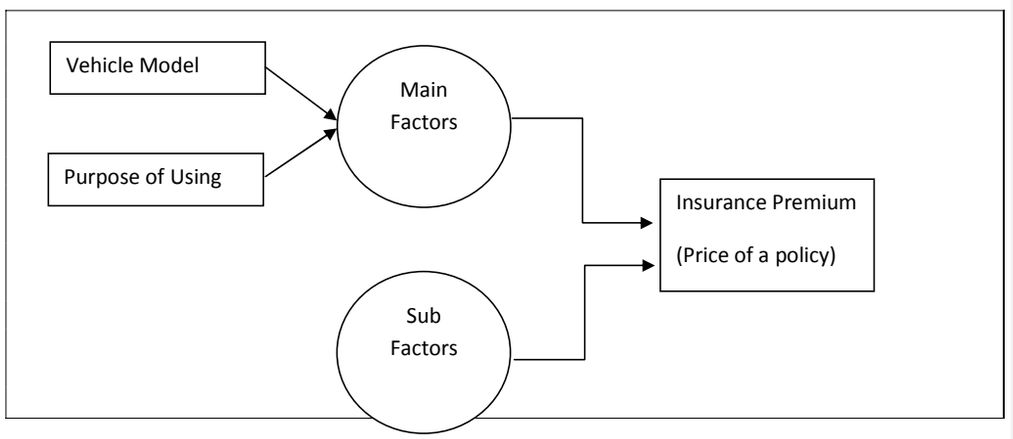

Table 1: Claim Frequency and Claim Ratios of Vehicles based on "Using Purpose"

Category	*Purpose*	*No of Claims*	*Active No of Policies*	*Frequency*	*Gross Incurred Claims (Mn) (a)*	*Gross Premium (Mn) (b)*	*Claim Ratio % (a/b)*100*	*Sum Insured (Mn)*
Cars	Private	15,375	25,034	61	645	832	77	45,581
	Hired	925	954	97	30	31	96	1,135
Dual Purpose	Hired	2,402	4,165	58	91	140	65	5,065
	Private	4,445	9,350	48	146	242	60	12,755
Lorries	Hired	2,634	8,664	30	135	205	66	10,512
	Private	2,049	8,906	23	107	152	70	10,999
Trailers *	Hired	12	84	14	1	1	51	68
	Private	5	197	2	(0)	1	(12)	78
Buses	Private	140	301	46	4	8	54	669
	Hired	1,127	1,647	68	49	56	88	2,914
Three wheelers	Hired	5	384	1	0	3	2	125
	Private	2	164	1	0	1	3	23
Motor Cycles	Private	1,982	7,426	27	23	46	50	729
Motor Traders Vehicles	Private	30	133	23	1	8	18	543
	Hired	408	359	114	19	22	87	762
Special Types vehicles	Both	165	2,707	6	7	19	39	1,447
Total		31,706	70,475	45	1,258	1,767	71	93,405

**Source: Based on the analyzed sample*

** In the above sample there is a minus gross incurred claim value due to accounting conventions (provision reversal)*

In the above analysis, number of claims, active number of policies, claim frequency, gross incurred claims, gross premium, claim ratio and sum assured are presented based on the "using purpose of vehicle" as currently practicing majority of insurance companies in Sri Lanka. Frequency is measured as the ratio of the number of claims to the number of policy units (Smith, Willis, and Brooks, 2000). Accident frequency of the sample is 45%. That means during last one year, 45% of vehicle in the total portfolio have met an accident. In other words, there is 45% chance for a vehicle to meet an accident during the policy period. There is 114% claim frequency for the vehicle used for solely rent purposes and cars' use for hiring purpose has 97% frequency while cars' use for private purpose maintains at 61%.

Based on the above frequencies, we can identify that all the private vehicle categories maintain lower accident frequency as compared with hired vehicles. Therefore as currently practiced in the country we can identify the using purpose as an important risk factor for pricing decisions in insurance industry.

Sample has a 71% claim ratio and it indicates that 71% of premium income straightway has to be paid as claim expenses. Cars' use for hiring purpose has a 96% of highest claim ratio and private cars maintain it at 77%. As shown in the claim frequency, we can identify there is a higher claim ratio for the vehicles use for "hiring purposes". Therefore researcher is in line with the rationale behind the "using purpose" as a major risk factor.

Today automobile industry is growing with new innovations, and different vehicle makes and models are being introduced to market. But at the current mechanism there is no weight for the importance of the make of the vehicle. For instance "Toyota vehicle" may be used for the private purpose or hiring purpose and if it meets an accident, the cost mainly depends on the availability of spare parts, labour and paint cost associated with Toyota vehicles (based on the discussion with the motor engineer). Therefore researcher attempted to identify the impact of "make" on pricing decisions.

Table 2: Claim Frequency and Claim Ratios of Vehicles Based on "Vehicle Make"

Seq. No	Make of the Vehicle	No of Claims	Active No of Policies	Frequency	Gross Incurred Claims (Mn)	Gross Premium (Mn)	Claim Ratio %	Sum Insured (Mn)
1	A	8,715	15,472	56	323.2	536.7	60	28,403.9
2	B	5,984	9,637	62	203.1	269.3	75	13,176.0
3	C	1,980	5,418	37	112.7	152.0	74	8,867.8
4	D	1,748	5,083	34	85.2	129.4	66	7,167.2
5	E	3,421	6,131	56	115	146	78	7,221
6	F	1,385	2,963	47	43.7	52.6	83	2,453.3
7	G	1,287	5,394	24	15.6	36.3	43	823.4
8	H	1,246	2,334	53	49.0	54.0	91	2,688.1
9	I	1,109	4,322	26	58.2	97.1	60	5,813.6
10	J	525	791	66	18.6	27.4	68	1,438.2
11	K	372	1,012	37	3.5	6.0	59	99.4
12	L	321	956	34	11.9	20.1	59	1,130.0
13	M	271	347	78	12.8	11.7	109	645.0
14	N	249	285	87	20.3	18.4	110	1,323.9
15	O	193	211	91	9.3	6.2	150	320.5
16	P	156	343	45	27.1	20.5	132	1,285.0
17	Q	131	232	56	5.7	5.0	112	234.7
18	R	130	217	60	14.8	8.1	183	424.1
19	S	122	220	55	2.4	3.9	62	196.2
20	T	99	250	40	3.3	6.1	54	317.4
21	U	93	459	20	4.3	7.1	61	420.9
22	V	85	217	39	3.1	5.5	57	265.5
23	W	79	129	61	3.6	4.7	77	240.8
24	X	65	233	28	1.4	1.7	83	27.4
25	Y	52	105	50	6.2	6.8	92	398.5
26	Z	51	156	33	1.8	2.9	64	138.0
27	AA	50	56	89	5.6	2.6	215	147.1
28	BB	47	79	59	3.9	3.7	106	223.4
29	CC	38	56	68	3.3	5.4	61	296.8
30	DD	31	432	7	0.9	5.6	16	387.3
31	EE	28	731	4	0.2	2.0	11	132.1
32	FF	27	52	52	1.9	1.5	132	89.0
33	GG	27	75	36	6.0	2.9	209	164.1
34	HH	27	94	29	2.6	1.7	153	85.5
35	II	19	28	68	0.3	0.8	40	44.1
36	JJ	15	46	33	1.7	1.2	148	61.1
37	KK	12	83	14	0.2	0.7	26	27.7
38	LL	11	9	122	0.4	0.8	50	36.5
39	MM	10	78	13	0.4	1.4	30	72.0
40	NN	7	31	23	0.1	0.6	18	33.5
41	OO	6	9	67	0.2	1.2	16	65.4
42	PP	6	64	9	0.2	0.3	75	16.2

(Contd.)

Seq. No	*Make of the Vehicle*	*No of Claims*	*Active No of Policies*	*Frequency*	*Gross Incurred Claims (Mn)*	*Gross Premium (Mn)*	*Claim Ratio %*	*Sum Insured (Mn)*
43	QQ	4	39	10	0.1	0.2	30	3.0
44	RR	4	63	6	0.2	2.2	12	152.4
45	SS	4	30	13	0.1	0.1	79	7.6
46	Others	1,464	5,503	27	74.2	97.1	76	5,841.0
Total		31,706	70,475	45	**1,257.8**	**1,767.2**	71	**93,405.3**

**Source: Based on the analyzed sample*

Table 3: Adjusting Expenses, Profit Margin of 90% for Claims and Calculation of Net Price based on Purpose

		a	*B*	*a + b*	*(a+b)/e*	*e*
Category	*Purpose*	*Gross Incurred Claims (Mn)*	*Expenses and Margin 90%*	*Total*	*Price/ Gross rate*	*Sum Insured (Mn)*
Cars	Private	644.8	580.3	1,225.2	2.69	45,581
	Hired	30.1	27.1	57.2	5.04	1,135
Dual Purpose	Hired	90.6	81.6	172.2	3.40	5,065
	Private	145.5	131.0	276.5	2.17	12,755
Lorries	Hired	135.2	121.7	256.9	2.44	10,512
	Private	106.8	96.1	202.8	1.84	10,999
Trailers	Hired	0.7	0.6	1.3	1.88	68
	Private	(0.1)	(0.1)	(0.2)	(0.29)	78
Buses	Private	4.1	3.7	7.9	1.18	669
	Hired	49.0	44.1	93.2	3.20	2,914
Three wheelers	Hired	0.1	0.1	0.1	0.10	125
	Private	0.0	0.0	0.0	0.15	23
Motor Cycles	Private	22.8	20.5	43.2	5.93	729
Motor Traders	Private	1.4	1.3	2.7	0.50	543
All Vehicles	Hired	19.3	17.4	36.7	4.81	762
Special Types vehicles	Both	7.4	6.7	14.1	0.98	1,447
		1,258	1,132	2,389.9	2.56	93,405

**Source: Based on the analyzed sample*

Average claim ratio is 71% and the make N, P, R, AA, BB and some other makes represent higher claim ratios while the make G, K, L, CC, DD, II, MM, OO and some other makes show favourable claim ratios.

Based on the discussion with the motor engineer who is practicing in the industry, it has been pointed out that followings are the major factors which affect the claim cost of a vehicle.

1. Availability of spare parts.
2. Condition of spare parts – whether brand new or reconditioned.
3. Repairer – whether through agent or a normal garage.
4. Paint cost – whether 2k paint, 1k paint, metallic or any other paint type.

Based on the discussion it was noted that spare parts, repair and paint expenses differ from make to make. Therefore vehicle make has more impact on claim of a vehicle.

Table 4: Adjusting Expenses, Profit Margin of 90% and Calculation of Net Price for Selected Claims Based on "Vehicle Make"

	A	*B*	*a + b*	*(a+b)/e*	*e*
Make	*Gross Incurred Claims (Mn)*	*Expenses and Margin 90%*	*Total*	*Price/ Gross rate*	*Sum Insured (Mn)*
A	323.2	290.9	614.0	2.16	28,403.9
B	203.1	182.8	386.0	2.93	13,176.0
C	112.7	101.4	214.1	2.41	8,867.8
D	85.2	76.7	161.8	2.26	7,167.2
E	115	103.1	217.7	3.02	7,221
F	43.7	39.3	83.0	3.38	2,453.3
G	15.6	14.0	29.6	3.59	823.4
H	49.0	44.1	93.0	3.46	2,688.1
I	58.2	52.4	110.6	1.90	5,813.6
J	18.6	16.7	35.2	2.45	1,438.2
M	12.8	11.5	24.2	3.76	645.0
N	20.3	18.2	38.5	2.91	1,323.9
P	27.1	24.4	51.5	4.00	1,285.0
R	14.8	13.3	28.2	6.64	424.1
Y	6.2	5.6	11.8	2.95	398.5
AA	5.6	5.0	10.6	7.19	147.1
BB	3.9	3.5	7.4	3.33	223.4
CC	3.3	3.0	6.3	2.11	296.8
MM	0.4	0.4	0.8	1.14	72.0
NN	0.1	0.1	0.2	0.58	33.5
Others	140	125.6	265.2	2.53	10,504
Total	1,258	1,132.0	2,389.8	2.56	93,405

**Source: Based on the analyzed sample*

After adjusting 90% (assuming as expense) for expenses and for profit margin, total price is 2.56% of sum insured. According to current practice the price to be charged from client is solely depends on the "purpose of vehicle using". For instance if there is a car which is used for private purpose the gross rate will be 2.69% of sum insured irrespective of the make of the vehicle

Based on the above calculation after adjusting 90% margin for expenses and for profit margin, different prices/gross rates for each selected make can be identified. For instance 4.00% of sum insured is charged from "P" due to higher claim cost but 0.58% of sum insured will be charged from "NN" due to lesser claim cost.

Based on the make-based pricing method, different prices for each make can be charged. Under make-based pricing 2.16% will be charged from "A" car as gross rate. But under the purpose based pricing method it will be charge as 2.69% for private usage and 5.04% for hiring usage. There is 87% difference between those two types. It will be difficult to accept such a huge difference for the same make if it is used for whatever purpose.

Conclusions and Recommendations

Under make-based pricing method, expenses incurred for a particular make is separately identified and add relevant expenses with the profit margin. Then the price

is calculated to recover all the expenses with a profit margin. Therefore this method is very transparent and future is predicted based on past claim pattern for a particular make. Under the present pricing method of vehicle, using purpose is not directly related to claim expenses of a vehicle. But vehicle make-based pricing method shows different prices for difference makes based on differentiations of those makes. For instance luxury vehicle makes shows higher premium due to higher prices related to spare parts and labour.

From the study, it was found that the make is very rational and important factor for insurance pricing and it is very important to adopt make-based pricing method to calculate motor insurance premium accurately by addressing all risk factors specially giving more weight to the make of the vehicle.

Further Research Studies

This study is focused to discuss the impact of make on pricing decision in insurance industry in Sri Lanka. Finally it illustrates that make is an important factor for pricing decisions in insurance industry. However to generalize the findings following areas should be re-searched as research areas.

1. How to contribute to total claims and to pricing of a particular Model (eg: Toyota – NZE 121, Vitz, AE 100) based on sub model.
2. How to absorb expenses correctly when both general and life insurance operations are conducted simultaneously.
3. How to decide price for a new model which does not have past claim expenses.

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