Chapter 5

Results And Data Analysis

5.1 Introduction

Informational advantage of one party in the transaction- asymmetry information- causes Pareto inefficiency; a mutually beneficial trade may not take place. This chapter will touch on regression results and its discussion. Its implications and comparisons with other past researches are touched in the end of this chapter. The chapter begins with framework of asymmetry information, section A will touch on test of non-linearity in pricing schedule and covariance between risk type and quantity purchased for male category, and the following section is for female category.

At a fundamental level, motivation to trade happens when if a contract can be completely specified and enforced. It means a contract, which specifies an outcome for every possible eventualities. It means, whatever happens, the parties must know what the situation is, and they must not be able to renege or renegotiate the deal. If it can be satisfied and the contract is enforceable, then there are gains to be made from the trade. The existence of asymmetry information can distort this desirable state of affairs because it raises the possibility of opportunistic behavior, which results "lying and cheating" (Molho ;1997).

This section investigates the existence of asymmetry information in Malaysia Insurance market particularly in Health and Surgical Insurance. This chapter tests the implications of the model of insurance under asymmetry information. We will investigate the predictions of asymmetry information; the rising marginal prices with quantity, and also on how quantity purchased responses to risk.

In competitive insurance markets with asymmetry information, the implications are that, conditional on all observable to the insurer, high risk individuals end up purchasing larger quantities of insurance than do low risk individuals. This occurs because low risk types are quantity-constrained in order to make their policies undesirable to those of high risk. The insurers will categorize the risk type according to the signals given by both risk types; high risk type will opt for larger quantities than low risk type. And therefore the unit price per coverage for both risk types are differed; unit price will increase with quantity of coverage purchased. This is because insurer can breakeven only if marginal prices rise with quantity.

Since high risk consumers buy larger quantities of insurance coverage, the unit price per coverage will drop initially and increases with coverage. Consequently we expect unit price is convex in the quantity coverage, i.e. unit price will drop for a certain level of quantity but will rise when quantity demanded exceeds a certain level. Such nonlinear prices are crucial for the risk-sorting to be incentive-compatible, and insurer can breakeven.

We will also examine the covariance between contract size and risk. Conventional arguments about insurance under asymmetry information predicts that high risk consumers purchase a larger quantity of insurance coverage than the low risk consumers because the latter are quantity-constrained.

5.2 Assessing The Non-linearity In Prices

The most obvious evidence of the existence of non-linearity of prices is the infeasibility of multiple contracting. If the multiple contracting is allowed, unit prices do not rise with quantity. This is because consumers will opt for smaller policies and paying lower unit price rather than paying a high unit price for a single large policy. Thus consumers could easily circumvent the rising cost. In this situation, large coverage charged at high price will not be purchased and there will be no non-linearity in prices. The aggregated unit price for all the policies will then be constant and only small policies will be purchased.

Contrary to this situation, multiple contracting is not allowed in Malaysia health and surgical insurance. In this regime, companies may offer a number of different contracts, which is referred to as price and quantity competition among the firms (Rothschild and Stiglitz ;1976). Individuals will buy at most only one contract, which is put up for sale. This particular contract specifies both price and quantity of insurance, and there is equilibrium. The reason is that for every purchase of a single contract or the amount of coverage purchased by any consumer will be known to all the insurance companies. Insurers will specify either that the contract will not be in force if there is another policy covering the same risk or that they will be liable only for the portion of the loss incurred. Thus when there is loss, insurers will divide it accordingly to compensate the insureds. Therefore there is no point buying more than one policy covering the same risk.

Another reason for multiple contracting becomes not feasible is moral hazard. Firms want to limit the coverage that an individual can buy to prevent that the consumers will have an interest in an accident occurring. If an individual can make claim to all the companies for the same losses, he will make profit from purchasing many contracts from different firms.

Since multiple contracting for the policy is not feasible, we want to investigate the existence of rising marginal prices with quantity. Figure 1 and 2 plot the change of unit prices with quantity according to age categories for male and female respectively.

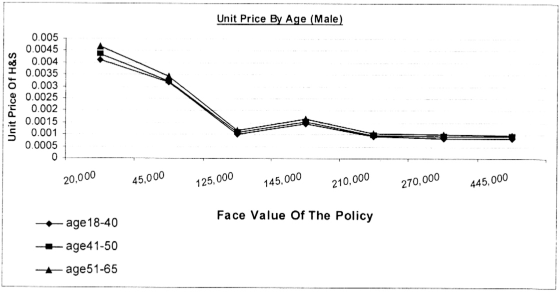


Figure 5.1: Marginal Price and Quantity Of Coverage (Male Category)

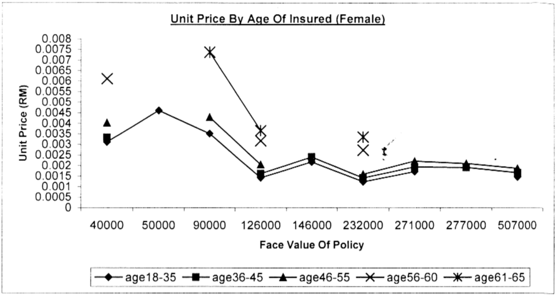


Figure 5.2: Marginal Price and Quantity Of Coverage (Female Category)

Figure 5.1 shows that marginal prices drop with quantity for policy lower than RM125,000.00, and it rises for policy larger than the amount for each categories. The unit price then is constant from 0.001 to 0.0015 per unit of coverage. This suggests that unit prices drop when the policy purchased is small in quantity to encourage demand, but the insures would want to limit or control the quantity purchased by the consumers after the level. Therefore consumers who want to purchase larger quantity (larger than RM125,000.00) will have to pay higher price (even not their fair odds),i.e. for safe type of consumers who purchase larger quantity will have to pay same unit price borne by the high risk types.

The result is consistent with signaling in separating equilibrium; where a firm will use its customer's behavior to make inferences about their accident probabilities. It infers that those with high accident probabilities will demand more coverage than those of less accident-prone. Hence both high risk and low risk types, if purchasing larger than usual coverage, will have to pay the same price. The low risk type has to pay higher total price even he belongs to the good risk. This is the opposite of bulk discount. If bulk discount exists the pricing schedule is not compatible with the incentives to sort themselves out across contracts (Cawley and Philipson ;1999).

We then will analyze directly the non-linearity in prices for male and female according to their age and occupation categories.

The theory of asymmetry information predicts that high risk types choose larger quantity than the low risk type. If they are offered common premium (pooling equilibrium), low risk types would prefer not to buy any insurance. This is a case of adverse selection problem, that is, due to self selection of policy, only the high risk types avail themselves in the market. This result also occurs in used car market where only "lemons" are traded in the market (Arkelof ;1970). In order to overcome this difficulty, firms propose price-quantity contract which, consumers are no longer allowed to choose their own level of coverage. These are the contracts where price and quantity are already determined by the insurers (Rothchild and Stiglitz ;1976). Such contracts will differ in prices; larger quantity would be priced at higher unit price than lower quantity of coverage. Such a contract is a particular case of non-linear pricing.

The results in table 5.1 present regression of unit price on quantity and quantity squared, it is direct estimate of quadratic pricing schedule. The constant term reflects fixed cost and the coefficients of quantity represents variability of unit prices across different quantity of coverage. The sign of the coefficient associated with coverage squared is of particular interest. The theory of insurance under asymmetry information predicts that marginal costs rise with quantity, and hence the coefficient should be positive and statistically significant. The results imply the presence of asymmetry information and separating equilibrium. The table indicates that quantity has negative linear effect and also quadratic non-linear effect on prices. The negative sign of the coefficient of award and award squared are consistent with our main reference and they are significant. The negative slope is due to intentions to encourage demand for small quantity of coverage and the quadratic effect is because of high risk types are assumed to prefer larger than usual coverage, thus unit price increases after a certain level of coverage (Rothchild and Stigligtz ;1976).

Table 5.1- Total Prices and Quantity Covariance In H&S Policy
(Dependent Variable:total premium of H&S Policy)

Independent Variable				
	Class1	**Class 2**	**Class 3**	**Category Age 38**
Intercept	4.458301	4.030715	4.818835	4.381173
	(24.25647)	***(27.88336)***	***(26.52452)***	***(18.73881)***
Award	-2.62E-05	-2.28E-05	-2.97E-05	-3.03E-05
	(-15.49107)	***(-17.53953)***	***(-2.54644)***	***(-8.409146)***
Award Squared	4.09E-11	3.61E-11	4.74E-11	5.25E-11
	(13.40449)	***(14.67139)***	***(9.4401)***	***(5.956083)***
R-Squared	0.891518	0.813663	0.91478	0.98297
Adjusted R-Squared	0.886473	0.809522	0.908224	0.979186
Observations	46	93	29	12
F-Statistics	176.6904	196.4982	139.5457	52.31649

Note: Unit Price (Multiplied by 1000) is regressed on quantity and quantity squared for each risk group. Table entries are regression coefficients and t-statistics in parentheses.

The regressions for each class of occupation are:

$$Total\ Premium = 4.4583 - 2.62E-05(Award) + 4.09E-11(Award^2)$$

t-Statistics (24.2565)(-15.4911) (13.4044) class 1

The model captures the nonlinearities, quadratic trend, in the data set. The coefficients β_1 and β_2 are -2.62E-05 and 4.09E-11 respectively, suggesting the trend is 'U' shape.

Individual t-statistic shows that the coefficient is statistically significant with 99% significance level. The overall model is also significant with $F_{\alpha,k-1,n-k} = F_{0.05,2,43} > F_{Critical}$ or $176.69 > 3.23$, therefore the model is significant. The R squared and adjusted R squared are 0.89 and 0.88 respectively which explains that 89% of the variation of the dependant variable can be explained by the model.

$$Total\ Premium = 4.0307 - 2.28E-05(Award) + 3.61E-11(Award^2)$$

t-Statistics (27.8834)(-17.5395) (14.6714) class 2

The coefficients β_1 and β_2 are -2.28E-05 and 3.61E-11 respectively, suggesting the trend is also a 'U' shape. Individual t-statistic shows that the coefficient is statistically significant with 99% significance level. The overall model is also significant with $F_{\alpha,k-1,n-k} = F_{0.05,2,90} > F_{Critical}$ or $196.498 > 3.15$, therefore the model is significant. The R squared and adjusted R squared are 0.8136 and 0.8095 respectively which explains that 82% of the variation of the dependant variable can be explained by the model.

$$Total\ Premium = 4.8188 - 2.97E-05(Award) + 4.74E-11(Award^2)$$

t-Statistics (26.5245) (-2.5464) (9.4401) class 3

The coefficients β_1 and β_2 are -2.97E-05 and 4.74E-11 respectively, suggesting the trend is 'U' shape. Individual t-statistic shows that the coefficient is statistically significant with 99% significance level. The overall model is also significant with $F_{\alpha,k-1,n-k} = F_{0.05,2,26} > F_{Critical}$ or $139.5457 > 3.32$, therefore the model is significant. The R squared and adjusted R squared are 0.91 and 0.90 respectively which explains that 91% of the variation of the dependant variable can be explained by the model.

$$Total\ Premium = 4.3812 - 3.03E - 05(Award) + 5.25E - 11(Award^2)$$

t-Statistics (18.7388) (-8.4091) (5.9561) Category age 38

The coefficients β_1 and β_2 are -3.03E-05 and 5.25E-11 respectively, suggesting the trend is 'U' shape. Individual t-statistic shows that the coefficient is statistically significant with 99% significance level. The overall model is also significant with $F_{\alpha,k-1,n-k} = F_{0.05,2,10} > F_{Critical}$ or $52.3165 > 4.10$, therefore the model is significant. The R squared and adjusted R squared are 0.98 and 0.97 respectively which explains that 98% of the variation of the dependant variable can be explained by the model.

The results show the quadratic pricing schedule for different class of occupation; class of occupation is always considered as an important variable for pricing strategy for insurers. The table analyses pricing schedule for the same class of risk, so we can separate the observations from other influences. One can also investigate the presence of quadratic pricing according to variables such as marital status, wealth age etc.

The observations are based on class occupation is because occupation plays an important role in underwriting decisions. Premiums are determined after considering the sum insured, riders, and class of occupation. Purchasers are only offered riders after proving class occupation (Agency Underwriting Handbook, Hong Leong Assurance ;2001). Normally premium/unit price is compatible with occupational class. Those from administrative duties and working indoor e.g. professionals, engineers (indoor only), announcer, manager (administrative duties only), architect or draughtsman, clerk, officer, teller, cashier, contractor and sub-contractor (supervisory duties only), manufacturer and pharmacist etc are included in first class occupation.

And for class 2 occupation, purchasers are charged from 0 to 2.15 as extra flat premium per RM1000.00 sum insured depending on the nature of responsibility. This applied to artist, engineers (superintending and inspecting duties), supervisor, surveyor, baker, bartender, clerk and manager (in beverage and bottling industry), foreman, inspector (in manufacturing), etc. This category encompasses half manual, and it depends on type of industry a purchaser involved in.

For class 3 occupation involves those nature of occupation which is hazardous to the workers. These include attendant and car washer in automobile industry, welder, singer and bouncer in entertainment industry, life guard, carpenter, etc. These groups of workers are charged from 0 to 2.5 extra for every RM1000.00 sum insured.

Thus by investigating quadratic pricing schedule base on each class of occupation enable us to isolate other influences which may affect the unit price. This is because purchasers in the same class are paying the same unit price.

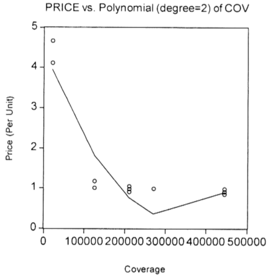
There are 9 types of H&S policies offered; all are differed in their quantity and price. The sample size is 168 observations for male category which is further categorized into different class of occupation. The statistics related to the quantity of coverage and number of cases are depicted in table 2. Class 3 occupation with mean value of 176206.9 and standard deviation of 164244.2, showing a wide variability. Compare to class 1 occupation with mean value 349891.3 and standard deviation of 145493.4, class 3 has wider dispersion. This suggests income effect from respective class of occupation is playing a major role in purchasing decision; i.e. class 1 occupation prefers to purchase larger quantity of coverage than class 2 workers. We will base our analysis of presence of asymmetry information by looking into class 2 and class 3 occupations specifically to isolate the income effect.

Table 5.2-Number of cases and summary statistics of overall quantity of coverage by class

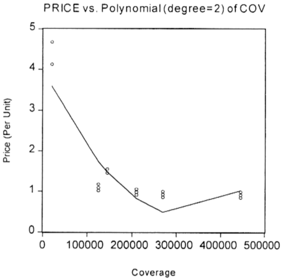
Quantity (male)	Number Of Cases	Mean	Median	SD	Skewness	Jarque-Bera (p-value)
Class 1						
						9.05
20000	3	349891.3	445000	145493.4	-1.06657	-0.011
125000	4					
210000	7					
270000	1					
445000	31					
Class 2						
						5.087
20000	10	239032.3	210000	139876.2	0.243794	-0.078
125000	22					
145000	3					
210000	14					
270000	21					
445000	23					
Class 3						
						3.37
20000	9	176206.9	125000	164244.2	0.641072	-0.185
45000	3					
125000	5					
210000	2					
270000	4					

The results in table 1 are for male category only. This is based on the assumption that male and female will be charged at a different unit price. By looking into female policy, we find that it has rider or benefit such as maternity benefit, which is not present in male policy for the same quantity of coverage. This causes the price charged for female policy is higher than for male policy. Thus we are able to analyze with more accuracy by separating the sex category.

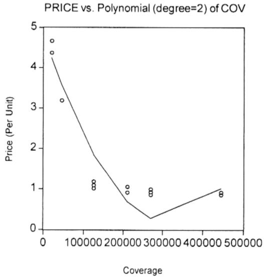
Figure 5.3 below plots the non-linearity or quadratic prices for each class occupation.



Class 1 Quadratic Pricing



Class 2 Quadratic Pricing



Class 3 Quadratic Pricing

Figure 5.3 Quadratic Pricing For Different Class Of Occupation

The plots above depict the convexity of prices with quantity of coverage or quadratic pricing. We then use calculus to examine the minimum point or at what level of coverage the unit price will start to increase? For class 1,2 and 3 occupation type, the minimum point is RM323,856, RM315,789 and RM313,291 respectively[1].

From the data sample set, the policies which have face value above RM300,000.00 for class 2 and 3 occupation, the policy holders are mostly already married. This implies larger policy is needed for married individuals who perceive themselves to be riskier (Lewis ;1989).

Risk sorting through quadratic pricing also commensurate with age; higher age individuals are more susceptible to diseases. Therefore they need more insurance coverage. This justifies the increase in unit price after the level of RM300,000.00 as mostly insureds for this coverage level aged 40 years old and above.

This way of classifying risk on the basis of insured's voluntary consumption of "product" (Bond and Crocker ;1991), their profession, marital status and age that are correlated with the underlying loss propensities allows the attainment of efficiency allocation; the contract becomes incentive-compatible. Such price which corresponds to risk category allows insurer to break even in a competitive market (Cawley and Philipson ;1999). This type of premiums schedule involve the use of categorization to correct moral hazard externalities, and the use of differential "consumption" to sort heterogeneous

[1] For Class 1 Occupation the minimum point is $\frac{\partial price}{\partial \text{cov}} = 323{,}856.61$ and same goes to class 2 and 3 minimum points.

consumers, will thereby mitigate the problem of adverse selection by the insurer. And it will maximize profit as there is no subsidizing between high risk by low risk types.

5.3 Logit Model For Covariance Between Risk And Quantity

Conventional theory under asymmetry information predicts that the amount of coverage desired by an insured will be positively correlated with the insured's probability of incurring loss (Beliveau ;1981). Thus if consumers maximize expected utility[2], riskier consumers will, for any fixed price per unit of coverage, demand more coverage than less risky consumers (Lewis 1989). In order to decide what terms the insurers should offer to let consumers buy insurance, information about consumers' market behavior is vital to make inference about their loss probabilities

This section investigates the covariance of quantity of coverage and level of riskiness of insureds. We examine the relationship and the likelihood of holding larger H&S insurance coverage by using logit regression. We estimate the regression on the variables for marital status, class of occupation and age.[3] The variables used are consistent with the article by Beliveau (1991) and Lewis and Campbell (1980). The result is in the table 4.3 below:

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[2] Consumer's expected utility; $E[U(T)] = \int_0^T \alpha(t) g[c(t)]\partial t + \beta(T)\varphi[S(T)]$.T is lifetime, $\varphi[S(T)]$ is the instantaneous utility of bequest and g[c(t0] is utility from consumption. and α and ß are discount factors. ß increases markedly when consumers marry and have offsprings. The demand for insurance depends mainly on exogenous shifts in consumers' utility function.

[3] One can replace these variables with consumption, bequest motives, smoking status etc.

Table 5.3: Regression Result For Logit Model

Dependent Variable: SI
Method: ML - Binary Logit (Quadratic hill climbing)
Sample: 1 168
Included observations: 168
Convergence achieved after 5 iterations
Covariance matrix computed using second derivatives

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-0.275162	0.571806	-0.481215	0.6304
MARITAL	3.858700	0.580131	6.651425	0.0000
C2	-1.149827	0.593009	-1.938970	0.0525
C3	-2.620742	0.780105	-3.359476	0.0008
D1	0.953179	0.612576	1.556019	0.1197
D2	0.943560	0.557182	1.693450	0.0904

Mean dependent var	0.648810	S.D. dependent var	0.478769
S.E. of regression	0.345628	Akaike info criterion	0.798031
Sum squared resid	19.35230	Schwarz criterion	0.909601
Log likelihood	-61.03462	Hannan-Quinn criter.	0.843312
Restr. log likelihood	-108.8943	Avg. log likelihood	-0.363301
LR statistic (5 df)	95.71939	McFadden R-squared	0.439506
Probability(LR stat)	0.000000		
Obs with Dep=0	59	Total obs	168
Obs with Dep=1	109		

The logit model is regressed against marital status (marital), class 2 and 3 occupation (c2) and (c3) and the base is class 1 occupation. Two age categories 41-50 (d1) and 51-65 (d2) and the base is 18-40 age category. The dependant is quantity of sum insured; the regressand takes the value zero if the sum insured is RM20,000 to RM145,000.00 and one if the sum insured is higher.

The model is written as

$$\ln\left(\frac{p}{1-p}\right) = -0.2751 + 3.8587(maritalstatus) - 1.1498(c2) - 2.6207(c3) + 0.9532(D1)$$
$$+ 0.9436(D2)$$

The result is consistent with conventional theory under asymmetry information that higher risk individuals demand larger quantity of coverage. It is apparent across different age categories in the same class of occupation, but not across the classes of occupation. For individual with class 2 occupation and not married, probability of holding policy larger than RM145,000.00 is 0.1939 for age category 18-40[4] and 0.3844 (41-50 years old) and 0.3819 (51-65 years old).

For class 3 occupation type and not married, probability of holding policy larger than RM145,000.00 is 0.05235 for age category 18-40, to 0.1254 for 41-50 years old and 0.1243 for age category 51-65 years old.

And probability for age category 18-40, class 2 occupation and unmarried is 0.1939 compare to 0.9193 for the same individual if he marries. Same calculation can be applied to age category 41-50, class 2 occupation type, unmarried has the probability of 0.3842, and 0.973 for those already married, and 0.3819 compare to 0.9669 for age category 51-65.

The findings are consistent with Lewis's (1989) examination on demand for life insurance. The key determinant of demand for life insurance is the effect of insured's death on the future consumption stream of other household members. A part from that, effect of off-springs and other household members' consumption uncertainty due to hospitalization of breadwinner is also a main cause. Therefore demand for insurance is higher for married individuals; this follows from the observation that insured's purchase of insurance represents transaction made on behalf of his household members. It is to avoid uncertain future consumption stream and sudden financial burden when hospitalized.

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[4] The logit model will take the form: $\ln\left(\dfrac{p}{1-p}\right) = a + b(marital) + c(c2) + d(c3) + e(d1) + f(d2)$.
The value is then anti-logged, from here obtain the probability.

5.4 Assessing Non-Linearity In Prices (Female Category)

We next analyze the presence of quadratic pricing for female according to their age category. The separation to different age categories is necessary because different unit price is charged for every different age category.

It is also very difficult to separate female workers based on their class of occupation. It is assumed that they mostly participate in class 1 and 2 occupations only.

Thus the age categories for female customers are 18-35, 36-45, 46-55 and 56-65; where insureds from the same age category enjoy the same unit price. Thus premium paid for same insurance package in age category 18-35 is same.

The separation based on age category is analogue to class of occupation in male category; we analyze the quadratic pricing schedule for same risk type category. We may replace age category with smoking status, number of children etc as long as other influences are eliminated.

Another reason to analyze male and female separately is because both sex categories are charged differently. This is due to the fact that female policy includes extra rider; e.g. maternity benefits. For instance, for the same age category 18-35 and sum insured of RM175,000.00, premium paid by male and female are RM164 and RM218 respectively. For married individuals, sum insured of RM160,000.00 will cost RM309 for male and RM545 for female.

There are 5 types of H&S policy offered for female insureds, and all are differed in their quantity and price. The sample size for female category is 158 observations which are separated into different age category.

The theoretical importance of adverse selection in the context of the market for insurance can be explained as: if the risk averse consumers know their own inherent degree of riskiness and act to maximize expected utility, efficiency will be achieved when marginal utility equals price. Thus the price paid will commensurate level of risk a consumer faces; i.e. the greater the probability of incurring a loss, the amount of coverage demanded by the consumers will be higher. This is because riskier than average individuals will reveal themselves through their willingness to pay higher than average rate to obtain the larger than average amount of coverage (Beliveau ;1981); i.e. quadratic pricing.

The insurer can exploit this phenomenon to discriminate between individuals of different degree of riskiness by increasing the per unit premium as the amount of coverage increases. Such separating equilibrium is necessary to ensure efficiency in production; as it results in insurer's marginal cost equals the price charged. Consumption will be efficient also as the price will equal marginal benefit (utility).

Table 5.4 :Total Prices And Quantity Covaraiance In H&S Policy
(Dependant Vatiable:total premium of H&S policy)

Independent Variable				
	18-35	36-45	46-55	56-65
Intercept	0.003569	0.003371	0.004317	0.007862
	(21.86)	(16.25)	(21.49)	(9.62)
Award	-1.50E-08	-1.12E-08	-1.71E-08	-4.35E-08
	(-8.008909)	(-6.065794)	(-8.458681)	(-2.91609)
Award Squared	2.32E-14	1.63E-14	2.64E-14	9.45E-14
	(5.75)	(4.69)	(6.22)	(1.74)
R-Squared	0.620136	0.599074	0.666165	0.747975
Adjusted R-Squared	0.606322	0.574016	0.652255	0.702152
Observations	58	35	51	14
F-statistics	44.89424	23.90761	47.89185	16.32322

Note: Unit Price (Multiplied by 1000) is regressed on quantity and quantity squared for each age category. Table entries are regression coefficients and t-statistics in parentheses.

The result in table 5.4 exhibits the quadratic pricing for female category. It implies the presence of increasing marginal cost with quantity. The pricing schedule exhibits decreasing trend for quantity of coverage less than RM322,997 for age category 18-35 and increases thereafter. And minimum points for age category 36-45, 46-55 and 56-65 are RM343,200, RM323,863 and RM230,158 respectively.[5] Figure 5.4 shows the plots for quadratic pricing for each group category.

Table 5.4 below depicts the statistics related to each age category and number of cases for every face value. For age category 18 to 35, mean value is 136620 and the standard deviation is 108740 suggesting wide variability. The wide dispersion from mean value can also be seen in age category 36 to 45 and 46 to 55.

[5] Use calculus to find the minimum points: ∂price/∂cov for each age category.

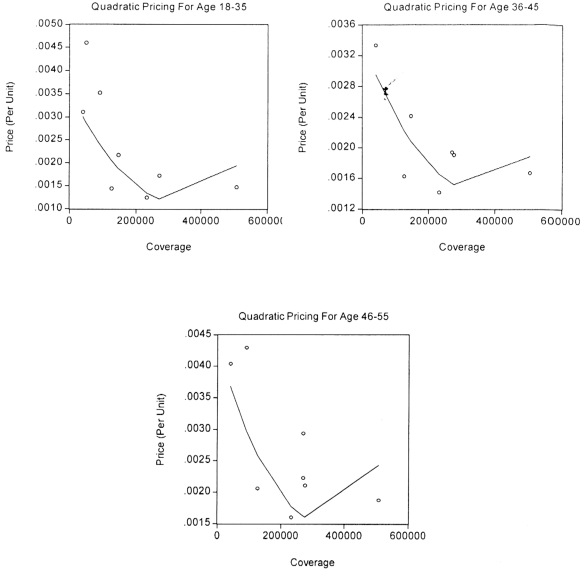

Figure 5.4 : Quadratic Pricing For Each Age Category

Table 5.5 : Number of cases and summary statistics of overall quantity of coverage by age

Age (Category)	Quantity (RM)	Number Of Cases	Mean	Median	SD	Skewness	Jarque Bera (p-value)
Age 18-35	40,000.00	20	136620.7	126000	108740	1.4962	36.43136 (0.00000)
	50,000.00	1					
	90,000.00	2					
	126,000.00	18					
	146,000.00	3					
	232,000.00	2					
	271,000.00	10					
	507,000.00	2					
Age 36-45	40,000.00	7	198942.9	232000	129639	0.8228	4.225623 (0.120898)
	126,000.00	9					
	146,000.00	1					
	232,000.00	5					
	271,000.00	8					
	277,000.00	2					
	507,000.00	3					
Age 46-55	40,000.00	12	163098	126000	109622	1.1143	15.78289 (0.0000)
	90,000.00	1					
	126,000.00	19					
	232,000.00	7					
	271,000.00	9					
	277,000.00	1					
	507,000.00	2					
Age 56-65	40,000.00	5	115428.6	126000	73599.45	0.5197	1.188037 (0.552104)
	90,000.00	1					
	126,000.00	5					
	232,000.00	3					

The results above reveal the presence of asymmetry information in Malaysia Insurance market. This can be shown from the pattern of pricing schedule; quadratic pricing in both male and female categories (Cawley and Philipson; 1999). The pricing schedule shows that marginal cost increases with quantity of coverage.

The quadratic pricing schedule is justified from the fact that the insureds are more well informed of their propensity of loss than the insurers. To avoid loss from charging the same premium on all the insureds, insurers have set a threshold which purchase above this level will be charged higher unit price, i.e. separating equilibrium. If individuals maximize utility, higher risk type will opt for larger coverage. Therefore higher premium (or higher price per unit coverage) for larger quantity of coverage is necessary to ensure break-even for insurers; higher premium commensurate with higher risk. The logit regression for male category shows that high risk individuals indeed demand larger coverage. This is based on the assumption that individuals maximize his utility; i.e. marginal cost equals price. That is, if possible, individuals will opt for full coverage.

As the result, quadratic pricing is necessary for premium paid commensurate with the risk they face. Otherwise low risk individuals will be paying higher premium while higher risk individuals are underpaying under pooling equilibrium. Therefore low risk individuals are subsidizing high risk individuals, i.e. marginal cost (losses) does not equal the price paid.

The results obtained are consistent with positive function between coverage and unit price found in the paper by Beliveau (1984). Our results support the hypothesis that if the theory of asymmetry information is true, then the insurance policies issued will exhibit increasing unit price or quadratic pricing. The pricing schedule is necessary for insurers to break even in the competitive market, as individuals purchasing unusually larger amounts of protection are more likely to be from high risk category. This is tested in our logit model, and the results imply the same hypothesis. In the article the author regressed gross premium with the characteristics of consumers, e.g. income, age, marital status, and if the risk is positively correlated with quantity purchased, the coefficient of marital status was to be found positive. Thus the results are consistent with our logit model for male category.

The same results are obtained in the paper by Dionné and Doherty (1994), which stressed that the adverse selection problem in insurance market can be solved through offer of different menu of contracts. As in quadratic pricing, these menus are designed to induce the potential insureds to reveal his true identity at the point of purchase.

In the paper by Cawley and Philipson (1999) there is no asymmetry information in US life insurance market. In this sense, it differs from this study as our analysis yields significant coefficient for the award squared term in the regression. The variables used in the paper by Cawley and Philipson, are similar and the results obtained are that the multiple contract is present. Although asymmetry information is present at the point of purchase, it does not affect the underwriting process as long as gains from trade dominates underwriting costs. The findings are differed from our results in terms of efficiency losses. One of the reasons is nature of the market is different; the number of customers in insurers' portfolio, the attitude of the insureds which may lead to moral hazard problems, the cost of underwriting and etc. Reasons for multiple contracting to be infeasible in Malaysian insurance market is the Health and Surgical insurance under study is controlled by the authority in terms of price, quantity, changes of premium and sales conducts.

The problem of asymmetry information is analyzed by Wolinsky (1983) in exchange market. The results are consistent with our quadratic pricing; when consumers (insurers) have limited access to the private information of the quality of the goods (potential insureds), the producer will charge a higher markup price (premium).

The response of insurers to problems of adverse selection is tested by Puelz and Snow (1994) for automobile insurance. The same results are obtained to overcome the problems; the insurers engaged in screening activities by assigning each applicant to a particular risk type through premium deductibles. Higher deductibles policy are associated with lower premium per unit coverage than lower deductibles policies. The results are consistent with quadratic pricing, as high risk individuals will choose low deductibles and are charged at higher premium than lower risk individuals who will choose higher deductibles policy.

5.5 Conclusion

Using direct evidence of the quantity and price of insurance, this chapter derives implications of the theory of insurance under asymmetry information, and evaluated the empirical support for the theory. The results; infeasibility of multiple contracting, positive covariance between risk and quantity, quadratic pricing schedule, each of these supports the existence of asymmetric information in Malaysia Insurance market.

One potential interpretation of the positive relationship we find between price and quantity is that insurers cannot distinguish risk through underwriting and even with observable systematic patterns in claims over time. Insurers also cannot tell the different probability of risks from the pool of customers and then base on this decide how much coverage should be optimally allocated to each individuals according to their risk type.

More generally it is that the superiority of information on the demand side, which the insurers are not able to overcome. This asymmetry information is due to fact that information collecting is costly. Even the fixed cost component in the production may decrease from experience in underwriting, insurers still cannot afford letting the insureds to purchase a certain quantity of coverage with standard unit price; pooling equilibrium.