APPLICATION OF TOBIT REGRESSION IN MODELING INSURANCE EXPENDITURE OF FARMER IN THAILAND

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Abstract

This study investigate the question of how much farm households have paid for insurance expenditure in three groups, namely poor, middle and rich farm households, which were determined by cluster analysis. The data set, in this study, was collected by the Nation of Statistical Office (NSO) and it is available on Socio-Economic Survey in Thailand (SES) for the year 2009. Tobit regression model was used to model what farm household characteristics, namely, area of land used, household-head-education, household size, household income and age of household head are linearly correlated with the farm household insurance expenditure. Moreover, Tobit regression model was compared with LS regression in terms of average sum of square (ASSR), first introduced by Mekbunditkul(2010). Regression coefficients in Tobit regression model were estimated by MLE. The results of this study indicate that there have had many farm households as 96 percent of all farm households in Thailand which can pay the insurance expenditure. Furthermore, household size is likely to be upholding of decreasing insurance expenditure while the remaining have been supported the increasing of this expenditure, excluding the household income as being not significantly variable.

Key words: Tobit regression model, insurance expenditure, MLE, cluster analysis

JEL code: C1, C10

Introduction

Whenever a dependent variable is limited, the Tobit regression, proposed by Tobin (1958), could be utilized. He has explained that there are some phenomena the dependent variable being the total durable goods expenditure has some observed data that value zero during time of survey. This zero value does not mean that the observation has never bought the durable goods but only during the time of survey he has not. In another case, the dependent variable, the students' monthly expenditure, has some observations of higher expenditure than the rest because they are rich persons. In which, this zero value or the higher expenditure is assumed to be the lower or upper limit, respectively, in Tobit analysis. For this study, the insurance expenditure of farmers in Thailand is taken into account due to the insurance system widespread in Thailand. Furthermore, the insurance expenditure is one of limited variable.

Agriculture based is primary economy of Thailand. Most of rural population in Thailand are farmer. In year 2012, the export value of rubber and rice and rice product are highest value among all crop products as 336 and 154 million bath, respectively. Nevertheless from characteristics of farm households as reported in Socio-Economic survey (SES) in Thailand, we found that there are more than 50 percent of farm households living below the 1.5 of the poverty line. This projection can be explained that farm households have been faced the poverty problem. The climate change has been one of cause the impoverishment of farm households. Disasters such as drought, floods, hay, heavy rain and plant pests are natural unpredictable that have affected to the high risk of farmers in the sense that the price and product of crop have much varied. Therefore, farmers are faced to hard decide under the uncertainty to use of resources and to produce the crop yield. The reducing of agricultural investment to cultivate has been occurred moreover that affects to the decreasing of farmer's income and welfare. Whenever the risk of loss has occurred, the insurance system has been utilized. In year 2010, there was the suggestion by Patrick (2010) that famers in Delta state, Nigeria have been unexpected the probability of uncertainty occurrence in disaster and they cannot cope with affects of these risk. Agricultural insurance policy is needed in the sense that can share or transfer risks and uncertainties associated with their farm yields as this policy can push the greater of the investment in agricultural production, promotion of new product and the improving of practicing of farmer furthermore the insurance benefit may attain the good creditability and financial of farmers. Moreover, Turvey (1992) found that the revenue insurance has been the best at promoting and spreading of self-insurance.

In Thailand, there are crop yield and crop price insurances which were set in order to reduce the risk of loss from disasters and the variation of economic in respectively that affect to farm households. Nevertheless there were not intensive both of life and non-life insurance in farm households. They have not taken into account the return of compensate in the case that they have faced any loss. The objective of this study is to investigate the question of how much farm household have paid for insurance expenditure and to construct the model of insurance expenditure. Tobit regression was used to model which is developed by Tobin(1958) in case of limited dependent variable be taken into account.

Previous researches

Alireza, Mashalla and Malek (2013) studied what factors effect on the demand of insurance of agricultural crops in Sistan area (of Iran). Tobit model was used to model effective factors on this demand. There were found that agricultural services insurance of crops has fluctuated due to several socio-economic effects on farmer's acceptance and demand of insurance in recent years. Tobit regression analysis obtained estimate of regression coefficients and associated probabilities where 1% increasing in income have caused a 0.06% increasing in admissions of insurance. Moreover, there were indicated that farmers with higher income level have a greater tendency for insurance of their products and a one percent of age of the insured crop increases then 4 percent of the insurance demand increases.

In year 2013, Abdulmalik, Oyinbo and Sami investigated the determinants of crop farmers participation inagricultural insurance in the federal capital Territory, Abuja, Nigeria. Logit regression was used to constructed the model of agricultural insurance and farm household characteristics. There were found that age, educational level and accessibility to credit significantly influenced to the farmers in agricultural insurance at 10% level of significant and also, farm size was a significant variable at 5% level of significant. This result is similar in results of study by Mishra and Godwin (2006). While household size, membership of association and contacts with extension agents were found to be insignificant in influencing the farmers participation in Agricultural insurance. Mishra and Godwin (2006) studied the identification of farm operation and farm financial characteristics of cash grain farms which are revealed with revenue insurance purchasing decisions. The reduction of risk can be handled by the revenue of insurance. The logit model is used in this study to identify the factors that effected to the farm operator in the sense of likelihood of purchasing revenue insurance. There were found that factors of age, educational level, debt-to-asset ratio, returns to revenue insurance and the participation in government programmes of farm operator are significant factors effecting to the purchasing revenue insurance. In addition, there were found that the size of farm operation and farm tenure are also important factors. Furthermore, the result indicate that farm operators who have much debt-to-assets and off-farm income can be ability to offer of insurance expenditure. Moreover, Coble and Heifner and Zuniga (2002) who found that revenue insurance products are potential substitutes for other risk reduction strategies, such as hedging in futures and options.

In a part of study of Suresh and et.at. (2010), Farmers' investment as crop insurance premium was taken into account. Tobit model was modeled the mount of insurance premium paid. The results shown that all factors such as gross cropped area, income other than agricultural sources, presence of risk in farming, number of workers in the farm family, satisfaction with the premium rate and the affordability of the insurance premium amount were found to be significantly and positively influencing the adoption of insurance and premium paid by the farmers. The size of holding and crop diversification index were found to be negatively influencing the insurance premium paid by the farmers. Moreover, there was found that "farmers possessing large size of holding hesitate to pay for insurance premium for two reasons. The first one is they diversified their farming operations and the second was the uncertainty about the claims made. Farm diversification helps the farmers to internalize the losses due to risk, as diversification increases the adoption of crop insurance and thereby the premium paid by farmers decreases."

Data and variables

Data used in this study were collected by National Statistical Office and were reported in Socio-Economic Survey(SES) year 2009 in Thailand from 3,363,584 farm households[1] with 185,682 having no insurance expenditure and the remaining having this expenditure. The insurance expenditure reported in SES is the insurances premium and the cremation fee paid in household. Three variables, namely net household-income, net profit from farming per area of land used and income-to-need-ratio were appropriately used to cluster all of farm households into three clusters such as "poor", "middle" and "rich" farm households. Other variables, moreover, that was not taken into account can divide households into same group of dividing by that three variables. In an attempt to address the model of insurance expenditure, five predictor variables are taken into account, namely 1) area of land used, 2) household-head-education, 3) household size and 4) household income and 5) age of household head as shown in detail by following.

[1] Household in this study means the farm household in Thailand.

Insurance expenditure is the household expenditure paid for all of type of insurance premium including the cremation fee. *Household income* is the monthly total income per household that is sum by all money income, namely wages and salaries, net profit from farming, income from pensions/annuities, other assistance, income in-kind and all other money receipt. *Net household-income* is the household income subtracted by the household expenditure and the household of debt payment as in summary. *Area of land used* is the area (unit is in "rai") of land used in agriculture. *Net profit from farming per area of land used* is the ratio of net profit from farming to the number of area of land used (unit is in "rai"). *Income-to-need-ratio* is the ratio of net household-income to the household size.

Household-head-education is the completed education level which was transformed to education years of household head. *Household size* is number of household member excluding servants. *Age of Household Head is* the present age of person who is head of household.

Theoritical

This study, the dependent variable as insurance expenditure is the limited variable. Therefore, the least square (LS) regression is not preferable in the sense that its property is the asymptotic bias estimator (Greene, 1981).

1. Tobit regression model

In a Tobit regression model, proposed by Tobin (1958: 24-36), it is assumed that the dependent variable Y satisfies

$$Y_i = \begin{cases} L & ; Y_i^* \le L, \\ Y_i^* & ; Y_i^* > L, \end{cases} \qquad (1)$$

where $Y_i^* = \alpha + \beta_1 x_{i1} + ... + \beta_k x_{ik} + \varepsilon_i$, for $i = 1, 2, ..., n$, is the link function, $x_1, x_2, ..., x_k$ are regressors, and ε_i 's are the error terms having independent normal distributions with zero mean and constant variance $\left(\varepsilon_i \sim \text{i.i.d.}N\left(0, \sigma^2\right)\right)$ and are independent of $\underset{\sim}{x}_i$. For a given value of L[2],

[2] The value of limit L is assumed to be observable for the whole sample

$\underset{\sim}{\theta} = (\beta_1,...,\beta_k)'$ and $\underset{\sim}{x}_i = (x_{i1}, x_{i2},..., x_{ik})$, the probability density function (p.d.f.) of Y_i is obtained by $f_Y(y_i) = \Phi\left(\frac{L - \alpha - \underset{\sim}{x}_i \underset{\sim}{\theta}}{\sigma}\right)$ if $y_i = L$, $f_Y(y_i) = \frac{1}{\sigma}\phi\left(\frac{y_i - \alpha - \underset{\sim}{x}_i \underset{\sim}{\theta}}{\sigma}\right)$ if $y_i > L$ and $f_Y(y_i) = 0$, otherwise, where Φ and ϕ are the cumulative distribution function (c.d.f.) and the probability density function (p.d.f.) of a standard normal distribution, respectively. Assume that the observations Y_{p1}, for $p = 1,2,...,n_1$, have values equal to their lower limits L and $\underset{\sim}{x}_{p1} = (x_{p11}, x_{p21},..., x_{pk1})$ are the observations of $\underset{\sim}{x}$ associated with Y_{p1}. The remaining also includes $n_2 = n - n_1$ observations in which Y_{q2}, for $q = 1,2,...,n_2$, are above their lower limits L and $\underset{\sim}{x}_{q2} = (x_{q12}, x_{q22},..., x_{qk2})$ are the observations associated with Y_{q2}.

By reparameterization and letting $\underset{\sim}{a} = (a_0, a_1,..., a_k, a_\sigma)$ be estimates of $\left(\frac{\alpha}{\sigma}, \frac{\beta_1}{\sigma},..., \frac{\beta_k}{\sigma}, \frac{1}{\sigma}\right)$, the likelihood function of $\underset{\sim}{a}$ is defined by

$$L(\underset{\sim}{a}) = \prod_{p=1}^{n_1}\left(\Phi\left(\frac{L - \underset{\sim}{x}_{p1}\underset{\sim}{\theta}}{1/a_\sigma}\right)\right)\prod_{q=1}^{n_2}\left(a_\sigma\phi\left(\frac{y_{q2} - \underset{\sim}{x}_{q2}\underset{\sim}{\theta}}{1/a_\sigma}\right)\right) = \prod_{p=1}^{n_1}\left(\Phi\left(a_\sigma y_{p1} - I_{p1}\right)\right)\prod_{q=1}^{n_2}\left(a_\sigma\phi\left(a_\sigma y_{q2} - I_{q2}\right)\right),$$

where $I_{p1} = a_\sigma \underset{\sim}{x}_{p1}\underset{\sim}{\beta} = a_0 + a_p x_{p11} + a_2 x_{p21} + ... + a_k x_{pk1}$

and $I_{q2} = a_\sigma \underset{\sim}{x}_{q2}\underset{\sim}{\beta} = a_0 + a_1 x_{q12} + a_2 x_{q22} + ... + a_k x_{qk2}$.

Therefore, the logarithm of the likelihood function is as follows;

$$\ln L(\underset{\sim}{a}) = \sum_{p=1}^{n_1}\ln\left(\Phi\left(a_\sigma y_{p1} - I_{p1}\right)\right) + n_2\ln(a_\sigma) - \frac{n_2}{2}\ln(2\pi) - \frac{1}{2}\sum_{q=1}^{n_2}\left(a_\sigma y_{q2} - I_{q2}\right)^2 .$$

The estimates $\underset{\sim}{a} = (a_0, a_1,..., a_k, a_\sigma)$ of $\left(\frac{\alpha}{\sigma}, \frac{\beta_1}{\sigma},..., \frac{\beta_k}{\sigma}, \frac{1}{\sigma}\right)$ are the result of normal equations that are non-linear as $\frac{\partial \ln L(\underset{\sim}{a})}{\partial a_j} = 0$, for $j = 0,1,...,k$ and $\frac{\partial \ln L(\underset{\sim}{a})}{\partial a_\sigma} = 0$.

These equations can be solved by using maximum likelihood (ML) estimation as usual.

2. The interpretation of coefficients in Tobit regression

In 1980, McDonald and Moffitt illustrated that coefficients in Tobit regression are not only traditionally interpreted as the LS regression but also are explained in the change of probability. This point is introduced as followed.

The expected of Y is in the form of

$$E(Y) = \underset{\sim}{x}\underset{\sim}{\beta}\Phi(z) + \sigma\phi(z), \qquad (2)$$

when $z = \underset{\sim}{x}\underset{\sim}{\beta} / \sigma$ and the expectation of Y^* is

$$E\left(Y^* \mid Y^* > 0\right) = \underset{\sim}{x}\underset{\sim}{\beta} + \frac{\sigma\phi(z)}{\Phi(z)} \quad \text{, (Amemiya, 1973)} \qquad (3)$$

From the equations of (2) and (3), we get $E(Y) = E\left(Y^* \mid Y^* > 0\right)\Phi(z)$.

The decomposition of the effects of a change in X_j , j=1,2,…,k , on Y can be expressed that (McDonald and Moffitt, 1980)

$$\frac{\partial E(Y)}{\partial X_j} = \Phi(z)\frac{\partial E\left(Y^* \mid Y^* > 0\right)}{\partial X_j} + E\left(Y^* \mid Y^* > 0\right)\frac{\partial \Phi(z)}{\partial X_j}. \qquad (4)$$

The total effect of changing in the variable j^{th} X on Y can be disaggregated into two terms of 1) the change in Y being above the limit weighted by the probability of being above limit and 2) the change in the probability of being above limit with weighted by the expected of Y being above limit. The ratios of $\frac{\partial E(Y)}{\partial X_j}$ and $\frac{\partial E(Y^* \mid Y^* > 0)}{\partial X_j}$ can called that the unconditional marginal effect and conditional marginal effect, respectively and they have a relation expressed as followed $E(Y^* \mid Y^* > 0) = \underset{\sim}{x}\underset{\sim}{\beta} + E(\varepsilon \mid \varepsilon > -\underset{\sim}{x}\underset{\sim}{\beta})$, where $E(\varepsilon \mid \varepsilon > -\underset{\sim}{x}\underset{\sim}{\beta}) = \frac{\sigma\phi(-\underset{\sim}{x}\underset{\sim}{\beta}/\sigma)}{1-\Phi(-\underset{\sim}{x}\underset{\sim}{\beta}/\sigma)}$, thus

$$E(Y^* \mid Y^* > 0) = \underset{\sim}{x}\underset{\sim}{\beta} + \frac{\sigma\phi(-\underset{\sim}{x}\underset{\sim}{\beta}/\sigma)}{1-\Phi(-\underset{\sim}{x}\underset{\sim}{\beta}/\sigma)} = \underset{\sim}{x}\underset{\sim}{\beta} + \frac{\sigma\phi(\underset{\sim}{x}\underset{\sim}{\beta}/\sigma)}{\Phi(\underset{\sim}{x}\underset{\sim}{\beta}/\sigma)} = \underset{\sim}{x}\underset{\sim}{\beta} + \frac{\sigma\phi(z)}{\Phi(z)}.$$

Therefore

$$\frac{\partial E(Y^* \mid Y^* > 0)}{\partial X_j} = \beta_j\left(1 - \frac{z\phi(z)}{\Phi(z)} - \frac{(\phi(z))^2}{(\Phi(z))^2}\right). \qquad (5)$$

By substitution the equation (5) into (4), the result is as

$$\frac{\partial E(Y)}{\partial X_j} = \Phi(z)\beta_j\left(1 - \frac{z\phi(z)}{\Phi(z)} - \frac{(\phi(z))^2}{(\Phi(z))^2}\right) + \phi(z)\frac{\beta_j}{\sigma}\left(\underset{\sim}{x}\underset{\sim}{\beta} + \frac{\sigma\phi(z)}{\Phi(z)}\right). \qquad (6)$$

Finally we get that

$$\frac{\partial E(Y)}{\partial X_j} = \beta_j\Phi(z). \qquad (7)$$

We can note that from equation (7) that the effect of a change in X_j on Y is not equal to β_j. The unconditional marginal effects provide economic meaning for the impact of changes in independent variables on the dependent variable. Specifically, it measures the percentage change in a dependent variable caused by a one percentage change in an independent variable while holding other independent variables constant.

Results of data analysis

Variables used to cluster all of 3,267,224 farm households into three clusters are as net household-income, net profit from farming per area of land used and income-to-need-ratio which have reflected to farm household economic. The result of cluster analysis is shown in Table 1.

Table 1: Characteristics of farm household classified by cluster

Characteristics	Cluster		
	1 (70,269 households)	2 (3,267,224 households)	3 (26,091 households)
Net household-income	-42,776.70	175.12	91,859.25
Net profit from farming per area of land used	415.70	568.77	6,175.33
Income-to-need-ratio	6,761.60	4,419.48	36,990.85
Household size	3.52	3.50	3.90

Source of data: Socio-Economic Survey in Thailand (SES), Nation of Statistical Office (NSO)

From important characteristics as shown in Table 1, the name of each cluster was identified by “poor”, “middle” and “rich” farm households. The most important variable used to cluster seem to be the net household-income which is lowest for poor as -42,776.70 baht, and followed by middle as 175.12 baht and rich as 91,859.25 baht, respectively.

Table 2: Monthly household insurance expenditure classified by cluster

Monthly household insurance expenditure (baht)	Cluster						Total	
	Poor		Middle		Rich			
	No.	%	No.	%	No.	%	No.	%
Non-insurance	7,490	10.66	174,382	5.34	3,811	14.61	185,682	5.52
< 200	56,508	80.42	1,466,807	44.89	22,177	85.00	1,545,492	45.95
200 - 400	1,629	2.32	875,083	26.78	103	0.39	876,715	26.06
401 - 600	1,043	1.48	425,218	13.01	0	0.00	426,361	12.68
601 - 1,000	3,358	4.78	203,088	6.22	0	0.00	206,446	6.14
1,001 - ,2000	241	0.34	95,627	2.93	0	0.00	95,868	2.85
> 2,000	0	0.00	27,019	0.83	0	0.00	27,019	0.80
Total	**70,269**	**100.00**	**3,267,224**	**100.00**	**26,091**	**100.00**	**3,363,584**	**100.00**
Mean	**117.55**		**293.11**		**61.36**		**287.64**	

Source of data: Socio-Economic Survey in Thailand (SES), Nation of Statistical Office (NSO)

From Table 2, the frequency distribution of insurance premium and cremation fee for all of whole kingdom, poor, middle and rich clusters are seem to be positive skewness. There have had many farm households as 96 percent of all farm households in Thailand which can pay the insurance expenditure. The average of household expenditure paid for the insurance premium and cremation fee is at 288 baht and there is 5.5 percent among of all farm households have not paid. Most of all farm households as 46.0 percent have paid monthly insurance premium less than 200 baht which is as the rate of cremation fee there. Considering for each cluster, we found that poor farm households have expended the insurance premium by average 118 baht moreover among of these households have paid for the premium less than 200 baht with majority being at 80.0 percent. Meanwhile, middle and rich households have paid this expenditure by average 293 baht and 61 baht per month, respectively. Furthermore, household insurance expenditures less than 200 baht have been accounted for 45.0 and 85.0 percent for middle and rice, respectively.

We can see that farmers in middle cluster can afford the insurance premium more than poor farmers. Moreover, farmers in poor and middle households have paid for insurance premium more than rich persons due to poor and middle have realized that whenever head of household dies, the outstanding of debt is repaid by insurance compensation. It brings about to household welfare. Meanwhile, for rich farmers who have many properties and more sustainable than other two clusters therefore these person have not perceived the important of insurance system.

This study, the linear relation of predicted variable, insurance expenditure, and predictor variables, namely area of land used (abbreviated by ALU), household-head-education (abbreviated by HHED), household size (abbreviated by HHS) household income (abbreviated by HHIn) and age of household head (abbreviated by AHH) by Tobit regression analysis compared with LS regression.

Table 3 illustrates the maximum likelihood estimation results of Tobit regression of the insurance expenditure, the associated unconditional marginal effect and the least square estimation. RE and ASSR are benefited to specify the performance of Tobit and LS regression.

For poor farm households, in Tobit regression result there was found that the most influencing is of age of household head (AHH) which has the coefficient estimate to be 3.43 with highly significant as same as the LS regression which has the coefficient estimate 3.48. The value of 3.43 means that when age of household head increases 1 year, insurance expenditure increase 3.43 baht in the same sense for the unconditional marginal effect of 2.87 is the total effect of household-head's age on insurance expenditure. We could mention that when household-head's age increases 1 percent, insurance expenditure increases 54.81 percent or accounted for 2.87 baht of 3.43 while assuming other independent variables have been constant. In this cluster, RE of Tobit is as 0.8323 that means the Tobit is particularly more preferable than LS.

For middle farm households, all of variables, namely area of land used (ALU), household-head-education (HHED), household size (HHS) and age of household head (AHH), excluding household income (HHin) are statistically significant. There exist the evident that negative sign is of household size and positive sign is of the remaining. The highly significant and the most influence on insurance expenditure is of household size with -12.67 coefficient estimate and the associated unconditional marginal effect is approximately -6.23 and respectively followed by of area of land used with 4.137 coefficient estimate which has the associated unconditional marginal effect is 2.24 and age of household head with 3.54 coefficient estimate as well as the associated unconditional marginal effect is 12.16. The meaning of unconditional marginal effect could be explained in the same sense. Moreover, we can see that parameter estimates of LS coefficients are more sloping down than Tobit and they have been less preferable than Tobit in sense of RE being at 0.6331.

Table 3: Tobit maximum likelihood estimation and LS results and marginal effects unconditional expected value $\left(\beta_j \Phi(z)\right)$ for household insurance expenditure.

Predictor variables	**Tobit coefficients**					
	Poor		**Middle**		**Rich**	
	$\hat{\beta}_{T1_j}$	$\hat{\beta}_{T1_j}\Phi(z)$	$\hat{\beta}_{T2_j}$	$\hat{\beta}_{T2_j}\Phi(z)$	$\hat{\beta}_{T3_j}$	$\hat{\beta}_{T3_j}\Phi(z)$
intercept	198.95***		313.39***		79.67***	
ALU	0.9542	0.5230	4.1037***	2.2357	0.7043	0.4371
HHED	-0.9059	-0.4416	3.2584*	1.6642	5.1491**	3.6618
HHS	-25.7980	-9.1648	-12.9295**	-6.2163	7.6087	4.7764
HHIn	-0.0001	-5E-05	-0.0003	-0.0002	-0.0002	-6.9E-05
AHH	3.4291**	2.8729	3.5426***	2.1577	0.5668	0.3775
ASSR	30,050.711		277,171.260		366,598.092	
RE[3]	0.8323		0.6331		0.8530	

[3] RE is the relative efficiency calculated by the ratio of ASSR of Tobit for each cluster to ASSR of LS corresponded cluster.

Predictor variables	**LS coefficients**		
	Poor	**Middle**	**Rich**
	$\hat{\beta}_{LS1_j}$	$\hat{\beta}_{LS2_j}$	$\hat{\beta}_{LS3_j}$
intercept	230.54***	356.88***	91.09***
ALU	0.48312	3.90069***	0.77371
HHED	0.16430	3.34868*	4.91020**
HHS	-22.94980	-12.67451**	7.13877
HHIn	-0.00033643	0.00002161	-0.00021841
AHH	3.47732***	3.47850***	0.65831
ASSR	**36,105.624**	**437,800.128**	**429,775.020**

* Significant at 0.10, ** Significant at 0.05 , *** Significant at 0.01

Source of data: Socio-Economic Survey in Thailand (SES), Nation of Statistical Office (NSO)

In the case of rich farm households, there exits quite household-head's education has been significantly linear effected to insurance expenditure with parameter estimate of 5.12 and the corresponding unconditional effect is 3.36 in Tobit regression and with parameter estimate of 4.91 for LS regression. And we can conclude that Tobit regression is particularly more efficiency than LS as illustrated by RE being at 0.8530.

All other variables which have not mentioned due to they have not any significantly linear related to insurance expenditure.

Conclusion

Insurance system widespread phenomenon in Thailand nevertheless there exists a few spending in farm households. Household characteristics which linearly related to insurance expenditure have been taken into account. The results of this study shown that insurance expenditure has been statistically linear related by age of household head for poor farmers and by area of land used, household-head-education, household size and age of household head for middle farmers as well as by household-head-education for rich farmers. Nevertheless, we can note that household income has been particularly not statistically significant to the insurance expenditure for all clusters. Moreover, there exists the evident that Tobit regression is particularly preferable than LS regression for all classes of rich, middle and poor in the sense that TP has obtained the less value of ASSR and RE to be less than 1.

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