

Lapsation Risk: Takaful Operators In Malaysia

Nurul Hazwany Shamsuddin¹, Siti Aida Sheikh Hussin^{2*}, Zalina Zahid³, Noor Asiah Ramli⁴

^{1,2,3,4}Universiti Teknologi MARA (UiTM) 40500 Shah Alam Selangor

* Corresponding author : sitaida842@uitm.edu.my

Received: 27 Oct 2022

Accepted: 8 Sept 2023

ABSTRACT

Insurance serves as a tool for risk management. Takaful is an Islamic insurance where the concepts of mutual cooperation (ta'awun) and donation (tabarru') are used as the main pillars. Apart from the usual market and credit risk, lapsation risk is one of the main risks faced by a life insurer. It is important to determine factors that may influence policy lapsation as it could affect the solvency and the profitability of insurance or a Takaful operator. Therefore, the relationship between surrender rates and economic variables (Unemployment Rate, Real Interest Rate, Growth Domestic Product (GDP), Inflation - Annual % change in Consumer Price Index and Stock Market Price Index (%)) were examined for Takaful operator ordinary life and unit investment link products. Out of sample forecast was performed for 2019 to 2020 surrender rates for Takaful operator ordinary life and unit investment link products. Panel data model was applied for both purposes as the method is viable to overcome small sample size issue. The empirical findings revealed that the economic variable displayed a different impact on the surrender rate for both products. Both ordinary life and investment linked products exhibited a significant relationship between unemployment rate and surrender rate; in which higher unemployment rate led to increased surrender rate. Stock also had a statistically significant impact on the surrender rate of both products. Meanwhile, interest rate had an insignificant link with the surrender rate of both products. This outcome is in agreement with several past studies that reported no real relationship between interest rate and surrender rate; thus disregarding the infamous interest rate hypothesis. Lastly, Gross Domestic Product (GDP) displayed an insignificant correlation with the surrender rate of both products. By using Pool OLS model, the trend for ordinary life product decreased in 2020 for all Takaful operators. As for investment linked products, a decreasing trend was noted from 2019 to 2020; the lowest and the highest forecast rates in 2019 were ascribed to Takaful Ikhlas and Takaful Malaysia, respectively.

Keywords: Econometric, Islamic Finance, Lapsation Risk, Takaful.

1 INTRODUCTION

Takaful is an Islamic insurance where the concept of mutual cooperation (ta'awun) and donation (tabarru') are used as the main pillars. The need for the Takaful concept is due to the uncertainty (gharar), interest (riba), and gambling (maysir) elements that exist in the conventional insurance concept that are prohibited in Islamic religion practices. Malaysia acts as the pioneer of Takaful business expansion as it starts to take presence globally even in non-Muslim countries. However, the penetration is concentrated on Takaful life products.

In the insurance industry, lapsation and surrender rate are crucial indicators. Lapsation is often interpreted as policy termination followed by surrender value pay out to the policyholder [1]. It is an important risk as it may have severe impact on the business of the company. A policy with embedded surrender option requires the insurer to pay the surrender pay-out if a policyholder lapses. Therefore, the insurer's liquidity can be impacted if massive lapse event happens. This cycle of lapse will eventually harm any potential of new business as well. Hence, insurance company must have good visibility on the possible risk exposure to make an effective business strategy decision.

The escalating unemployment rate in Malaysia can increase the risk of lapse due to certificate owner tendency of using the surrender cash to help them during financial crisis. In addition, steep competition within the insurance industry demands the industry players to always ensure that their products are competitive enough to be selected by consumers. To date, consumers have a basket of choices, including to lapse their certificate if they are unsatisfied with the current performance. Therefore, Takaful operators need to have visibility on the factors that can affect lapsing behavior so that such risk can be mitigated via effective business decision strategy.

The cutoff year for this research is year 2020 data (during COVID19 pandemic) so that it can be used as the benchmark of future reference as it is believed in year 2020 the economy worldwide was stagnant.

2 LITERATURE REVIEW

One may lapse his or her policy due to non-satisfaction towards the policy performance, especially for investment-linked policy. Since there is no active market, such as the investment market, to monitor contract values, a policyholder hardly exercises the surrender option at the right time [2]. This shows that, most of the time, the policyholder's surrender behaviour is irrational [3] and can further complicate the modelling process.

Several studies have looked into the impact of income shock based on the emergency fund hypothesis (see [4], [5] and [6]). The emergency fund hypothesis asserts that policyholders use their surrender pay out to help them during personal financial crisis [6]. As a result, recession is bound to cause higher lapse rate. Meanwhile, the interest rate hypothesis contends that when interest rate increases, the lapse rate would increase as well [5]. The authors explained that when the interest rate increases, the policy premium will generally go down. An opportunity to get a lower premium with the same coverage in the market will influence a policyholder to lapse.

In the context of Korea, [4] discovered a significant relationship between unemployment and interest rate. [7], found that both hypotheses are insignificant, especially for traditional products (non-investment link products). Inconsistency noted among the results of prior studies is ascribed to the varying ranges of datasets studied, time periods of the samples, and methods deployed. Environmental variables, such as macro-economic indicators and company characteristics, have been given much attention by most researchers mainly because most of the data are public data [8]. Thus, policyholder and product factors have been mostly neglected as such data demand confidential consumer information.

The literature does not offer a variety of methods to assess this particular topic. The most popular

model used by past researchers is logistic regression or arctangent, which is limited to a binary respond variable, generalize linear model (GLM), which is more synonym with a categorical dependant variable, as well as machine learning model, such as classification and regression tree (CART) to examine non-continuous respond variable. By using the cointegration model, [5] had captured the long-term impact of explanatory variable on lapse rate that other methods were unable to do. Regression analysis using panel data has been the most commonly used technique in econometrics and statistics due to its flexibility for comparison with other models [9]. Several scholars (see [10], [11] and [12]) studied the macroeconomic effect on lapse rate using this method and reported a concrete conclusion.

3 METHODOLOGY

The dataset was composed of continuous variables. The respond variable consisted of surrender rate from year 2011 to 2020 extracted from Statistical Yearbook of Insurance and Takaful operators in Malaysia. The explanatory variable consisted of economic variables extracted from World Bank online data. The data sample is in annual basis and comprised of data from 1960 to 2020. However, only data from 2011 to 2020 were assessed in this study to match the data availability for the dependent variable. The research framework is as summarised below:

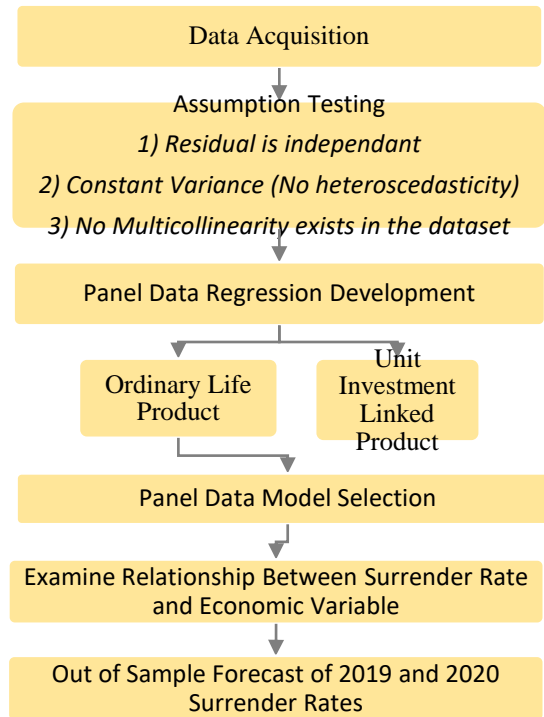


Figure 1: Research Framework

3.1 Panel Data Regression Model Estimation

The panel data model is a combination of time series data and cross-section data. In general, the model is represented as follows:

$$y_{it} = \alpha + \beta_1 X_{1it} + \beta_2 X_{2it} + \varepsilon_{it} \quad (1)$$

Where,

y_{it} is the surrender rate

α is the intercept value

β is the parameter to be estimated

X_{it} is the economic variables (Unemployment Rate, Real Interest Rate, Growth Domestic Product GDP, Inflation - Annual % change in Consumer Price Index and Stock Market Price Index (%))

ε_{it} is the error term

i is the i^{th} subject

t is the time entity

In this present study, three panel data models were developed by using EViews. The proposed regression models were Pooled OLS Regression (Pooled OLS), Fixed Effect Model (FEM), and Random Effect Model (REM).

The Pooled OLS assumes a constant intercept regardless of cross-sectional subject and time entity. Meanwhile, FEM has an individual characteristic for each cross-sectional subject (Takaful operator) that may or may not affect the relationship between surrender rate and economic variables. This is represented by intercept, α_i , for each Takaful operator.

The REM assumes the variation across cross-sectional subject to be random and uncorrelated with the independent variable (economic variables). The model assumes that the cross-sectional subject's error term is not correlated with economic variables, thus allowing for time-invariant variables to function as independent variables. Besides, μ_{it} denotes the error between the cross-sectional subjects.

After developing the models, the model selection process was carried out to select the type of panel data model that fit the data.

3.2 Panel Data Model Selection

3.2.1 Langrange Multiplier (LM)

The LM test initiated by [13] was used to decide if the REM or the Pooled OLS model was suitable for this study. The test is defined as:

H_0 : There is no random effect in the model

H_1 : Random effect exists in the model

If the probability value exceeds 0.05, H_0 is accepted and REM is unsuitable. In another words, Pooled OLS is selected. On the other hand, if the probability value is below 0.05, H_0 is rejected and REM would be selected as the study model.

3.2.2 Hausman Test

In order to execute the selection process between FEM and REM, Hausman Test [14] was performed. The individual effects were examined to determine the existence of any correlation with other regressors in the model. The test is defined as:

H_0 : FEM and REM estimators do not differ substantially

H_1 : FEM and REM estimators differ substantially

If the probability value exceeds 0.05, H_0 is accepted and FEM is not appropriate. In another words, REM is selected. On the other hand, if the probability value is below 0.05, H_0 is rejected and FEM is selected as the study model.

3.3 Diagnostic Criteria for Model

Akaike Information Criterion (AIC), R-squared, and adjusted R-squared were applied to measure the goodness of fit and the adequacy of the final model selected from the previous section.

3.4 Out of Sample Forecast of Surrender Rate

For the second and the last objective, out of sample forecast of surrender rate with the selected panel data model was carried out. Two types of error measure were used in this study to examine the forecasting accuracy of the Takaful model; Mean Squared Error (MSE) and Root Mean Squared Error (RMSE). The model with low MSE and RMSE was considered as a better forecasting model.

4 RESULTS AND DISCUSSION

4.1 Panel Data Regression Model Estimation

First, the dataset was split into 80:20 ratio, where 80% of the data were allocated for model training and the remaining 20% were used to test the predictive model. The first sub-section depicts models that were regressed against surrender rate of ordinary life product, while the second sub-section presents models against the surrender rate of investment linked product. The estimated models are listed in the following:

4.1.1 Ordinary Life Product Model

Pool OLS Regression Model:

$$SR_{OL_{it}} = -68.09259 + 17.02596UR_{it} + 1.261112IR_{it} + 3.895831GDP_{it} - 0.304648Stock_{it} + \varepsilon_{it} \quad (2)$$

Fixed Effect Model:

$$SR_{OL_{it}} = -68.09259_i + 17.02596UR_{it} + 1.261112IR_{it} + 3.895831GDP_{it} - 0.304648Stock_{it} + \varepsilon_{it} \quad (3)$$

Random Effect Model

$$SR_{OL_{it}} = -68.09259 + 17.02596UR_{it} + 1.261112IR_{it} + 3.895831GDP_{it} - 0.304648Stock_{it} + \mu_{it} + \varepsilon_{it} \quad (4)$$

4.1.2 Investment Linked Product Estimated Model

Pool OLS Regression Model:

$$SR_{IL_{it}} = -101.5850 + 27.91587UR_{it} + 0.731600IR_{it} + 3.751525GDP_{it} - 0.354725Stock_{it} + \varepsilon_{it} \quad (5)$$

Fixed Effect Model:

$$SR_{IL_{it}} = -101.5850i + 27.91587UR_{it} + 0.731600IR_{it} + 3.751525GDP_{it} - 0.354725Stock_{it} + \varepsilon_{it} \quad (6)$$

Random Effect Model

$$SR_{IL_{it}} = -101.5850 + 27.91587UR_{it} + 0.731600IR_{it} + 3.751525GDP_{it} - 0.354725Stock_{it} + \mu_{it} + \varepsilon_{it} \quad (7)$$

4.2 Model Assumption Testing

First, the model assumption of independent residual was tested by using Pesaran’s CD test. Since the probability value was 0.8463, H_0 is accepted; signifying no correlation among the residuals. The second model assumption of constant variance was tested using White Test for heteroscedasticity. Since the chi-square probability value was 0.4812 (> 0.05), H_0 is accepted.

Table 1: Pesaran’s CD and White Test Result

	Prob.	Decision	Conclusion
Pesaran’s CD Test	0.8463	Accept H_0	No cross-sectional dependence i.e. correlation in residual
White Test	0.4812	Accept H_0	Variance is constant

Multicollinearity test was conducted to detect any collinearity between the independent variables. The first variable removed was Inflation since the correlation coefficient exceeded 0.8; indicating serious multicollinearity. Inflation was removed instead of IR due to the stronger theoretical support for the variable based on the literature review presented in Section 2. The second test run without Inflation showed that all four variables (UR, IR, GDP, & Stock) had correlation coefficient below 0.8; indicating that no multicollinearity existed.

4.3 Panel Data Regression Model Selection Process

The LM test was performed to test between Pool OLS and REM, where Pool OLS was selected since the probability value exceeded 0.05. For investment linked product, H_0 is rejected when LM test was

carried out. Hence, FEM is deemed appropriate.

Table 1: LM and Hausman Test Results

Model	LM Test	Hausman Test	Final Model Selected
	Prob.	Prob.	
Ordinary Life Model	0.1340	0.00	Pool OLS
Investment Linked Model	0.0355	0.00	FEM

4.4 Relationship Between Surrender Rate and Economic Variables

By using the model selected in the previous section, the relationships between surrender rate and economic for both products were examined. Both models displayed a significant relationship between UR and SR with p-values of 0.0024 and 0.0000, respectively. Moreover, stock was statistically significant with the surrender rate of ordinary life product with p-value = 0.0162. For investment linked model, the p-value of 0.0013 reflected a significant variable as well. On the other hand, IR and GDP showed an insignificant link with the surrender rate of both products.

4.5 Model Diagnostic

The results are summarised in Table 2, where the adjusted R^2 values are 20% and 52% for ordinary life and investment linked models, respectively. The AIC values are 6.389731 and 6.127778 for both models, in which investment linked shows a slightly lower AIC value; reflecting a better model. Overall, both models displayed good fit.

Table 2: Diagnostic Criterion Results

	R^2	Adjusted R^2	AIC
Ordinary Life Model	0.271215	0.203421	6.389731
Investment Linked Model	0.613304	0.521718	6.127778

4.6 Model and Data

By using the estimated model selected in the previous section, the surrender rates for 2019 and 2020 were predicted (see Table 3). By using the Pool OLS model, the surrender rate for ordinary life product had forecasted the same for every Takaful company with 12.9317 in 2019 and -7.1088 in 2020. As for the investment linked product, by using FEM, the surrender rate for each Takaful company was forecasted based on its fixed individual intercept value.

Table 3 : Surrender Rate Out of Sample Forecast for 2019 to 2020 (actual values in bracket)

Company	Ordinary Life		Investment Linked	
	2019	2020	2019	2020
AIA Public Takaful Berhad	12.9317 (16.9951)	-7.1088 (22.0174)	10.1083 (27.6303)	2.5891 (31.0900)
Great Eastern Takaful Berhad	12.9317 (22.7336)	-7.1088 (20.9825)	12.3406 (21.6255)	6.8214 (19.2360)
Hong Leong MSIG Takaful Berhad	12.9317 (11.3402)	-7.1088 (15.1203)	13.7795 (13.5207)	8.2603 (15.8300)
Prudential BSN Takaful Berhad	12.9317 (12.6769)	-7.1088 (17.4937)	13.6721 (16.8331)	8.1529 (13.3764)
Syarikat Takaful Malaysia Keluarga Berhad	12.9317 (7.4969)	-7.1088 (6.2290)	16.0242 (7.0104)	10.5050 (4.3829)
Takaful Ikhlas Family Berhad	12.9317 (12.5920)	-7.1088 (7.3774)	9.7551 (22.3516)	4.2359 (39.1939)

5 CONCLUSION AND RECCOMENDATION

Economic variables have different impacts on the surrender rate of the products for Takaful Operator in Malaysia. Both models showed a significant relationship between UR and SR with p-values of 0.0024 and 0.0000, respectively. An increase in unemployment rate led to increment of 17.02596 and 27.91587 in surrender rates for ordinary life and investment linked products, respectively. This supports the infamous emergency hypothesis where people rely on surrender cash value during personal financial crisis. Next, stock appeared to be statistically significant with the surrender rate of ordinary life product with p-value = 0.0162. For investment linked model, the p-value was 0.0013; signifying a significant variable as well. The variable exhibited a negative sign for both models; depicting that increment in stock price can lead to decrease by 0.304648 and 0.354725 in surrender rates, respectively. On the other hand, IR showed an insignificant link with the surrender rate of both products. This is in agreement with several past studies that found no real relationship for interest rate and surrender rate, thus the dismissal of the infamous interest rate hypothesis. The hypothesis states that IR has a significant relationship with surrender rate. Lastly, GDP displayed an insignificant relationship with the surrender rate of both products.

The Pool OLS did not offer a good forecasting performance for ordinary life product since the actual and the predicted values had obvious gap for most of the Takaful operator. However, FEM emerged to be suitable for investment linked product since the surrender trend is more aligned between the actual and the predicted values. This observation is supported by the calculation of error criterion. Next, the investment linked model exhibited better forecasting performance with lower MSE and RMSE values, 16.0 and 0.961 respectively, when compared to ordinary life model.

REFERENCES

- [1] A. Renshaw, and S. Haberman, "Statistical analysis of life assurance lapses", *Journal of the Institute of Actuaries*, vol. 113, no. 3, 459-497, 1986.
- [2] C. Cheng, and J. Li, "Early default risk and surrender risk: Impacts on participating life insurance policies", *Insurance: Mathematics and Economics*, vol. 78, 30-43, 2018.
- [3] S. Nolte, and J. C. Schneider, "Don't lapse into temptation: A behavioral explanation for policy surrender", *Journal of Banking & Finance*, vol. 79, 12-27, 2017.
- [4] C. Kim, "Modeling surrender and lapse rates with economic variables", *North American Actuarial Journal*, vol. 9, no. 4, 56-70, 2005.
- [5] W. Kuo, C. Tsai, and W.K. Chen, "An empirical study on the lapse rate: The cointegration approach", *Journal of Risk and Insurance*, vol. 70, no. 3, 489-508, 2003.
- [6] J. F. Outreville, "Whole-life insurance lapse rates and the emergency fund hypothesis", *Insurance: Mathematics and Economics*, vol. 9, no. 4, 249-255, 1990.
- [7] D. Kiesenbauer, "Main determinants of lapse in the German life insurance industry", *North American Actuarial Journal*, vol. 16, no. 1, 52-73, 2012.
- [8] M. Eling, and M. Kochanski, "Research on lapse in life insurance: what has been done and what needs to be done?" *The Journal of Risk Finance*, vol. 14, no. 4, 392-413, 2013.
- [9] M. Arellano, "Panel data econometrics", *Oxford University press* (2003).
- [10] M. Adams, L. F. Andersson, M. Lindmark, L. Eriksson, and E. Veprauskaite, "Managing policy lapse risk in Sweden's life insurance market between 1915 and 1947", *Business History*, vol. 62, no. 2, 222-239, 2020.
- [11] E. Barucci, T. Colozza, D. Marazzina, and E. Rroji, "The determinants of lapse rates in the Italian life insurance market", *European Actuarial Journal*, vol. 10, no. 1, 149-178, 2020.
- [12] L. Yu, J. Cheng, and T. Lin, "Life insurance lapse behaviour: evidence from China", *The Geneva*, 2019.

- [13] T.S. Breusch, and A. R. Pagan, "The Lagrange multiplier test and its applications to model specification in econometrics", *The review of economic studies*, vol. 47, no. 1, 239-253, 1980.
- [14] J. A. Hausman, "Specification tests in econometrics. *Econometrica*", *Journal of the Econometric society*, 1251-1271, 1978.