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EXAMINING THE RELATIONSHIP BETWEEN SELECTED MACROECONOMIC VARIABLES ON LIFE INSURANCE DEMAND PROXIES IN MALAYSIA: AN ARDL ANALYSIS

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Abstract: *This study examines the dynamic influence of key macroeconomic variables on the demand for life insurance in Malaysia using the Autoregressive Distributed Lag (ARDL) framework. Specifically, it evaluates the effects of the saving rate, stock index, inflation, unemployment, and gross domestic product (GDP) on life insurance premiums. Annual time series data from 1982 to 2023 are employed, with gross saving (GS), claim ratio (CR), and life insurance density (LD) used as proxies for life insurance premiums (LIP). The ARDL technique is selected due to its suitability for datasets containing a mixture of stationary and non-stationary variables and its ability to capture both short-run and long-run dynamics. The empirical results indicate the presence of a long-run relationship between the selected macroeconomic variables and life insurance premiums. In the short run, the estimated negative coefficient (-0.089771) suggests that a one-unit increase in the macroeconomic variables corresponds to a 0.089771-unit decline in life insurance premiums. The saving rate demonstrates a positive effect on life insurance demand, whereas inflation exerts a negative influence. Similar patterns are observed across all proxy measures in the short-run analysis. These findings provide important insights for policymakers and industry practitioners, highlighting the need for targeted strategies to enhance life insurance penetration and support Malaysia's broader economic development goals.*

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Keywords*:* *Life insurance premium, Saving rate, Stock index, Time Series Data, ARDL Model.*

Introduction

Spending on financial well-being in Malaysia has shown an increasing trend (Hasin & Zainol, 2026). Within this context, the insurance sector plays an important role in promoting financial stability and supporting long-term economic development. Insurance companies contribute to the stability of financial systems through risk protection and sustained premium generation, which in turn supports national economic performance (Musliza et al., 2022). In particular, life insurance serves as an important financial protection mechanism by providing income security for dependents in the event of death, permanent disability, or policy maturity. Previous studies highlight that life insurance helps mitigate financial risks and enhances household financial resilience (Cheng & Hou, 2021; Rambeli et al., 2024).

Despite its recognised importance, the demand for life insurance among Malaysians, particularly young adults, remains relatively low. Many individuals continue to underestimate the importance of life insurance even as medical costs and financial risks continue to rise. This situation raises concerns regarding the adequacy of financial protection among households and highlights the need to better understand the factors influencing life insurance demand in Malaysia.

Economic development and the growth of insurance markets are closely interconnected. Previous studies suggest that economic conditions influence individuals' financial decisions, including their participation in insurance markets. For instance, several Malaysians may choose not to purchase life insurance due to limited awareness of its benefits and financial constraints (Rambeli et al., 2024). At the broader level, research interest in the determinants of life insurance demand has expanded significantly since the post–World War II period, with scholars examining the relationship between economic conditions and insurance consumption across various economies (Sibindi et al., 2022). Fluctuations in economic conditions may also affect consumer spending on life insurance products, particularly when individuals reduce discretionary financial commitments during periods of economic uncertainty (Yu, Cheng & Lin, 2018). Similarly, aggregate consumption behaviour is influenced by macroeconomic factors such as income and inflation, which may indirectly affect household spending on insurance products (Mohd Bakri et al., 2017).

Although previous studies have highlighted the role of economic conditions in shaping insurance consumption (Yu, Cheng & Lin, 2018; Mohd Bakri et al., 2017; Rambeli et al., 2024), empirical evidence examining the macroeconomic determinants of life insurance demand in the Malaysian context remains relatively limited. In particular, limited attention has been given to understanding how macroeconomic variables influence life insurance premiums over time. A clearer understanding of these relationships is important for explaining how economic conditions may shape insurance demand and financial protection behaviour among households.

As highlighted by Ching, Kogid, and Furuoka (2010), efforts to strengthen the life insurance sector can be approached from both demand and supply perspectives. Enhancing financial literacy can increase consumer awareness regarding the benefits of life insurance, while insurers may improve marketing strategies by understanding the motivations behind insurance purchases. Strengthening public understanding and improving promotional approaches may therefore contribute to increasing life insurance uptake in Malaysia. In addition, Katmon et al. (2025) highlight that economic and organisational factors can influence financial outcomes and

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decision-making processes. Although their study focuses on firm-level governance and compensation structures, the broader implication that economic conditions influence financial behaviour remains relevant in the context of insurance demand. Changes in macroeconomic indicators such as savings, inflation, and economic growth may influence individuals' financial decisions, including their participation in life insurance markets.

In line with these considerations, this study examines how several key macroeconomic variables, namely gross domestic product (GDP), inflation, unemployment, stock market performance, and the savings rate, influence life insurance premiums in Malaysia. Specifically, this study investigates both the short-run and long-run relationships between these macroeconomic variables and life insurance demand. The Autoregressive Distributed Lag (ARDL) framework is employed due to its suitability for analysing time-series data with mixed orders of integration and its ability to capture both short-term adjustments and long-term relationships within a single estimation framework.

The remainder of this paper is organised as follows. The next section reviews the relevant literature, followed by the methodology, empirical findings, and conclusion.

Literature Review

The relationship between saving rates and life insurance premiums has been the focus of several studies. Based on Cargill & Troxel (1979) suggested that higher saving rates might lead to higher premiums due to the expected greater returns on the savings component of life insurance contracts. Studies by Gardner, Najand & Rahman (1997) indicate that higher saving rates often influenced by an expansion in money supply, and it's are associated with increased demand for life insurance, as greater liquidity and financial security encourage individuals to allocate surplus funds toward long-term financial products. Furthermore, Cheng & Hou (2021) show that higher saving rates, supported by accommodative monetary conditions, positively affect life insurance prices by enhancing insurers' investment capacity and expected returns.

The connection between stock indices and life insurance premiums has also garnered attention. Hashim, Rambeli & Awang Marikan (2025) found that better stock market performance encourages individuals to performed better or precise investment, viewing it as a means of financial protection and investment. This study indirectly suggested that improved stock market returns boost life insurance companies' investment capacity, resulting in more attractive policies.

The relationship between inflation and life insurance premiums is significant, as inflation affects the purchasing power and financial stability of policyholders. Gardner, Najand & Rahman (1997) claimed that life insurance premiums generally rise with increasing inflation rates, as policyholders require more coverage to maintain their quality of life. This study also highlighted that higher inflation rates lead to higher life insurance consumption, as individuals seek to safeguard their financial stability. Moreover, this study supported these findings, suggesting that inflation positively impacts life insurance rates by enhancing insurers' investment potential.

Unemployment's impact on life insurance premiums has also been extensively studied. High unemployment rates negatively affect people's financial security, leading to reduced demand for life insurance and potentially lower premiums. Research by Kim Leng Yeah et al. (2022) and Mohd Bakri, Rambeli, Hashim, Mahdinezhad, & Abdul Jalil (2017) in Malaysia indicated that consumption behaviour suggests the effect the unemployment rates result in consumption. This indirectly support for the case of life insurance expenditure. This study found that higher

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unemployment rates are linked to lower life insurance consumption, as individuals prioritize short-term financial needs over long-term insurance investments.

Economic growth has an impact on the insurance industry, as evidenced by the numerous studies that show an important connection between GDP and life insurance premiums. Malaysian life insurance premiums and GDP were found to be significantly positively correlated by Soo (2024) suggesting that greater GDP levels result in higher life insurance consumption. This aligns with research by Moheddine, Marwa, & Mongi (2024) in Nigeria, which showed higher GDP levels are associated with increased life insurance premiums. The study by Ching, Kogid & Furuoka (2010) confirmed that insurance industry operations positively impact economic development in G-20 economies, including life insurance. Studies like those by Haiss & Sümegi (2006) reinforced the idea that higher income levels, driven by GDP growth, enhance purchasing power and investment in life insurance products. Understanding this relationship is crucial for policymakers, insurers, and policyholders to make informed financial decisions that support both economic growth and financial stability.

Overall, previous studies have widely examined the relationship between macroeconomic factors and life insurance demand. Existing literature consistently suggests that economic indicators such as saving rates, stock market performance, inflation, unemployment, and economic growth influence life insurance consumption through different economic channels. Higher saving rates and favourable financial market conditions tend to increase individuals' ability to allocate funds toward long-term financial products such as life insurance (Cargill & Troxel, 1979; Gardner, Najand & Rahman, 1997; Cheng & Hou, 2021). Similarly, strong stock market performance may enhance insurers' investment capacity and increase the attractiveness of life insurance policies (Hashim, Rambeli & Awang Marikan, 2025). In contrast, adverse economic conditions such as high unemployment may reduce individuals' financial security and discourage long-term financial commitments (Kim Leng Yeah et al., 2022; Mohd Bakri et al., 2017). Meanwhile, macroeconomic variables such as inflation and economic growth are also found to influence insurance consumption by affecting purchasing power and overall economic stability (Gardner, Najand & Rahman, 1997; Soo, 2024; Moheddine et al., 2024).

However, despite the growing body of literature, several gaps remain. First, previous studies tend to examine these macroeconomic determinants separately rather than analysing their combined effects on life insurance premiums within a single empirical framework. Second, empirical evidence focusing specifically on the Malaysian life insurance market remains relatively limited compared with studies conducted in other economic contexts. Third, limited attention has been given to examining the dynamic short-run and long-run relationships between macroeconomic variables and life insurance demand. Addressing these gaps is important for providing a more comprehensive understanding of how macroeconomic conditions influence life insurance premiums in Malaysia.

Methodology

In order to determine the connection between the independent and dependent variables, the following model was constructed. Nevertheless, many past studies have also maintained that productivity is not only affected by capital and labour but additionally by other macroeconomic factors (Rambeli et al., 2021). This study adopted the hypothesis testing approach applied by Rambeli and Povinsky (2014).

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To ensure the robustness and reliability of the estimated model, several diagnostic tests were conducted. The Breusch–Pagan–Godfrey (BPG) test was employed to examine the presence of heteroskedasticity in the regression model. In addition, multicollinearity among the explanatory variables was assessed using the Variance Inflation Factor (VIF), which was computed using Python code. Furthermore, the Autoregressive Conditional Heteroskedasticity (ARCH) test was performed to detect the presence of conditional heteroskedasticity in the residuals. Finally, a normality test was conducted to evaluate whether the residuals follow a normal distribution. These diagnostic tests are important to ensure that the model satisfies the classical regression assumptions and that the estimated results are statistically reliable.

Data Sources

This study focusses on the impact selected macroeconomics variables on expenditure on insurance at the aggregate level. The expenditure on insurance is represented by four proxies namely, life insurance premium, gross saving, claim ratio and life insurance density. The independent variables is represented by saving rate, stock market main board, inflation, unemployment and gross domestic product, Table 1 will detail the other useful information of the data series.

Table 1: Data sources of the study

Variables	Representative data	Data Name in Modelling	Data Sources
Dependent	Life Insurance Premium	InLIP	Federal Reserve Economic Data
	Gross Savings	InGS	World Bank Data
	Claim Ratio	InCR	International Monetary Fund
	Life Insurance Density	InLD	World Bank Data
Independent	Saving Rate	InSR	International Monetary Fund
	Stock Index (2010=100)	InSI	International Monetary Fund
	Inflation	InINF	Federal Reserve Economic Data
	Unemployment	InUNEM	Department Of Statistics Malaysia
	Gross Domestic Product	InGDP	International Monetary Fund

Sources: Author

Model Specification

Inspired by Yu, Cheng, and Lin (2018), this study proposes an augmented empirical model to estimate Malaysia's life insurance market. For brevity and clarity of exposition, the model specification is explicitly presented using life insurance premium (LIP) as the dependent variable, expressed as a function of saving rate (SR), stock index (SI), inflation (INF), unemployment (UNEM), and economic growth (GDP). As shown in Table 1, this study employs four alternative proxies to represent insurance development, namely life insurance premium, gross saving, claim ratio, and life insurance density. The functional form and econometric specification for the remaining proxies are conceptually identical to the LIP model and differ only in the choice of the dependent variable. Therefore, to avoid redundancy, the detailed model formulation is reported solely for the LIP specification, while the same structure is applied to the other insurance proxies. The general function is as follows:

$$LIPit = f\,(SR, SI, INF, UNEM, GDP) \quad (1)$$

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The general specifications for the function is as follows:

$$LIPit = \beta 0 + \beta 1 \text{ SR} + \beta 2 \text{ SI} + \beta 3 \text{ INF} + \beta 4 \text{ UNEM} + \beta 5 \text{ GDP} + \varepsilon t \quad (2)$$

The model is constructed by transforming selected variables of Equation (2) into the natural semi logarithm;

$$LIP_t = \beta_0 + \beta_1 InSRt + \beta_2 InSIt + \beta_3 InINFt + \beta_4 InUNEMt + \beta_5 InGDPt + \varepsilon t \quad (3)$$

The ARDL Model

The methodological procedure applied in this study is inspired by Rambeli, Awang Marikan, Povinsky, Amiruddin, & Ismail. (2021). In this equation independent variables $\beta_1 InSRt, \beta_2 SIt, \beta_3 InINFt$, $\beta_4 UNEMt$ and $\beta_5 GDPt$ are saving rate , log stock index, inflation ,log unemployment and log economic growth respectively. Each data series is characterised by an annual frequency, denoted by the letter "t", and all values are expressed in natural semi logarithms. The notation "t" represents the error term, which is a constant coefficient or magnitude. In this notation, "i" can take on the values 1, 2, 3, 4 or 5.A lagged autoregressive model, also known as an ARDL, will be utilised in order to evaluate the relationship of macroeconomic factors and the demand for life insurance in Malaysia through the use of the ARDL approach. According to Pesaran et al. (2001), the approach known as ARDL is suitable for this investigation since it is able to deal with both integrated and non-integrated variables, and it is also able to withstand the presence of small sample numbers. The model that was employed in the study is inspired by Rambeli et al. (2024) with modification. Thus, the modelling structure served for this dynamic model is as in equation (4)

$$\Delta InLIP_t = \beta_0 + \sum_{k=1}^{n} \beta_1 \Delta SR_{t-k} + \sum_{k=1}^{n} \beta_2 \Delta SI_{t-k} + \sum_{k=1}^{n} \beta_3 \Delta INF_{t-k} + \sum_{k=1}^{n} \beta_4 \Delta UNEM_{t-k} + \sum_{k=1}^{n} \beta_5 \Delta InGDP_{t-k} + \delta_0 + \delta_1 InLIP_{t-1} + \delta_2 InSR_{t-1} + \delta_3 InSI_{t-1} + \delta_4 InINF_{t-1} + \delta_5 InUNEM_{t-1} + \delta_6 InGDP_{t-1} + \varepsilon t \quad (4)$$

Based on equation (4), the notation of β0 refers to drift, Δ represents initial difference, and εt represents white noise. Equation (4) is developed to served the bound cointegration test. The study uses the error correction model (ECM) to explore short-run dynamics after establishing the long-run link between variables. Equation (5) is the generic version of ECM Equation:

$$\Delta InLIP_t = \beta_0 + \sum_{k=1}^{n} \beta_1 \Delta SR_{t-k} + \sum_{k=1}^{n} \beta_2 \Delta SI_{t-k} + \sum_{k=1}^{n} \beta_3 \Delta INF_{t-k} + \sum_{k=1}^{n} \beta_4 \Delta UNEM_{t-k} + \sum_{k=1}^{n} \beta_5 \Delta InGDP_{t-k} + \delta_0 + \delta_1 InLIP_{t-1} + \delta_2 InSR_{t-1} + \delta_3 InSI_{t-1} + \delta_4 InINF_{t-1} + \delta_5 InUNEM_{t-1} + \delta_6 InGDP_{t-1} + \theta ECM + \varepsilon t \quad (5)$$

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In the context of short-run dynamics, the symbol Δ denotes the initial difference, whereas the symbol θ symbolizes the coefficients of the ECM. ECM illustrates the rate at which equilibrium is adjusted in the long run following a shock that occurs in the short run. Differ with the study conducted by Hashim, Rambeli & Awang Marikan (2025), the unit root test is not reported in this study.

Empirical Findings

The first cointegration, which explains the presence of a stable relationship between the variables, was performed in the F-Bound Test. Autoregressive distributed lag (ADL) The presence of a long-term relationship between the variables was assessed using the ARDL bound test. We reject the null hypothesis that there is no level association if the F-Bound test is greater than the upper bound I (1). On the other hand, we accept the null hypothesis if the F-threshold test is less than the lower threshold I (0). In order to accomplish the goal of examining the long-term relationship between the variables, the test is also crucial. Table 2 showed the outcome of the F-Bound Test. All models are passed the diagnostic testing.

Bound Cointegration Test Results

Table 2: Result of F-Bound Test for Cointegration of Life Insurance Premium Model

Model LIPt = f (SR, SI, INF, UNEM, GDP)	F- Statistic: 17.59799***	
Actual Sample Size (n) =38	K =5, N = 38	
Critical value for bound test: Case 2: Restricted Constant and No Trend	Lower Bound I (0)	Upper Bound I (1)
1%	3.06	4.15
2.5%	2.7	3.73
5%	2.39	3.38
10%	2.08	3

Source: Calculated by author using EViews 1

According to Table 2, the F-Statistic value is bigger than critical value at all significance levels at both lower bound I (0) and upper bound I (1). Where, 17.59799 bigger than 2.08, 2.39,2.70 and 3.06 for 10%, 5%. 2.5% and 1% significance level respectively for lower bound I (0). Where else, for upper bound I (1) 6.102259 bigger than 3.00, 3.38, 3.73 and 4.15 for 10%, 5%. 2.5% and 1% significance level respectively. The hypothesis for F-Bound cointegration test as follows:

H0= No long run relationship exists between variables.

H1= There is a long-run relationship exists between variables.

Based on the results, the null hypothesis is rejected, indicating evidence of cointegration among the variables in the model. Consequently, the alternative hypothesis is accepted, suggesting the existence of a long-run relationship between the variables. Therefore, the findings confirm the presence of a long-run relationship in the model. This outcome is consistent with previous studies such as Rambeli et al. (2021).

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Table 3: Result of F-Bound Test for Cointegration for Gross Saving

Model GSt = f (SR,SI,INF,UNEM,GDP)	F- Statistic: 7.622710***	
Actual Sample Size (n) =38	K =5 , N = 38	
Critical value for bound test: Case 2: Restricted Constant and No Trend	Lower Bound I (0)	Upper Bound I (1)
1%	3.06	4.15
2.5%	2.7	3.73
5%	2.39	3.38
10%	2.08	3

Table 3 shows that the F-Statistic value is bigger than critical value at all significance levels at both lower bound I (0) and upper bound I (1). Where, 7.622710 bigger than 2.08, 2.39,2.70 and 3.06 for 10%, 5%. 2.5% and 1% significance level respectively for lower bound I (0). Where else, for upper bound I (1) 7.622710 bigger than 3.00, 3.38, 3.73 and 4.15 for 10%, 5%. 2.5% and 1% significance level respectively.

Table 4: Result of F-Bound Test for Cointegration for Claim Ratio

Model CRt = f (SR,SI,INF,UNEM,GDP)	F- Statistic: 6.705339***	
Actual Sample Size (n) =38	K 5, N = 38	
Critical value for bound test: Case 2: Restricted Constant and No Trend	Lower Bound I (0)	Upper Bound I (1)
1%	3.06	4.15
2.5%	2.7	3.73
5%	2.39	3.38
10%	2.08	3

Table 4 shows that the F-Statistic value is bigger than critical value at all significance levels at both lower bound I (0) and upper bound I (1). Where, 6.705339 bigger than 2.08, 2.39,2.70 and 3.06 for 10%, 5%. 2.5% and 1% significance level respectively for lower bound I (0). Where else, for upper bound I (1) 6.705339 bigger than 3.00, 3.38, 3.73 and 4.15 for 10%, 5%. 2.5% and 1% significance level respectively.

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Table 5: Result of F-Bound Test for Cointegration for Life Insurance Density

Model LDt = f (SR,SI,INF,UNEM,GDP)	F- Statistic: 6.471191***	
Actual Sample Size (n) =38	K =5 , N = 38	
Critical value for bound test: Case 2: Restricted Constant and No Trend	Lower Bound I (0)	Upper Bound I (1)
1%	3.06	4.15
2.5%	2.7	3.73
5%	2.39	3.38
10%	2.08	3

Table 5 shows the F-Statistic value is bigger than critical value at all significance levels at both lower bound I (0) and upper bound I (1). Where, 6.471191 bigger than 2.08, 2.39,2.70 and 3.06 for 10%, 5%. 2.5% and 1% significance level respectively for lower bound I (0). Where else, for upper bound I (1) 6.471191 bigger than 3.00, 3.38, 3.73 and 4.15 for 10%, 5%. 2.5% and 1% significance level respectively.

Long Run Coefficients Estimation

Considering that the variables have a long-term connection. The ARDL cointegration approach may be used to establish the long-term link between variables with different integration orders. It is optimum for variables that are integrated of order 0 (I(0)), order 1 (I(1)), or both. The long-run coefficients in the ARDL model demonstrate the equilibrium connections among the variables being studied. These coefficients reflect the enduring impact of one variable on another, irrespective of the immediate fluctuations. The long-run coefficients estimate results for the long run model were displayed in Table 6. The model from Table 6 reveals several key relationships between economic variables and life insurance premiums. The saving rate (InSR) and inflation (InINF) both have negative coefficients, suggesting that a 1% increase in either result in a decrease in life insurance premiums by approximately 0.026% and 0.46%, respectively. These relationships are statistically significant, with t-statistics and p-values indicating robust findings. So many researchers suggested adopting monetary policies aimed at controlling inflation, such as adjusting interest rates or managing money supply (Ashok & Mishra, 2014). Conversely, the stock index (SI) has a positive coefficient, indicating that a 1% increase in the stock index corresponds to a 1.36% increase in life insurance premiums, although this relationship's high p-value suggests marginal significance. Unemployment (InUNEM) also shows a negative relationship, with a 1% increase in unemployment leading to a 1.57% decrease in life insurance premiums, a statistically significant finding. This result was supported by previous researchers namely Azitadoly Mohd Arifin et al. (2022). Lastly, the Gross Domestic Product (InGDP) negatively impacts life insurance premiums, where a 1% increase in GDP results in a 2.01% decrease in premiums, supported by statistical significance. These findings are consistent with previous research, highlighting the complex interplay between economic factors and life insurance pricing (Mohd Arifin et al., 2022).

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Table 6: Results of the Long-Run ARDL Model Estimation for Life Insurance Premium

Variables	Coefficient	Std. error	t-statistic	p-value
InSR	-0.026226	0.007191	-3.647238	0.0026***
InSI	1.361577	0.656431	2.074211	0.0570**
InINF	-0.464142	0.182251	-2.546711	0.0233***
InUNEM	-1.571399	0.385515	-4.076103	0.0011***
GDP	-2.006056	0.729517	-2.749840	0.0156***
C	15.40444	4.018578	3.833305	0.0018***

Based on the result, the estimation model of the long run can be derived as follows:

$$\boldsymbol{In}\text{LIP} = 15.40444 - 0.026226\ \boldsymbol{ln}\text{SR} + 1.361577\ \boldsymbol{In}\ \boldsymbol{S}\text{I} - 0.464142\ \boldsymbol{In}\ \text{INF} - 1.571399\ \boldsymbol{In}\text{UNEM} - 0.435764\ \boldsymbol{In}\ \text{GDP} + \varepsilon t \qquad (3.15)$$

Table 7: Results of the Long-Run ARDL Model Estimation for Gross Saving

Variables	Coefficient	Std. error	t-statistic	p-value
InSR	-5.433969	34.57788	-0.157152	0.8777
InSI	-724.0447	5263.924	-0.137548	0.8929
InINF	-219.0799	1579.918	-0.138665	0.8920
InUNEM	-606.5605	4522.773	-0.134113	0.8955
GDP	-405.6940	2701.594	-0.150168	0.8831
C	7706.046	54983.85	0.140151	0.8909

Based on the result, the estimation model of the long run can be derived as follows:

$$\boldsymbol{In}\text{SR} = 7706.046 - 5.433969\ \boldsymbol{ln}\text{SR} - 724.0447\ \boldsymbol{In}\ \boldsymbol{S}\text{I} - 219.0799\ \boldsymbol{In}\ \text{INF} - 606.5605\boldsymbol{In}\ \text{UNEM} - 405.6940\boldsymbol{In}\ \text{GDP} + \varepsilon t \qquad (3.16)$$

Table 8: Results of the Long-Run ARDL Model Estimation for Claim Ratio

Variables	Coefficient	Std. error	t-statistic	p-value
InSR	0.003888	0.006588	0.590182	0.5645
InSI	0.487893	0.465302	1.048551	0.3122
InINF	-0.228340	0.093339	-2.446350	0.0282***
InUNEM	-0.065957	0.360706	-0.182855	0.8575
GDP	-0.538215	0.337280	-1.595752	0.1329
C	1.710893	3.046953	0.561509	0.5833

Based on the result, the estimation model of the long run can be derived as follows:

$$\boldsymbol{In}\text{CR} = 1.710893 - 0.003888\ \boldsymbol{ln}\text{SR} - 0.487893\ \boldsymbol{In}\ \boldsymbol{S}\text{I} - 0.228340\ \boldsymbol{In}\ \text{INF} - 0.065957\boldsymbol{In}\ \text{UNEM} - 0.538215\boldsymbol{In}\ \text{GDP} + \varepsilon t \qquad (3.17)$$

Table 7 show a negative but not statistically significant correlation between gross saving and the saving rate (InSR). The high p-value of 0.8777 and the coefficient of -5.433969 indicate that the relationship is not significant. Similarly, with a high p-value of 0.8929 and a coefficient of -724.0447, the stock index (InSI) displays a negative but not statistically significant link with

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gross saving. With a coefficient of -219.0799 and a p-value of 0.8920, inflation (InINF) likewise exhibits a negative but not statistically significant association with gross saving. The same trend is seen in unemployment (InUNEM), which shows no significant link with a high p-value of 0.8955 and a coefficient of -606.5605. GDP, too, has a negative but not statistically significant relationship with gross saving, as shown by a coefficient of -405.6940 and a p-value of 0.8831. Finally, the constant term (C) has a positive but not statistically significant relationship with gross saving, with a coefficient of 7706.046 and a p-value of 0.8909. By this result in long run, suggest that can, introduce tax incentives or matched savings programs to encourage individuals to save more. This can increase the pool of funds available for life insurance purchases (Ashok & Mishra, 2014).

According to Table 8, with a high p-value of 0.5645 and a coefficient of 0.003888, the model shows that the saving rate (InSR) and the claim ratio have a positive but not statistically significant association. With a coefficient of 0.487893, the stock index (InSI) and the claim ratio have a positive association; however, the p-value of 0.3122 indicates that this link is not statistically significant.(Azitadoly Mohd Arifin el al. 2023).The results are matched with the findings from Hodula et al. (2021)According to a coefficient of -0.228340 and a p-value of 0.0282, there is a statistically significant negative correlation between inflation (InINF) and the claim ratio at the 99% level. With a coefficient of -0.065957 and a p-value of 0.8575, unemployment (InUNEM) and the claim ratio have a negative but not statistically significant association. GDP also shows a negative relationship with the claim ratio, with a coefficient of -0.538215, though this relationship is not statistically significant, as indicated by the p-value of 0.1329. Finally, the constant term (C) has a positive but not statistically significant relationship with the claim ratio, with a coefficient of 1.710893 and a p-value of 0.5833. Overall, the only significant relationship observed is the negative relationship between inflation (InINF) and the claim ratio. A high claim ratio may indicate that an insurance company is paying out more in claims than it is receiving in premiums, which can affect the financial stability of the insurance sector in future. A high claim ratio may indicate that an insurance company is paying out more in claims than it is receiving in premiums, which can affect the financial stability of the insurance sector. This statement was supported by previous researchers namely Christophersen et al(2014).

Table 9: Results of the Long-Run ARDL Model Estimation for Life Insurance Density

Variables	Coefficient	Std. error	t-statistic	p-value
InSR	-0.003050	0.000380	-8.030529	0.0000***
InSI	0.175136	0.048101	3.640989	0.0024***
InINF	0.008304	0.005515	1.505727	0.1529
InUNEM	-0.121866	0.034555	-3.526710	0.0031***
GDP	0.115544	0.031929	3.618780	0.0025***
C	1.172525	0.276449	4.241376	0.0007***

Based on the result, the estimation model of the long run can be derived as follows:

$$\boldsymbol{In}\text{LD} = 1.172525 - 0.003888\ \boldsymbol{ln}\text{SR} - 0.487893\ \boldsymbol{In}\ \boldsymbol{S}\text{I} - 0.228340\ \boldsymbol{In}\ \text{INF} - 0.065957\boldsymbol{In}\ \text{UNEM} - 0.538215\boldsymbol{In}\ \text{GDP} + \varepsilon t \qquad (3.18)$$

According to Table 8, with a highly significant p-value of 0.0000 and a coefficient of -0.003050, the model shows a substantial negative association between the saving rate (InSR) and life insurance density. With a coefficient of 0.175136 and a p-value of 0.0024, the stock index (InSI)

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and life insurance density have a strong positive association (Azitadoly Mohd Arifin el al. 2023). With a coefficient of 0.008304 and a p-value of 0.1529, inflation (InINF) and life insurance density have a positive but not statistically significant association. With a coefficient of -0.121866 and a p-value of 0.0031, unemployment (InUNEM) and life insurance density have a strong negative connection. A coefficient of 0.115544 and a p-value of 0.0025 show a strong positive correlation between GDP and life insurance density. Finally, with a coefficient of 1.172525 and a p-value of 0.0007, the constant term (C) significantly positively correlates with life insurance density. So, we can suggest that strengthen social safety nets to support unemployed individuals, which can indirectly stabilize the insurance market (Ashok & Mishra, 2014). In conclusion, life insurance density has significant positive connections with GDP, the constant term (C), and the stock index (InSI), but significant negative relationships with the saving rate (InSR) and unemployment (InUNEM). There is no apparent relationship with inflation (InINF). (Scott et al. 1981)

Short Run Coefficients Estimation (ECM)

A variant of the Autoregressive Distributed Lag (ARDL) model, the Error Correction Model (ECM) focuses on short-term dynamics and the process of adjusting to long-term equilibrium (Clements, 2019). The creators of the ARDL model created the ECM. The Error Correction Model is a useful tool for assessing the short-term and long-term effects of one time series on another, especially when dealing with non-stationary data. When the relevant data is not stationary, this is particularly true. The outcome of the short-term ARDL Model Estimation utilizing the Error Correction Model (ECM) is displayed in Table 10. According to Table 9, the short-run connection in Malaysia highlights how different economic conditions affect life insurance premiums (LIP). Increased inflation (INF) is specifically linked to lower premiums, indicating that premiums are lowered when living expenses increase. So, it shows a negative relationship on life insurance premiums. On the other hand, premiums and changes in the stock index (SI) and saving rate (SR) typically have a positive association, suggesting that premiums may rise if financial markets improve (Azitadoly Mohd Arifin el al. 2023). With certain lagged values having a positive impact on premiums and others having a negative one, the unemployment rate (UNEM) has mixed effects. In the same way, premiums are typically negatively impacted by GDP (economic income), suggesting that a more robust economy may result in lower premiums. The lagged cointegrating equation's (CointEq(-1)) negative coefficient supports the concept that any transient departures from equilibrium are eventually corrected, guaranteeing stability over the long term. All things considered, these factors work together to affect the premiums, pushing and pulling them to stay balanced over time. (Scott et al. 1981).

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Table 10: Results of the Short-Run ARDL Model Estimation (ECM) for Life Insurance Premium

Variable	Coefficient	Std. error	t-statistic	Prob.
D(LIP(-1))	-0.184127	0.093782	-1.963352	0.0698**
D(LIP(-2))	-0.294069	0.078656	-3.738652	0.0022***
D(SR)	8.88E-05	0.000417	0.212889	0.8345
D(SR(-1))	0.002569	0.000462	5.564551	0.0001***
D(SR(-2))	0.000816	0.000404	2.019926	0.0630**
D(SR(-3))	0.002665	0.000398	6.703269	0.0000***
D(SI)	0.025375	0.025933	0.978454	0.3445
D(INF)	-0.028048	0.003781	-7.418470	0.0000***
D(INF(-1))	-0.007563	0.004049	-1.867849	0.0829**
D(INF(-2))	-0.013103	0.003293	-3.978491	0.0014***
D(UNEM)	-0.033880	0.022248	-1.522852	0.1501
D(UNEM(-1))	0.127581	0.021042	6.063035	0.0000***
D(UNEM(-2))	0.064831	0.019102	3.393906	0.0044***
D(UNEM(-3))	0.103720	0.021207	4.890925	0.0002***
D(GDP)	-0.088703	0.017550	-5.054363	0.0002***
D(GDP(-1))	-0.005253	0.020298	-0.258784	0.7996
D(GDP(-2))	-0.040055	0.015511	-2.582409	0.0217***
CointEq(-1)*	-0.089771	0.006767	-13.26574	0.0000***
R-squared		0.955222		
Adjusted R-squared		0.917161		
Durbin-Watson stat		2.410615		

Notes: The asterisks (***), (**) and (*) denotes that statistically significant at 1%,5% and 10% respectively.

Table 11: Results of the Short-Run ARDL Model Estimation (ECM) for Gross Saving

Variable	Coefficient	Std. error	t-statistic	Prob.
D(GS(-1))	0.160960	0.094272	1.707397	0.1135
D(GS(-2))	-0.184890	0.069837	-2.647446	0.0213***
D(SR)	0.164068	0.034562	4.747018	0.0005***
D(SR(-1))	0.137273	0.037536	3.657128	0.0033***
D(SR(-2))	0.146252	0.032290	4.529274	0.0007***
D(SR(-3))	0.211758	0.030764	6.883272	0.0000***
D(SI)	1.281834	2.109284	0.607710	0.5547
D(SI(-1))	-5.850959	2.042532	-2.864562	0.0142***
D(SI(-2))	2.256941	2.091433	1.079136	0.3017
D(SI(-3))	10.68073	1.866081	5.723615	0.0001***
D(INF)	0.741334	0.279427	2.653056	0.0211***
D(INF(-1))	0.020549	0.339235	0.060576	0.9527
D(INF(-2))	1.043632	0.318441	3.277317	0.0066***
D(INF(-3))	0.778459	0.241093	3.228875	0.0072***
D(UNEM)	-2.586751	1.515207	-1.707193	0.1135
D(GDP)	1.744197	1.260739	1.383471	0.1917
D(GDP(-1))	-2.5183123	1.363743	-1.846618	0.0896**
D(GDP(-2))	4.001034	1.169073	3.422400	0.0051***
D(GDP(-3))	5.467681	1.043899	5.237748	0.0002***
CointEq(-1)*	-0.008313	0.000929	-8.946421	0.0000***
R-squared		0.965242		
Adjusted R-squared		0.928554		
Durbin-Watson stat		2.759163		

Notes: The asterisks (***), (**) and (*) denotes that statistically significant at 1%,5% and 10% respectively.

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The Table 11 shows short-run connection illustrates how different economic conditions affect gross saving (GS) over time. In particular, there is often a positive correlation between higher saving rate (SR) and gross saving, indicating that higher interest rates result in higher savings. The impact of changes in the stock index (SI) is not equal; some lag values have a positive effect on savings, while others have a negative effect. There is a positive correlation between inflation (INF) and savings, suggesting that greater rates of inflation tend to boost savings over time. The negative effect of unemployment (UNEM) suggests that greater unemployment rates reduce savings. Additionally, the GDP (income) has a range of effects, with some lagged values having a negative influence on saves and others having a positive impact. Stability in the long run is ensured by the correction of any short-term departures from equilibrium over time, as indicated by the negative coefficient of the lagged cointegrating equation (CointEq(-1)).

Table 12: Result of the short run ARDL Model Estimation using Error Correction Model (ECM) for Claim ratio

Variable	Coefficient	Std. error	t-statistic	Prob.
D(CR(-1))	0.517942	0.173268	2.989253	0.0098***
D(CR(-2))	-0.187775	0.084644	-2.218418	0.0436***
D(SR)	0.086251	0.010434	8.266124	0.0000***
D(SR(-1))	0.079168	0.014897	5.314391	0.0001***
D(SR(-2))	0.033303	0.013769	2.418683	0.0298***
D(SR(-3))	0.022113	0.011132	1.986379	0.0669**
D(SI)	1.145547	0.625775	1.830604	0.0885**
D(SI(-1))	4.282527	0.584874	7.322138	0.0000***
D(SR(-2))	2.840207	0.787660	3.605880	0.0029***
D(SR(-3))	3.971354	0.747398	5.313572	0.0001***
D(INF)	-0.106460	0.085351	-1.247315	0.2327
D(INF(-1))	0.342526	0.108487	3.157305	0.0070***
D(UNEM)	0.589403	0.464834	1.267985	0.2255
D(UNEM(-1))	1.618402	0.472489	3.425268	0.0041***
D(UNEM(-2))	0.855208	0.511535	1.671845	0.1167
D(GDP)	-0.129727	0.407414	-0.318416	0.7549
D(GDP(-1))	1.294617	0.476957	2.714327	0.0168***
CointEq(-1)*	-2.174233	0.265519	-8.188613	0.0000***
R-squared		0.963923		
Adjusted R-squared		0.933257		
Durbin-Watson stat		1.908412		

Notes: The asterisks (***), (**) and (*) denotes that statistically significant at 1%,5% and 10% respectively.

The Table 12, shows short-term connection in Malaysia illustrates how different economic conditions affect the claim ratio (CR). According to the analysis, the claim ratio and changes in the saving rate (SR) typically have a positive connection, meaning that higher interest rates result in greater claim ratios. Additionally, there is a positive correlation between the stock index (SI) and claim ratios, indicating that rising stock indexes lead to higher claim ratios. However, based on Scott et al. (1981) the inflation variables, has a range of consequences; some lag values are positively impacted, while others are negatively impacted. Greater unemployment rates are positively correlated with greater claim ratios, according to the unemployment rate (UNEM). The GDP has mixed effects as well, with some lagged values positively influencing the claim ratio, while others have a negative impact. The negative coefficient of the lagged cointegrating equation (CointEq (-1)) indicates that any short-term deviations from equilibrium are corrected over time, ensuring stability in the long run. The ECT coefficient supposed to be in negative form to ensure

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the stability in the long run relationship, as the coefficient derived will explain how fast or how slow would it be to achieve the equilibrium (Thao and Hua, 2016).

Table 13: ARDL Model Estimation using Error Correction Model (ECM) for Life Insurance Density

Variable	Coefficient	Std. error	t-statistic	Prob.
D(LD(-1))	1.549550	0.077150	20.08489	0.0000***
D(LD(-2))	-0.684283	0.076375	-8.959540	0.0000***
D(SR)	-1.02E-05	4.67E-06	-2.181261	0.0455***
D(SR(-1))	-2.03E-05	5.53E-06	-3.666809	0.0023***
D(SR(-2))	-2.82E-05	4.54E-06	-6.210218	0.0000***
D(SI)	-0.000675	0.000248	-2.716758	0.0159***
D(SI(-1))	0.002562	0.000356	7.191493	0.0000***
D(SR(-2))	0.001934	0.000305	6.332549	0.0000***
D(SR(-3))	0.000868	0.000284	3.056375	0.0080***
D(INF)	-3.37E-05	3.10E-05	-1.087835	0.2938
D(UNEM)	-0.0006641	0.000256	-2.588928	0.0205***
D(UNEM(-1))	-0.000766	0.000228	-3.365445	0.0042***
D(UNEM(-2))	0.000317	0.000229	1.384473	0.1865
D(UNEM(-3))	-0.000714	0.000276	-2.583239	0.0208***
D(GDP)	-0.000241	0.000173	-1.391925	0.1842
D(GDP(-1))	0.000573	7.52E-05	7.611037	0.0000***
CointEq(-1)*	0.013066	0.001641	7.963522	0.0000***
R-squared		0.999172		
Adjusted R-squared		0.998542		
Durbin-Watson stat		2.067033		

Notes: The asterisks (***), (**) and (*) denotes that statistically significant at 1%,5% and 10% respectively.

The Table 13 shows short-run relationships in Malaysia and highlights the ways in which different economic conditions affect life insurance density (LD) over time. In particular, life insurance density and changes in saving rates (SR) typically have a negative connection, meaning that rising interest rates cause insurance density to fall. The stock index (SI) likewise shows conflicting results; some lagged values have a negative impact on insurance density, while others have a positive one. The link between inflation (INF) and insurance density is generally negative, meaning that higher rates of inflation tend to reduce insurance density. Similarly, there is a negative correlation between the unemployment rate (UNEM) and insurance density, with higher unemployment rates resulting in lower insurance density. The influence of GDP varies; some lagged values have a favourable effect on insurance density, while others have a negative effect. The positive coefficient of the lagged cointegrating equation (CointEq (-1)) indicates that deviations from the long-run equilibrium are corrected over time, ensuring stability. According to Antzoulatos (2015), If the ECT coefficient is positive, it may suggest instability in the relationship being modelled. That a positive ECT coefficient could arise from omitted variables or poor proxies for future income expectations, leading to biased estimates.

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Conclusion

This study thoroughly examines how different economic indicators impact the demand for life insurance in Malaysia, covering data from 1982 to 2023. Using the long run and short run model, the research analyses the relationships between life insurance premiums (LIP), gross saving (GS), claim ratio (CR) and life insurance density (LD) with variables such as saving rate, stock index, inflation, unemployment and gross domestic product. The study finds there is a positive relationship between the saving rate (SR) and stock index (SI) on life insurance premiums in short term and inflation is negative relationship and other variables are mixed effect. In long term only stock index shows positive relationship and other variable shows negative relationship on life insurance premium. An increase in the stock index is associated with an increase in life insurance premiums, suggesting that improved financial market conditions boost demand for life insurance. For gross saving (GS) short term shows that saving rate (SR) and inflation (INF) shows positive relationship, unemployment shows negative relationship and other variables shows mixed relationship on gross saving (GS). While, in long term shows that none of the variables show a statistically significant and all negative relationship on gross saving, as all the p-values are high. For claim ratio in short-term saving rate, stock index and unemployment are positive relationship and inflation is negative relationship and other variables are mixed effect on claim ratio and for long-term saving rate and stock index are positive relationship and other variables give negative effect on claim ratio. For life insurance density, in short term shows that all variables are negative relationship on life insurance density while in long term shows that saving rate and unemployment only negative relationship, others variable gives positive relationship on life insurance density. Overall, the best proxy is life insurance density because it shows a clear positive correlation with life insurance premiums and the dynamics of the life insurance market are well-represented by LD. The study's robust econometric techniques and extensive diagnostic testing ensure the validity of its conclusions, highlighting the relationship between the demand for life insurance. This contributes to academic knowledge and offers practical insights for the insurance industry in Malaysia.

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