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ANALYSIS OF THE DEMAND FOR LIFE INSURANCE AND FAMILY TAKAFUL

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Abstract

The Malaysian insurance and takaful industry has enjoyed encouraging growth in the last decade despite the global economic crisis. This paper aims to investigate the driving force of the life insurance and family takaful consumption in Malaysia, using annual time series data covering the period from 1970 to 2008. To investigate the long-run relationship and short-run dynamics of the theorized variables on the demand for life insurance and family takaful, the autoregressive distributed lag (ARDL) bounds testing are employed. Computation of the F-statistic for testing the significance of the lagged levels of the variables in the error correction format of the underlying ARDL model confirmed the existence of cointegation between the variables under study. The estimations of the coefficients of the long-run relations and of the error correction model find that income, education level, and EPF are among significant predictors of the life insurance and family takaful consumption.

Keywords: Life Insurance, Family Takaful, ARDL Modeling

1. Introduction

Life insurance provides individuals and the economy as a whole with a number of important financial services. It is an instrument to manage income risk by providing coverage against income loss from death, as well as an investment vehicle for long-term savings (Savvides, 2006). Much empirical research has shown the overwhelming positive relationship between insurance industry development and economic growth (see Beenstock et al., 1986; Browne and Kim, 1993; Outreville, 1996; Ward and Zurbruegg, 2002; Beck and Webb, 2003). A United Nation's report (1975) acknowledged that a sound national life insurance and reinsurance market is an essential characteristic of economic growth. In recent decades, the life insurance sector has grown in economic importance since it forms an essential component of the global financial market. Hence, understanding the determinants of life insurance demand is crucial in encouraging the consumption of life insurance. The impact could be significant in improving the growth of the insurance industry.

Analysis of the determinants of life insurance consumption is complex, because a country's economic progress, consumer attitudes toward insurance, social structure and social security system play significant roles in the demand for life insurance (Hwang & Greenford, 2005). Empirical evidence shows that the determinants for life insurance demand vary widely not only between developing and developed countries, but also within the group of developed nations (Savvides, 2006). The aim of this research is to investigate the key determinants of life insurance and family takaful consumption in Malaysia. Although various studies have identified determinants of life insurance consumption across countries, little is known about the factors affecting the demand for life insurance in Malaysia. Hence, this research seeks to

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cover this gap in the literature by examining and empirically testing the relationship between the demand for life insurance in Malaysia, with a set of theoretically identified macro-level variables, within the framework of the life-cycle model of consumption and savings. A similar relationship for family takaful demand is also investigated. To capture possible long-run and short-run variations between the theorized determinants and life insurance demand, the method of analysis employed in this research is the autoregressive distributed lag (ARDL) approach advanced by Pesaran, Shin and Smith (2001).

2. Literature Reviews

A pioneer work in analyzing life insurance demand is that by Yaari (1965). He examined the role of insurance within the context of the life cycle model by including the risk of dying. He showed conceptually that an individual increases expected lifetime utility by purchasing fair life insurance and fair annuities. Fisher (1973) extended Yaari's work by incorporating the explicit demand for term life insurance into his model explaining the demand for life insurance as part of a limited portfolio of financial assets (only bonds and insurance are available). Lewis (1989) also built upon Yaari's theoretical demand model, but suggested that the goal in the purchase of life insurance is to maximize the utility of the surviving dependents. Hence, the purpose of life insurance is to provide a bequest for surviving dependents who are risk-averse with regard to the potential loss of income derived from the wage earner. Hammond, Houston and Melander (1967) found that income, net worth (marketable securities) and education positively influence premium expenditure on life insurance. Marital status and family size are also found to positively influence insurance purchase. Berekson (1972) found that income, age and birth order show a significant positive effect on premium expenditure on life insurance. Headen and Lee (1974) observed that life insurance demand is influenced by changes in the financial conditions and changes in household demand for alternative financial assets.

Burnett and Palmer (1984) argued that the demographic variables found to influence life insurance ownership are the number of children, education and income. As for the psychographic variables, the authors asserted that purchase of life insurance is not a matter of believing or not believing in insurance, but is associated with specific needs and personality traits. The results of the study by Beenstock, Dickinson and Khajuria (1986) suggested that life expectancy, number of dependents and price of goods positively affect premium income. Truett and Truett (1990) compared the demand for life insurance in the United States and Mexico. They found that income, education and age are significant determinants of life insurance consumption. Browne & Kim (1993) argued that a number of variables may explain international differences in life insurance demand, such as life expectancy, national income, dependency ratio, social security and education. Outreville (1996) investigated the correlation of life insurance premiums to real disposable income and other factors, such as real interest rate, anticipated inflation, insurance price and level of financial development. Gandolfi and Miners (1996) estimated the influence of income and the value of household production on the amount of life insurance purchases for husbands and wives. The results of the study

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indicated that total household income is positively correlated to life insurance ownership in each model.

Ward and Zurbruegg (2000) analyzed the relationship between economic growth and growth in the insurance industry for nine OECD countries using the error correction model. Their findings showed that both short-run and long-run dynamics determined significant causal relationship from insurance growth to GDP growth for Australia. Enz (2000) introduced an econometric estimation called the S-curve, which exhibits the income elasticity of demand of one at certain low and high level of income, but may exceed one, even reaching two or more at intermediate income levels. The results of a work by Beck and Webb (2002) show that countries with higher income, lower inflation, and better developed banks have higher life insurance consumption. In addition, a higher private savings rate and a higher real interest rate were also associated with higher life insurance consumption. Ward and Zurbruegg (2002) found that the consumption of life insurance in the OECD countries is around three times less sensitive to changes in income compared to the Asian sample. Lim & Haberman (2003) focused on the Malaysian life insurance market. They found that savings deposit rate has a positive effect on life insurance demand, while insurance price has a negative impact on demand. An empirical investigation by Hwang and Gao (2003) showed that the main factors that influenced the people in China to purchase life insurance are directly related to successful economic reform, which resulted in a higher level of economic security, increase in the level of education and the change in social structure. The findings of Hwang and Greenford (2005) suggest that income has a positive and significant effect on life insurance demand in China, Taiwan and Hong Kong. Li, Moshirian, Nguyen and Wee (2007) found that life insurance consumption increases with income, number of dependents and level of education, and decreases with life expectancy and social security expenditure. The country's level of financial development and high degree of competition of the insurance market appear to stimulate life insurance consumption.

3. Model Development

The literature review suggests that the possible set of determinants of life insurance demand function is indeed large. However, several macroeconomic variables have been widely investigated and identified to affect the consumption of life insurance. These variables are income, number of dependents, level of education, social security, interest rate, inflation rate and savings rate. In this study, the long-run and short-run relationship between life insurance demand and theorized macroeconomic variables are explored by considering the following regression equation:

$$\log(LIFE) = \beta_0 + \beta_1 \log(INC) + \beta_2 \log(DEP) + \beta_3 \log(EDU) + \beta_4 \log(EPF) + \beta_5 (INT) + \beta_6 (INF) + \beta_7 (SAV) + \varepsilon \quad (1)$$

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Similarly, the relationship between family takaful and pre-determined explanatory variables is depicted in this equation:

$$\log(TFUL) = \beta_0 + \beta_1 \log(INC) + \beta_2 \log(DEP) + \beta_3 \log(EDU)) + \beta_4 \log(EPF) + \beta_5 (INF) \quad + \beta_6(IFSAV) + \varepsilon \tag{2}$$

Annual time series data for the period 1970-2008 for the life insurance demand analysis, and for the period 1986-2008 for family takaful demand analysis, were collected from various sources. Table 1 describes the measurement and source of data for each regressor depicted in equations (1) and (2).

Table 1: Variable Definition, Measurement and Source of Data

Abbreviation	Variable	Measurement	Source of Data
LIFE	Demand for Life Insurance	Premium income of life insurance	Insurance Annual Report, BNM, 1970-2008
TFUL	Demand for family takaful	Contributions of family takaful	Takaful Annual Report, BNM, 1986-2008
INC	Disposable Income	Nominal GDP per capita	World Development Indicator (WDI) Database, World bank
DEP	Dependency Ratio	Population under 15 to total population	WDI Database, World bank
EDU	Level of Education	Enrolment in tertiary education	Annual Statistics Report, Department of Statistics
EPF	Employees' Provident Fund	Contributions to EPF	Bank Negara Annual Report, 1970-2008
INT	Interest	Lending rate	WDI Database, World bank
INF	Inflation	Percentage of annual price changes in CPI	WDI Database, World bank
SAV	Savings	Rate of return on savings account	Bank Negara Annual Report, 1970-2008
IFSAV	Interest-Free Savings	Rate of return on interest-free savings account	Bank Negara Annual Report, 1970-2008

The model and the research hypotheses in this study are built within the life-cycle theoretical framework. The most common specification is the log-linear form, which is frequently used for estimating demand models (Browne and Kim, 1993). As shown by Deaton and Muellbauer (1980), a desirable characteristic of this specification is that the estimated coefficients are interpreted as elasticities. In the empirical analysis, all continuous variables will be transformed into the logarithmic forms.

3.1 Measurement of Life Insurance Demand

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Various measurement of life insurance demand have been used in empirical studies, such as premium expenditures, insurance density and insurance penetration (Beck and Webb, 2003; Schlag 2003). Previous research has typically used premium expenditure as a proxy for life insurance consumption (see recent research by Beenstock, et al., 1986; Truett and Truett, 1990; Browne and Kim, 1993; Outreville, 1996; Ward and Zurbruegg, 2002, Beck and Webb, 2003; Hwang and Greenford, 2005; Savvides, 2006; Li et al., 2007). However, it has been argued that premium expenditure may not be the most superior measure of insurance consumption since premium data usually combine pure insurance protection and annuity protection, which may lead to less accurate inferences about life insurance protection. To allow for direct comparison with earlier studies, this study uses natural logarithm of premium expenditure as a measure of insurance consumption.

3.2 Determinant of Life Insurance Demand

(1) Disposable Income

Income is the most important factor found in many empirical studies to significantly affect the demand for life insurance. The ability to pay life insurance premium has been proven to be related to the level of income. As income grows, insurance becomes more affordable. A larger income may also result in a greater expected loss to the dependents in the event of premature death of the breadwinner. Following most prior work, this study employs real GDP per capita to represent disposable income. It is hypothesized that income has a positive effect on the consumption of life insurance and family takaful in Malaysia.

(2) Number of Dependents

The desire to protect dependents from financial difficulties in the event of death to the wage earner is the major driving force for life insurance purchase (Li et al., 2008). It has been shown that the demand for life insurance increases with the expected value of the dependents' lifetime consumption. As defined by the United Nations, the dependency ratio used in this study is the ratio of the total number of children under 15 to the total number of persons between 15 and 64. The relationship between the number of dependents and life insurance and family takaful demand is expected to be positive.

(3) Level of Education

Education results in greater understanding of the function of insurance. A higher level of education has been associated with higher awareness of insurance and a willingness to spend more on insurance products (Browne and Kim, 1993). Education has also been shown to lengthen the period of dependency. Following Truett and Truett (1990), the level of education is proxied by the number of student enrolments in third-level education. Similar to many previous studies, education is expected to have a positive correlation with life insurance demand.

(4) Social Security

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The social security death benefit is an important income source for survivors, which may affect an individual's demand on life insurance. Browne and Kim (1993) demonstrated that social security expenditure is a proxy for national wealth, which can be viewed as a substitute for life insurance coverage. In Malaysia, the pension system is adopted in place of social security, with the objective of old-age poverty alleviation and smoothing consumption from work life into retirement, to provide economic stability and security to the ageing population. Malaysia's pension system is essentially an occupational retirement income scheme, operated by the Employees Provident Fund (EPF) and the Public Service Department of Malaysia. The EPF is a scheme that provides retirement benefits for members through the management of their savings in an efficient and reliable manner. In this study, EPF is used to surrogate the social security variable. In many studies, social security benefits are measured by the ratio of social security spending to GDP. In this study, social security expenditure is measured by the ratio of EPF contributions to GDP. EPF is expected to decrease the demand for life insurance.

(5) Inflation

The negative effect of inflation on life insurance demand has been reported in many studies. Browne and Kim (1993), Outreville (1996), Hwang and Greenford (2005) provided empirical evidence that anticipated inflation has a negative effect on life insurance consumption. Despite indexed policies, Babbel (1981) showed that the demand for life insurance in Brazil still declined during inflationary periods. During economic volatility and high inflation, consumers prefer short-term and more liquid investments rather than long-term financial instruments, such as life insurance (Black and Skipper, 2000). In this study, inflation is expected to reduce life insurance consumption.

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(6) Savings

Rose and Mehr (1980) argued that since household savings can protect the consumption ability of surviving dependents, it can negatively affect the demand for life insurance. Black & Skipper (2000) suggested that consumers would have more tendency to save in the banks rather than to buy insurance when the savings rate increases. Beck and Webb (2003) found that savings rate is negatively correlated with life insurance demand when the demand is measured by life insurance in private savings, and the correlation is positive when demand is measured by life insurance penetration. In the life insurance analysis of this study, the savings rate is measured by the rate of return on savings account while in family takaful analysis, the savings rate is measured by the interest-free rate of return on savings accounts. Since a higher savings rate may induce consumers to save in the banks rather than in life insurance products, it is hypothesized that savings rate and life insurance demand is negatively correlated.

(7) Interest Rates

Browne and Kim (1993) found a negative relationship between the interest rate and life insurance consumption. Real interest rate can be represented by lending rate yield on government bonds less rate of inflation, or money market rates less inflation (Beck and Webb, 2003; Li et al, 2008). Following Beck and Webb (2003), the interest variable in this study is measured by the lending rate, and, since prior studies have conflicting findings on interest

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rate, this study hypothesizes that the effect of interest on life insurance demand is inconclusive.

4. Econometric Specification

The statistical technique considered suitable to estimate the life insurance and family takaful demand functions in this study is the ARDL Bounds Testing Approach advanced by Pesaran and Shin (1999), and Pesaran, Shin and Smith (2001). Narayan and Smyth (2005) asserted the usefulness of the ARDL approach in empirical studies that have a small sample size. Small data sample of this study underlies this preference (see Pahlavani et al., 2005).

The ARDL procedures proposed by Pesaran et al. (2001) involve two stages. The first stage is the test of cointegration to establish the existence of a long-run relationship. Once the long run relationship has been established, the second stage of the analysis involves a two-step procedure to estimate the model. First, the orders of the lags in the ARDL model are selected using appropriate lag selection criterion. In the second step, the long-run coefficients and the associated error correction model are estimated using the ordinary least squares technique (Pesaran et al., 2001; Narayan and Smyth, 2005). The main advantage of ARDL lies in its flexibility in that it can be applied when the variables are of different order of integration (Pesaran and Pesaran, 1999). The approach avoids problems resulting from non-stationarity of time series data since no pre-testing for unit root is required.

To capture the short-run effects, the short-run dynamic adjustment process is incorporated in equation (1) by specifying it in an error-correction model format. Following Pesaran et al. (2001), the unrestricted conditional Error Correction Representation within the framework of ARDL for life insurance demand Model (1) is defined by:

$$\begin{aligned}
&\Delta logLIFE \\
&= \alpha + \sum_{k=1}^{n} \beta_{0,k} \Delta logLIFE_{t-k} + \sum_{k=0}^{n} \beta_{1,k} \Delta logINC_{t-k} + \sum_{k=0}^{n} \beta_{2,k} \Delta logDEP_{t-k} \\
&+ \sum_{k=0}^{n} \beta_{3,k} \Delta logEDU_{t-k} + \sum_{k=0}^{n} \beta_{4,k} \Delta logEPF_{t-k} + \sum_{k=0}^{n} \beta_{5,k} \Delta INT_{t-k} + \sum_{k=0}^{n} \beta_{6,k} \Delta INF_{t-k} \\
&+ \sum_{k=0}^{n} \beta_{7,k} \Delta SAV_{t-k} + \delta_0 logLIFE_{t-1} + \delta_1 logINC_{t-1} + \delta_2 logDEP_{t-1} + \delta_3 logEDU_{t-1} \\
&+ \delta_4 logEPF_{t-1} + \delta_5 INT_{t-1} + \delta_6 INF_{t-1} + \delta_7 SAV_{t-1} \\
&+ \mu_t
\end{aligned} \tag{3}$$

where Δ is the first difference operator.

Similarly, the Error Correction Representation of the ARDL model for family takaful equation (2) is specified as follows:

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$$\Delta logTFUL = \alpha + \sum_{k=1}^{n} \beta_{0,k} \Delta logTFUL_{t-k} + \sum_{k=0}^{n} \beta_{1,k} \Delta logINC_{t-k} + \sum_{k=0}^{n} \beta_{2,k} \Delta logDEP_{t-k} + \sum_{k=0}^{n} \beta_{3,k} \Delta logEDU_{t-k} + \sum_{k=0}^{n} \beta_{4,k} \Delta logEPF_{t-k} + \sum_{k=0}^{n} \beta_{5,k} \Delta logINF_{t-k} + \sum_{k=0}^{n} \beta_{6,k} \Delta IFSAV_{t-k} + \delta_0 logLIFE_{t-1} + \delta_1 logINC_{t-1} + \delta_2 logDEP_{t-1} + \delta_3 logEDU_{t-1} + \delta_4 logEPF_{t-1} + \delta_5 logINF_{t-1} + \delta_6 IFSAV_{t-1} + \mu_t \quad (4)$$

The results of the long-run relationship and short-run dynamics depicted in equation (3) and (4) are presented in the next section.

5. Empirical Results

The critical values of the F-statistic for upper bound and the lower bound tabulated by Pesaran and Pesaran (1997), for cases with intercept and no trend, are provided in Table 2. These are values for testing the null of the existence of a long-run relationship. An F-statistic exceeding the upper bound indicates cointegration between the regressors. An F-statistic that falls below the lower indicates the absence of a long-run relationship between the variables, and an F-statistic that falls within the two bounds indicates inconclusive results.

Table 2: Critical Value Bounds of the F-statistic for Cointegration Relationship

Number of regressors	Level of significance					
	90%		95%		99%	
	Lower bound I(0)	Upper bound I(1)	Lower bound I(0)	Upper bound I(1)	Lower bound I(0)	Upper bound I(1)
6	2.141	3.250	2.476	3.646	3.267	4.540
7	2.035	3.153	2.365	3.553	3.027	4.296
8	1.956	3.085	2.272	3.447	2.848	4.126

In testing the null of no cointegration, the order of lags on the first differenced variables must be decided upon. The results of this first step are usually sensitive to the order of VAR (Pesaran et al., 2001; Bahmani-Oskooee and Ng, 2002). Since the time series used in this study is annual data, Narayan (2004) suggested that a lag order of 1 and 2 be imposed on the first differenced of each variable and that the F-statistic for the joint significance of lagged levels of variables be computed. The computed F-statistics for each order of lags for the demand models of this study are reported in Table 3.

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Table 3: F-statistic for Testing the Existence of a Long-Run Life Insurance and Family Takaful Demand

The Model	*Number of regressors*	*Order of lag*	
		1	*2*
Model 1: Life Insurance Demand Model	7	5.5160***	1.6135
Model 2: Family Takaful Demand Model	6	9.7616***	-

****, ** and * indicates F-statistic falls above 99% , 95% and 90% upper bound, respectively*

The F-statistics of the cointegration results indicate that a long-run relationship exists between the regressors at lag of order 1 in both models. Once cointegration between the variables to be estimated is established, the coefficients of long-run and short-run relations can be estimated using the ARDL approach. In this section, the results of the model estimation are provided based on the SBC. The SBC-based model is selected since it provides a relatively better fit for small sample size than $\overline{R}^2$, AIC or HQC. According to Pesaran and Smith (1999), the SBC should be used in preference to other model selection criteria because it tends to define more parsimonious specification.

Table 4: Long- Run Coefficient Estimates of Life Insurance and Family Takaful Demand Models

	Model 1: Life Insurance Demand		**Model 2: Family Takaful Demand**	
Regressors	Coefficient	Standard Errors	Coefficient	Standard Errors
logINC	6.2599 ***	.82812	4.4989 **	1.8999
logDEP	5.2299 **	2.1419	35.1895 ***	9.4744
logEDU	1.2358 ***	.36861	7.8631 ***	1.5274
logEPF	-1.5200 ***	.23014	-4.3851 **	1.4581
INT	-.12859 ***	.038745		
INF	-.018982 *	.0098614	.25791**	.095083
SAV	-.013834	.038233		
IFSAV			-.38022	.22252
Constant	-66.7166***	13.5761	-220.0272***	54.8524

****, **, and * indicates significance at 1%, 5% and 10% level, respectively*

The estimated long-run coefficients of the variables in Model 1 and Model 2 are reported in Table 4. For the life insurance demand function, the long-run test statistics indicate that most of the variables are statistically significant with the expected sign. The results show that income is the key determinant of life insurance demand. It suggests that in the long-run, an increase of 1 percent of per capita income is associated with an increase of about 6 percent in life insurance consumption. The coefficients of the number of dependents and level of education have positive signs and in each case are highly statistically significant.

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The coefficients of Employees' Provident Fund (EPF), interest rate and inflation rate have the hypothesized negative signs and are also statistically significant. Although the coefficient of savings satisfies the hypothesis of negatively affecting life insurance demand, it is statistically insignificant, suggesting that the savings rate does not determine life insurance consumption in Malaysia.

For family takaful demand, the estimated coefficients of income per capita, number of dependents and level of education are statistically significant with the hypothesized positive signs. The coefficient of EPF is also significant with a negative sign as expected. The variable interest-free savings rate has the expected negative coefficient but not statistically significant. The coefficient of inflation is statistically significant, but does not have the expected negative sign.

Table 5: Error Correction Representation of the ARDL Model

	Model 1: Life Insurance Demand		**Model 2: Family Takaful Demand**	
Regressors	Coefficient	Standard Errors	Coefficient	Standard Errors
ΔlogINC	3.9661 ***	1.0426	3.0096 **	-.66898
ΔlogDEP	26.4567 **	11.2449	77.5458 *	41.8643
ΔlogEDU	1.2358 ***	.36861	1.7664 **	.74302
ΔlogEPF	-4.9019 ***	1.3464	-1.1360 *	.59404
ΔINT	-.022338	.034495		
ΔINF	-.018982 *	.0098614	.0080782	.035149
ΔSAV	-.013834	.038233		
ΔIFSAV			.35848 **	.12077
ΔConstant	-66.7166 ***	13.5761	-147.1935 ***	33.8820
Ecm(-1)	-.75523 ***	.14930	-.66898 ***	.10518

****, **, and * indicates significance at 1%, 5% and 10% level, respectively*

Table 5 reports the short-run coefficient estimates obtained from the ECM version of the ARDL model. It shows that the coefficients of change in income, number of dependents, level of education and EPF are statistically significant in the short-run. While interest is found to be significant in the long-run, it is not statistically significant in the short-run. This suggests that, the change in interest rate is not associated with the change of life insurance demand in the short-run. The change in savings rate is also found not statistically significant. In the short-run, the impact of inflation is only significant at the 10 percent level.

The error correction term indicates the speed of the adjustment, which restores equilibrium in the dynamic model (Pahlavani et al., 2005). The larger the error correction coefficient (in absolute value), the faster is the economy's return to its equilibrium, once shocked (Pesaran and Pesaran, 1997). An ECM coefficient that is statistically significant with a negative sign is a further proof of the existence of a long-run relationship (Bannerjee et al., 1998). Under the life insurance demand model, this coefficient is estimated to be -0.76,

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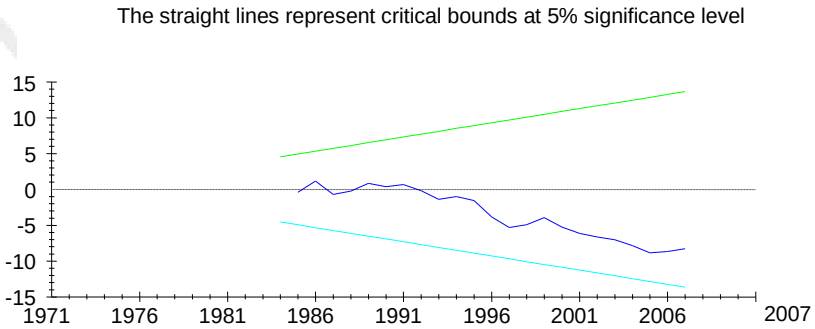
suggesting a relatively high speed of convergence to equilibrium at the rate of about 76% a year. It has a negative sign and is highly statistically significant, thereby reinforcing the existence of the cointegration relationship among the variables of Model 1.

Under the family takaful model, the coefficient of the change in income has a positive sign and is significant at the 5 percent level. The coefficients of the number of dependents and level of education are also significant. The results suggest that the change in EPF has a negative effect on family takaful consumption in the short-run. The coefficient of interest-free savings rate is found to positively affect family takaful demand in the short-run. The change in inflation is not statistically significant, suggesting that inflation rate does not influence family takaful consumption in the short-run. The coefficient of the error correction term is -0.6670. It has the correct negative sign and is highly statistically significant. This result reaffirms the cointegration relationship between the variables in Model 2.

In examining the stability of the long-run coefficients together with the short-run dynamics, the CUSUM and CUSUMSQ proposed by Brown et al. (1975) is applied, as suggested by Pesaran and Pesaran (1997). The test is applied to the residuals of the models under investigation. The CUSUM test makes use of the cumulative sum of recursive residuals based on the first set of n observations and is updated recursively and plotted against break points (Bahmani-Oskooee and Ng, 2002). If the plot of CUSUM statistics stays within the critical bounds of 5% significance, the null hypothesis that all coefficients in the error correction model are stable cannot be rejected. If either of the lines is crossed, the null hypothesis of coefficient constancy can be rejected at the 5 percent level of significance (Brown et al., 1975). The CUSUMSQ test is carried out using a similar procedure, but it is based on the squared recursive residuals.

Plots of the stability test results of Model 1 are given in Figure 1. The plots of the CUSUM and CUSUMSQ stay within the 5 percent critical bounds, indicating stability in the estimated parameters of the life insurance demand Model 1.



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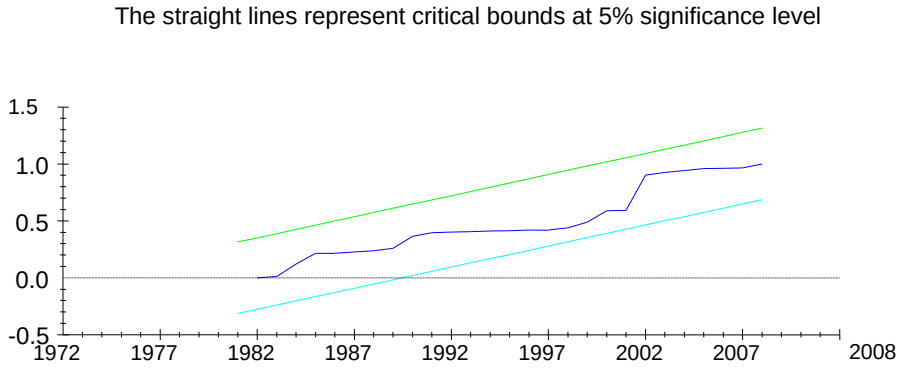
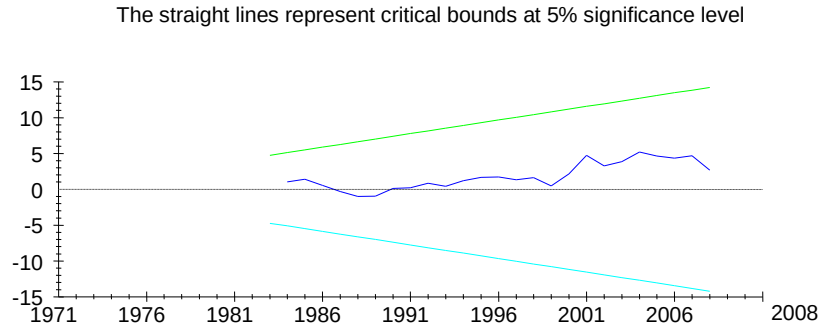


Figure 1: Plots of CUSUM and CUSUMSQ Statistics for Life Insurance Demand Model

The plots of the CUSUM and CUSUMSQ statistics for coefficient stability for Model 2 (family takaful demand) are displayed in Figure 2. The plot of CUSUM is within the critical bound, implying that all coefficients in the error correction model are stable. However, the plot of CUSUMSQ deviates from the critical bounds around the year 1996 to 2000 before returning to inside the bounds. However, the deviation seems to be transitory in nature, and, eventually, the plot returns back within the critical bounds lines.



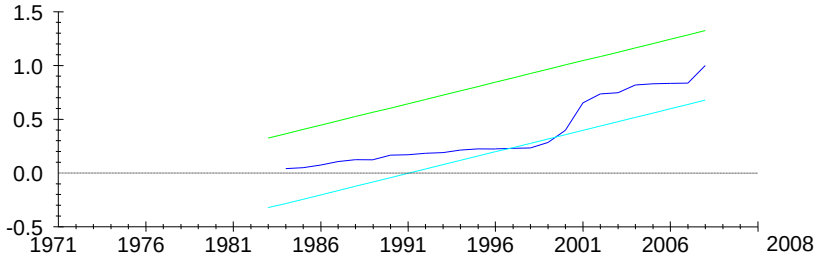


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Figure 2: Plots of CUSUM and CUSUMSQ Statistics for Family Takaful Demand Model

6. Conclusion

The results of analysis suggest that the level of income, number of dependents and level of education are significant determinants of life insurance and family takaful demand in Malaysia. These variables are found to positively influence life insurance purchase, in the long-run as well as the short-run. Savings in EPF was found to have a negative impact on life insurance and family takaful consumption both in the long-run and also short-run. The rate of inflation is found to negatively affect life insurance purchase, but the result is ambiguous for family takaful demand. Interest rate is found to have a negative effect on life insurance demand in the long-run but not the short-run. The results indicate that the rate of savings does not influence life insurance demand in either the long- or the short-run, but does have some influence on family takaful demand in the short-run.

Since income variable has undergone a logarithmic transformation, the estimated coefficients are measures of income elasticity of demand for insurance. It is a measure of the responsiveness of consumer purchase of insurance to changes in consumer income. Any value greater than 1 indicates that a change in income will drive an even bigger change in the demand for life insurance. The results of this study suggest that an increase in income by 10 percent will increase consumption of life insurance by 63 percent and family takaful by 45 percent. The estimated income elasticity suggests that consumption of life insurance in Malaysia is about four times more sensitive to changes in income compared to the consumption in the U.S. or in the OECD countries (see Hammond et al., 1967 and Li et al., 2007). Given the higher average income level in the U.S. and the OECD countries, this finding is consistent with the "S-curve" hypothesis by Enz (2000), which suggests that at a higher level of income, insurance consumption becomes less sensitive to income growth.

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