Macroeconomic Variables and the Demand for Life Insurance in Malaysia

Chee Chee Lim
Steven Haberman

Faculty of Actuarial Science and Statistics,
CASS Business School, City University (London)

PRELIMINARY VERSION. COMMENTS WELCOME.

ABSTRACT

Economic environments have a profound effect on the growth of the insurance industry. History has shown that, although the performance of the insurance industry is closely linked to economic conditions, the life business has been able to survive in different economic environments. In Malaysia, the performance of the insurance industry in 1998 was affected by an economic downturn. The insurance industry as a whole and the non-life business experienced a negative growth rate but the life business achieved a low, positive growth rate in 1998. Because the macroeconomic environment has an important influence on life business and this area has not been greatly researched in Malaysia, this study is undertaken to examine the demand for life insurance in Malaysia from a macroeconomic perspective. More formally, work is carried out in order to study the interaction between macroeconomic and demographic variables (i.e. financial development, income, inflation, interest rate, price, stock market return, birth rate, death rate, fertility rate and life expectancy) and the demand for life insurance (by sums insured) in order to seek evidence of their relationship in the context of Malaysia. The major findings of this study indicate that the savings deposits rate and price change in insurance are two important macroeconomic variables associated with the demand for life insurance in Malaysia. However, the finding on the savings deposits rate fails to show the expected negative sign. Further research is needed in this respect in order to confirm the relationship between these two variables. A change in the price of insurance has a significant negative relationship with the demand for life insurance. This finding has an important implication on policy formulation for the policy makers of the central bank and the marketing directors of life insurance companies. This finding may be helpful to them in developing pricing strategies to achieve a specific sales target for life business.

1.0 INTRODUCTION

The insurance industry has gradually emerged to become an important component of the financial services sector in Malaysia in the past decade (Bank Negara Malaysia or BNM, 1994-2002). The total premium income of this industry (comprising premium income from the life and non-life businesses) constituted a mere 2.9% of the nominal gross national product (GNP) in 1990 but this proportion rose to 5.4% of the nominal GNP in 2001. The total premium income of the insurance industry has been growing from year to year from 1990 to 2001 except for 1998 due to a negative growth in the non-life business. The total premium income has increased more than five fold during the last decade

(1990: RM3,170.1 million and 2001: RM17,101.2 million). Of the total premium income reported, more than half of the income was contributed by the life business, i.e. 51.8% and 68.5% of the total premium income for 1990 and 2001 respectively.

However, the total premium income generated by the insurance industry in Malaysia (2000: US$4,004 million) is small as compared to those in countries such as United States (US) (2000: US$1,157,516 million), Japan (2000: US$342,421 million) and United Kingdom (UK) (2000: US$256,352 million) (Website ABI updated on 15 November 2002; BNM, 1994-2002; OECD, 1999-2002). The respective percentages of the contribution of life business to the gross domestic product (GDP) were 4.85%, 13.01%, 5.25% and 5.20% for Malaysia, the US, Japan and the UK in 2000. This indicates that the Malaysian insurance industry in general, and its life business in specific, both have a bright prospect and a high potential role to play in contributing to the national savings.

The economic environment may have a profound effect on the growth of the insurance industry. In Malaysia, the performance of the insurance industry in 1998 was affected by an economic downturn. The total and non-life premium income declined by 2.1% and 9.7% respectively whereas the life premium income experienced a lower positive growth rate of 4.6% in 1998 (1997: 13.5%) (BNM, 1999-2000). However, history has proven that even though the performance of the insurance industry is very much linked to the economic conditions, life business has been able to sustain different economic environments with different products developed in order to meet different client needs during the varying economic periods (Niedzielski, 1997; Jones, 1999).

The study of the demand for life insurance has attracted the interest of a number of researchers in the past (Headen and Lee, 1974; Anderson and Nevin, 1975; Moffet, 1979 a & b; Robertson, 1982; Lewis, 1989; Truett and Truett, 1990) but only a small number of studies are devoted to examining the impact of macroeconomic factors on life insurance demand (Cargill and Troxel, 1979; Babbel, 1985; Browne and Kim, 1993; Outreville, 1996; Hau, 2000). However, these studies are not Malaysian oriented, except for one recent study conducted by Rubayah and Zaidi (2000).

Based on the scenario mentioned above, this study is undertaken to examine the demand for life insurance from a macroeconomic perspective in the context of Malaysia. The current study is different from the study of Rubayah and Zaidi (2000) in the following three aspects: the demand for life insurance in this study is defined in terms of the amount of sums insured but the study of Rubayah and Zaidi (2000) adopted the number of policies as a representation for life insurance demand; the set of macroeconomic variables examined in this study (i.e. the level of financial development, income per capita, inflation rate, savings deposits rate, the price of insurance, stock market return and demographic variables – crude live-birth rate, crude death rate, fertility rate and life expectancy at birth for males) is different from that in the study of Rubayah and Zaidi (2000) (i.e. GNP, personal savings rate, income tax exemption, short-term interest rate, income per capita, current interest rate, inflation rate); and the periods covered in this study are from 1968-2001 but the study of Rubayah and Zaidi (2000) covered the period 1971-1997.

This paper proceeds to review the literature and the macroeconomic factors affecting the demand for life insurance, to describe the data and the measurements of the variables in this study, to present and discuss the empirical results, and to conclude with a discussion of the major findings of this study.

2.0 LITERATURE REVIEW

There is no unique and integrated theory for life insurance demand. According to Outreville (1996), almost all the theoretical works on the demand for life insurance have related their work to the study of Yaari (1965) which considered the demand for life insurance within the lifetime allocation process of an individual.

A number of different models on life insurance demand have been developed and tested empirically in the past. For studies that involve many countries, a comprehensive cross-sectional study to examine the demand for life insurance across many countries has been carried out by Robertson (1982). Browne and Kim (1993) examine the factors that influence the demand for life insurance across 45 countries spread throughout the world which include the under-developed and developed nations. Outreville (1996) has studied 48 developing countries to investigate empirically the relationships between the development of life insurance sector and the level of financial development and market structure of insurance institutions.

In a comparative study, Truett and Truett (1990) examine the factors affecting life insurance demand in Mexico and the US. Other related studies on life insurance demand on a single country basis comprise those that relate life insurance demand with financial development and market structure (Headen and Lee, 1974; Outreville 1996), household characteristics (Anderson and Nevin, 1975; Cargill and Troxel, 1979; Lewis 1989; Hau, 2000), price expectations (Cargill and Troxel, 1979; Babbel, 1985), and social security retirement and survivor benefit (Lewis 1989; Browne and Kim, 1993). A study directly associated the macroeconomic variables with the demand for life insurance has been conducted by Rubayah and Zaidi (2000).

3.0 A REVIEW ON MACROECONOMIC FACTORS AFFECTING THE DEMAND FOR LIFE INSURANCE

The demand for life insurance is influenced by many factors and economic factors might be one of them. For example, current interest rate, income per capita and inflation rate may affect the demand for life insurance in a country.

A number of studies have examined the effects of macroeconomic factors on the demand for life insurance. Among them are the studies conducted by Cargill and Troxel (1979), Babbel (1985), Browne and Kim (1993), Outreville (1996) and Rubayah and Zaidi (2000). The macroeconomic factors investigated in these studies are highlighted and discussed in brief below.

Financial Development. The findings of Outreville (1996) indicate that the level of financial development directly affects the development of life insurance sector. However, the findings are not statistically significant. Two different proxies have been used as a measurement for financial development. The first one is the ratio of quasi-money (M2−M1) to broad money (M2). This is an indicator for the complexity of financial structure. The second one is the broad definition of money (M2). It is an average value over four years. M2 is regarded as an adequate measure for the financial development in developing countries because banking is the predominant sector in the financial market of developing countries.

Income. Income level significantly affects the demand for life insurance. The findings of Cargill and Troxel (1979), Babbel (1985), Browne and Kim (1993), Outreville (1996) and Rubayah and Zaidi (2000) confirm that income has a positive relationship with life insurance demand. Life insurance becomes more affordable when income increases.

The income variable in the study of Cargill and Troxel (1979) refers to the normalised disposable personal income. It is the disposable personal income divided by the total household net worth.

Babbel (1985) uses two different measures for disposable personal income in his study. The single-year income is used as a proxy for human capital and the three-year moving average income is used as a proxy for permanent income. The income variables are the real amounts of aggregate disposable personal income. The nominal income values are deflated by the yearly average indices of personal consumption expenditure deflator to render the nominal values in constant dollar terms.

The disposable personal income in the study of Browne and Kim (1993) refers to the national income. It is defined as the GNP minus depreciation (capital consumption) and indirect business taxes. According to Browne and Kim (1993), national income is a more accurate measurement of disposable personal income for a country than GNP or GDP because national income is the income earned by the various production factors.

Outreville (1996) relates the income variable in his study as the real disposable income per capita. GDP is used as the basis for the disposable personal income. The income variable is expressed in linear form and in logarithmic form.

Rubayah and Zaidi (2000) examine two types of income variable in their study, namely GDP and income per capita. Income per capita is defined as the GDP divided by the size of the population. In the initial stage, both the GDP and income per capita are found to have a positive relationship with the demand for life insurance but are not significant. It is only when stepwise regression analysis is applied in the later stage that GDP appears to have a significant positive relationship with the demand for life insurance but income per capita has been aborted. This is because income per capita contains the element of GDP and therefore multicollinearity exists because the two income variables are highly correlated.

Inflation. The findings of Browne and Kim (1993) and Outreville (1996) reveal that inflation has a significant negative relationship with life insurance demand. Inflation has a dampening effect on the demand for life insurance. High inflation tends to cause the purchasing of life insurance to be less attractive because of the rising cost of living.

However, the findings of Cargill and Troxel (1979) and Rubayah and Zaidi (2000) are not in line with the findings of Browne and Kim (1993) and Outreville (1996). Only the moderately defined savings model (i.e. the model that takes into account the changes in policy loans besides the changes in life insurance reserves/savings and dividend accumulations) in the study of Cargill and Troxel (1979) generates a significant result with the expected negative sign for this variable. There is only a weak relationship between life insurance savings and price expectation. Further, the findings of Rubayah and Zaidi (2000) show an insignificant positive relationship between inflation rates and the demand for life insurance.

Browne and Kim (1993) use an average inflation rate for the last eight years to represent the expected inflation rate. Outreville (1996) uses a weighted average of realised price changes over the last five years as a measure of anticipated price change.

On the other hand, the price expectation in the study of Cargill and Troxel (1979) refers to the percentage changes in the Consumer Price Index (CPI) over a period of 14 months based on the data contained in the Livingston Survey that have been revised by Carlson. Similarly, Rubayah and Zaidi (2000) use the CPI as a basis for the anticipated rate of inflation in their study.

Interest Rate. The findings on the relationship between interest rates and the demand for life insurance are inconclusive.

Cargill and Troxel (1979) examine two kinds of interest rates in their study: the competing yield on other savings products and the return earned by life insurers. The findings on the competing yield are inconsistent. However, the competing yield tends to be negatively related to life insurance savings. A higher interest rate on alternative savings products tends to cause insurance products to become less attractive as a savings instrument. The yield on newly issued AAA utility bonds is used to represent all the competing rates of return on alternative savings products. Cargill and Troxel (1979) include the current and twelve-quarter distributed lag variables of competing yields in their study. The lag variables are included to reflect the delayed reactions of savers towards new information regarding interest rates on savings because changes in interest rates are assumed to produce a lagged response. Likewise, the findings on the return earned by life insurers are mixed. However, the return earned by life insurers is frequently positively related to life insurance savings. Life insurers earning a higher rate of return tend to attract individuals to purchase insurance from them. The yield on industrial bonds placed privately with a representative group of life insurance companies is used as a proxy for the return earned by life insurers. It is the “new money” rate of return earned by the life insurers, not the average rate of return on the invested funds. Similar to the competing yield, the current and twelve-quarter distributed lags of the

return earned by life insurers are included in the models to investigate the immediate and lagged responses of changes in interest rates on life insurance demand.

Outreville (1996) has shown that interest rates such as the real interest rate and the lending rate are not a determining factor affecting the demand for life insurance. The real interest rate is obtained by subtracting the anticipated inflation from the current bank discount rate.

On the other hand, Rubayah and Zaidi (2000) investigate three types of interest rates in their study: the personal savings rate, short-term interest rate and current interest rate. The personal savings rate and short-term interest rate are found to influence significantly and negatively the demand for life insurance, while the current interest rate is found to have no significant effect on life insurance demand. The personal savings rate refers to the interest rate offered by banks on normal savings, the short-term interest rate refers to the interest rate on three-month Treasury Bills, and the current interest rate refers to the base lending rate on bank borrowings.

Price of Insurance. The findings reported with respect to the effect of price on the demand for life insurance are consistent in the studies of Babbel (1985) and Browne and Kim (1993). The price of insurance is significantly and inversely related to the demand for life insurance. A high insurance cost tends to discourage the purchasing of life insurance.

The various insurance price indices in the study of Babbel (1985) are the net present cost per 1000 present-valued unit of insurance expected to be in force over any arbitrary time horizon selected based on the published policy values for a male of age 35. Specifically, the price index refers to the ratio of the present value of expected premium cost, net of dividends and accumulations of cash values, per 1000 present-valued unit of indemnification benefits expected to be received, in excess of the actuarially fair cost. Two different discount rates, namely the yields of 10-year prime grade municipal bonds and double-A-rated corporate bonds, are used to discount the expected future cash flows from the policies.

Browne and Kim (1993) use the policy loading charge as the price measure. It is the ratio of the life insurance premiums to the amount of insurance in force. In fact, it is the cost per dollar of life insurance coverage.

Life Expectancy. In the study of Browne and Kim (1993), average life expectancy is found to be an insignificant factor affecting the demand for life insurance. However, the life expectancy at birth in the study of Outreville (1996) is found to affect significantly the demand for life insurance. Life expectancy at birth has a direct relationship with the demand for life insurance. The variable of life expectancy in the study of Outreville (1996) is different from that in the study of Browne and Kim (1993). The former is used to reflect the actuarially fair price of life insurance in a country (refer to note 1) whereas the latter is adopted to represent the probability of death in a country. Even though the probability of death appears not to affect significantly the demand for life insurance, the

price of life insurance has a significant effect on life insurance demand. The positive relationship between life expectancy at birth and the demand for life insurance implies that populations with a longer life span tend to buy life insurance policies. This is because they would expect to enjoy a lower cost for insurance and a greater incentive for human capital accumulation as the cost is being spread over a longer period and the cash value is being accumulated for a longer duration. This finding indirectly verifies the finding of Browne and Kim (1993) that the price of insurance is inversely related to the demand for life insurance.

4.0 DATA

Sample Size. The data for this study consist of annual aggregate data from 1968 to 2001.

Source of Study. All data in this study are secondary in nature. The data related to the demand for life insurance are obtained from the following annual reports: the Annual Report of the Insurance Commissioner and the Annual Report of the Director General of Insurance.

The macroeconomic and demographic data are obtained from various types of annual reports: Monthly Statistical Bulletin, Economic Report, Annual Report of the Ministry of Labour/ Ministry of Labour and Social Welfare/ Ministry of Labour and Manpower, Stock Exchange of Malaysia and Singapore Gazette, Kuala Lumpur Stock Exchange Gazette, Kuala Lumpur Stock Exchange Index, Investors Digest, Demographic Yearbook, Vital Statistics, Yearbook of Statistics and Social Statistics Bulletin. The materials obtained online are gathered from the official websites of BNM and Kuala Lumpur Stock Exchange (KLSE).

5.0 MEASUREMENT OF VARIABLE

The demand for life insurance is the dependent variable and the macroeconomic factors are the explanatory variables in this study**.** The macroeconomic variables included in this study are among those that have been examined in the studies of Cargill and Troxel (1979), Babbel (1985), Browne and Kim (1993), Outreville (1996) and Rubayah and Zaidi (2000) but subject to the availability of the similar data in Malaysia. In addition, this study has also included a number of demographic variables at the macro level such as the crude live-birth rate, crude death rate and total fertility rate. At this stage, it is not clear as to how these demographic variables are related to the demand for life insurance.

For the purpose of this study, the following operational definitions are used for the variables being examined:

Demand for Life Insurance (DEMAND). This is the dependent variable. It refers to the percentage calculated as the ratio of the new sums insured in a year to the total sums insured in force in the preceding year of ordinary life business (comprising policies such as whole life, endowment, temporary, and others).

Financial Development (FD). Financial development is hypothesized to be positively related to the demand for life insurance. The value of broad definition of money (M2) at the end of December is used to proxy the level of financial development.

Income (IPC). Income is hypothesized to be positively related to the demand for life insurance. Income per capita defined as the amount of income calculated as the GDP at market price divided by the number of mid-year population is used to represent disposable personal income.

Inflation (CPI). The Inflation rate is hypothesized to be negatively related to the demand for life insurance. The rate of change in the price index (Retail Price Index – prior to 1967 and Consumer Price Index – from 1967 onwards) is used as a proxy for the anticipated rate of inflation.

Interest Rate (SAVINGS). The savings deposits rate is hypothesized to be negatively related to the demand for life insurance. Savings deposits rates are derived from a combination of three different savings deposits rates: a representative rate which reflects the duration for which the various interest rates have been effective throughout the year (prior to 1979), the most frequently quoted rate (mode) at the end of December (for 1979), and the rate which reflects the average maturity of the deposits at the end of December (from 1980 onwards). The data are combined in such a way due to the changes in the formats in reporting the interest rates for the savings deposits throughout the periods 1968-2001 (refer to note 2).

Price (PRICE). The price of insurance is hypothesized to be negatively related to the demand for life insurance. The price measure used in this study is based on the model used by Browne and Kim (1993). More formally, the price is the cost per RM1,000 of ordinary life insurance coverage defined as the ratio of the total annual premium in force to the total sums insured in force in a year.

Life Expectancy (LIFE_M). Life expectancy at birth is hypothesized to be positively related to the demand for life insurance. More specifically, the life expectancy variable in this study refers to the life expectancy at birth for males. It is defined as the average number of years of life for males, if they continue to be subject to the current age-specific mortality experience. It would be preferable to use the life expectancy at a specific age that reflects the normal age of purchase (e.g. 25) or the average age of policyholders (e.g. 40 or 45), but unfortunately these types of data are not readily available.

Stock Market Return (STOCK). In addition to the variables mentioned above, this study also examines the performance of the stock market associated with the demand for life insurance. The stock market return is hypothesized to be positively related to the demand for life insurance. The rates of return from the stock market are derived from a combination of percentage changes in two different local stock market indices, namely the Industrial Index (for 1969-1976) and the KLSE Composite Index (for 1977-2001), in which the indices are those recorded on either the last trading day in the year or the last Friday of December.

Crude Live-Birth Rate (BIRTH). Crude live-birth rate is defined as the annual number of live births per 1,000 mid-year population.

Crude Death Rate (DEATH). Crude death rate is defined as the annual number of deaths per 1,000 mid-year population.

Total Fertility Rate (FERTILITY). Total fertility rate is defined as the sum of age-specific fertility rates per woman over the reproductive age range (i.e. aged 15 to 49 years).

Model Specification. Based on the above propositions, the demand for life insurance is hypothesized to have the following relationships with the macroeconomic and demographic variables:

DEMAND = f [FD (+), IPC (+), CPI (–), SAVINGS (–), PRICE (–), STOCK (+),
LIFE_M (+), BIRTH (?), DEATH (?), FERTILITY (?)]

6.0 EMPIRICAL ANALYSIS

The analysis is carried out based on the following steps (Koop, 2000; Gujarati, 2003).

Transformation of Variable. The necessity to transform a variable depends on its value. A transformation is made on variables of level-value, however, variables of rate-value are not transformed because they are already in a preferred form as they are a measure of change. Based on this rationale, the variables of financial development (FD), income per capita (IPC), the price of insurance (PRICE) and life expectancy at birth for males (LIFE_M) are subject to transformation by taking the natural logarithm of their level-values. The transformed variables are named as LNFD, LNIPC, LNPRICE and LNLIFE_M. Henceforth, the transformed variables are used in the analysis. Clearly, the transformed variables are monotonic functions of the underlying variables.

Time Series Graph. A collection of time series graphs is plotted for each of the variables examined in this study. The graphs provide a crude observation of the variables about the likely nature of the time series before a formal test of stationarity is pursued.

The dependent variable, the life insurance demand (DEMAND), tends to be volatile over time during the periods 1968-2001. The explanatory variables such as the anticipated rate of inflation (CPI), the savings deposits rate (SAVINGS) and the stock market return (STOCK) tend to exhibit some large variations from time to time with noticeable ups and downs throughout the periods under investigation.

Other explanatory variables tend to exhibit either an upward or a downward trend over time. Financial development (FD) and its transform (LNFD), income per capita (IPC) and its transform (LNIPC) together with life expectancy at birth for males (LIFE_M) and its transform (LNLIFE_M) tend to be increasing over time. Meanwhile, the time series graphs for the price of insurance (PRICE) and its transform (LNPRICE), crude live-birth

rate (BIRTH), crude death rate (DEATH) and total fertility rate (FERTILITY) tend to exhibit very similar patterns of behaviour. In general, they tend to sustain a downward movement from 1968 to 2001.

Testing for Unit Root. Having inspected the time series graphs visually, these variables are then subject to a statistical test to investigate their univariate properties. More formally, the Augmented Dickey-Fuller (ADF) Unit Root Test is used to examine whether a data series is stationary or non-stationary in its level series. For data series (i.e. DEMAND, CPI, SAVINGS and STOCK) that do not exhibit any trend and have a nonzero mean, a constant has been included in their respective ADF regressions. On the other hand, for data series (i.e. FD, LNFD, IPC, LNIPC, LIFE_M, LNLIFE_M, PRICE, LNPRICE, BIRTH, DEATH and FERTILITY) that seem to contain a trend (whether deterministic or stochastic), a constant and a linear time trend have been added to their respective ADF regressions.

The summary results of the ADF test are displayed in Table 1. From the table, it can be observed that the ADF test statistics are less than the MacKinnon critical values at 5% (i.e. the test statistic lies to the right of the critical value) for all of the data series. Therefore, the null hypothesis of unit root is not rejected in favour of the one-sided alternative. It can be concluded that all of the data series have a unit root and are non-stationary. These data series will be subject to a cointegration test later to verify whether they are cointegrated.

Table 1: Summary Results of Augmented Dickey-Fuller Unit Root Test

Variable	**n**	**Test Statistic**	**Critical Value 5%**	**Non-Stationary**
DEMAND	34	-2.551843	-2.9499	/
CPI	36	-2.941880	-2.9446	/
SAVINGS	36	-1.847627	-2.9446	/
STOCK	31	-2.812574	-2.9591	/
FD	37	-2.126158	-3.5348	/
LNFD	37	-2.430850	-3.5348	/
IPC	30	-2.502862	-3.5670	/
LNIPC	30	-2.233525	-3.5670	/
LIFE_M	28	-1.319152	-3.5796	/
LNLIFE_M	28	-1.404195	-3.5796	/
PRICE	35	-1.651972	-3.5426	/
LNPRICE	35	-1.988829	-3.5426	/
BIRTH	36	-2.171922	-3.5386	/
DEATH	37	-2.010843	-3.5348	/
FERTILITY	31	-1.186243	-3.5614	/

Initial Estimation Equation. An initial estimation equation is constructed by regressing DEMAND on its lag one period (t-1) and the current regressor along with its lags one period (t-1) and two periods (t-2) for each of the macroeconomic variables: LNFD, LNIPC, CPI, SAVINGS, LNPRICE and STOCK, plus the original regressor (with no lag)

of each of the demographic variables: BIRTH, DEATH, FERTILITY and LNLIFE_M (refer to note 3).

The initial estimation equation formulated for analysis is shown below:

$$DEMAND_t = ß_0 + ß_1DEMAND_{t-1} + ß_2LNFD_t + ß_3LNFD_{t-1} + ß_4LNFD_{t-2} + ß_5LNIPC_t + ß_6LNIPC_{t-1} + ß_7LNIPC_{t-2} + ß_8CPI_t + ß_9CPI_{t-1} + ß_{10}CPI_{t-2} + ß_{11}SAVINGS_t + ß_{12}SAVINGS_{t-1} + ß_{13}SAVINGS_{t-2} + ß_{14}LNPRICE_t + ß_{15}LNPRICE_{t-1} + ß_{16}LNPRICE_{t-2} + ß_{17}STOCK_t + ß_{18}STOCK_{t-1} + ß_{19}STOCK_{t-2} + ß_{20}BIRTH_t + ß_{21}DEATH_t + ß_{22}FERTILITY_t + ß_{23}LNLIFE\_M_t$$

The initial estimation equation is subject to subsequent simplification by removing the most insignificant variable from the equation. This process is repeated until further deletion of any insignificant variables from the equation causes autocorrelation in the residuals.

Testing for Residual Serial Correlation. The Lagrange Multiplier (LM) Serial Correlation Test is used to test for the first-order and the second-order residual serial correlation to confirm that the error terms (e_t) (residuals (u_t) have been used in place of errors in the analysis) of the estimated regressions do not exhibit autocorrelation. The P-value for the F-statistic, which is an omitted variable test for the joint significance of all lagged residuals, and the significance level of 5% are used for making decisions.

An equation is tested for the presence of residual serial correlation before and after the simplification process. If the equation passes the test that serial correlation is not present in the residuals, the most insignificant variable is removed from the equation. After removing the variable, the simplified equation is subject to the LM test again in order to ensure that the simplified equation is free of residual serial correlation. Based on the simplified equation, further simplification is made by deleting (again) the most insignificant variable from the equation. After the deletion, the equation is subject to the LM test (again) to confirm that there is no evidence of residual serial correlation in the further simplified version of the equation.

If residual serial correlation is detected as a consequence of removing the insignificant variable, this indicates that the variable should not be removed from the equation at that stage. Therefore, the simplification process is carried on in order to try to delete the next most insignificant variable, i.e. the second most insignificant variable (if the most insignificant variable should not be removed at that stage), then the third most insignificant variable (if the second most insignificant variable should not be removed at that stage). It is a prerequisite for the equation to pass the serial correlation test in the simplification process, both before and after the process. These steps are repeated as part of the subsequent simplification.

Respecifying the Equation. As the simplification process may be stopped because residual serial correlation is detected when trying to delete any insignificant variables further from the equation, a need might arise to respecify the prevailing estimation equation. For example, the first-difference term is introduced to replace the current and the lag one period of a variable. The respecified estimation equation is then subject to the simplification process and the testing for residual serial correlation until the final regression model is obtained.

Testing for Normality. The Jacque-Bera (JB) Normality Test is used to examine whether the residuals of the final estimation regression are normally distributed. The reported probability of the JB statistic and a 5% significance level are used for making a decision whether to reject the null hypothesis or not. A probability that is greater than the significance level leads to a failure to reject the null hypothesis of a normal distribution.

Testing for Heteroscedasticity. White's Heteroscedasticity Test with no cross term is used to investigate the presence of heteroscedasticity in the variance of the residuals of the final estimation regression. The P-value for the F-statistic and the significance level of 5% are used to make a decision on the hypothesis. If the P-value for the F-statistic exceeds the significance level, we may conclude that heteroscedasticity is not present in the variance of the residuals. In the presence of heteroscedasticity, a remedial measure can be taken in order to rectify this situation by using the robust standard errors option for correcting the (conventional) standard errors.

Testing for Redundant Variables. The variables which appear in the initial estimation equation but have been removed sequentially from the equation and are no longer in the final estimation equation are subject to the redundant variables test. The redundant variables test is used to examine the statistical significance of these variables that they all jointly have zero coefficients. The P-value for the F-statistic and the significance level of 5% are adopted as a guide for decision. A P-value for the F-statistic that is larger than the significance level indicates a failure to reject the null hypothesis and the conclusion that these variables are in fact redundant. Therefore, it is appropriate to delete them from the estimation equation.

Testing for Cointegration. With the presence of a group of non-stationary variables in the final estimation equation, these variables are subject to a cointegration test to determine whether they are cointegrated. If these variables are cointegrated, the spurious regression problem (refer to note 4) does not exist. Moreover, a further step is taken to identify the cointegrating relationship among these variables because there is a long-term, or equilibrium, relationship among them. For the purpose of testing for cointegration, Johansen's Cointegration Test is used to determine whether the non-stationary variables are cointegrated.

7.0 EMPIRICAL FINDINGS

Table 2 displays the results of the Ordinary Least Square (OLS) estimation for the initial test equation. From Table 2, the OLS estimation indicates that savings deposits rate, the

Table 2: The OLS Estimation for the Initial Test Equation for the Regression of the Demand for Life Insurance on Macroeconomic and Demographic Variables
Dependent Variable: DEMAND n = 33 (1969 - 2001)

Variable	Coefficient	Std. Error	t-Statistic	P-value
Constant	-668.9117	898.4797	-0.744493	0.4756
$DEMAND_{t-1}$	0.373253	0.278454	1.340448	0.2130
$LNFD_t$	-15.29139	16.09534	-0.950051	0.3669
$LNFD_{t-1}$	12.47218	15.50053	0.804629	0.4418
$LNFD_{t-2}$	1.395330	10.33087	0.135064	0.8955
$LNIPC_t$	-2.850923	10.22042	-0.278944	0.7866
$LNIPC_{t-1}$	-5.305149	8.838500	-0.600232	0.5632
$LNIPC_{t-2}$	6.482374	10.08856	0.642547	0.5365
CPI_t	-0.715280	0.431218	-1.658744	0.1315
CPI_{t-1}	0.440859	0.317975	1.386460	0.1990
CPI_{t-2}	-0.265196	0.421517	-0.629147	0.5449
$SAVINGS_t$	1.605850	0.685652	2.342078	0.0439
$SAVINGS_{t-1}$	-1.135755	0.855365	-1.327802	0.2169
$SAVINGS_{t-2}$	1.990159	0.854826	2.328146	0.0449
$LNPRICE_t$	-37.35373	45.08708	-0.828480	0.4288
$LNPRICE_{t-1}$	120.4136	48.30802	2.492622	0.0343
$LNPRICE_{t-2}$	-72.08074	29.42298	-2.449811	0.0368
$STOCK_t$	0.030118	0.022312	1.349832	0.2100
$STOCK_{t-1}$	0.063325	0.023701	2.671841	0.0255
$STOCK_{t-2}$	0.076466	0.027498	2.780772	0.0214
$BIRTH_t$	-0.283780	1.030075	-0.275495	0.7892
$DEATH_t$	3.462857	6.893524	0.502335	0.6275
$FERTILITY_t$	-2.168408	8.107348	-0.267462	0.7951
$LNLIFE\_M_t$	159.0396	209.4858	0.759190	0.4672
R^2		0.867937		
Adjusted R^2		0.530444		
S.E. of regression		3.296715		
F-statistic		2.571719		
P-value (F-statistic)		0.071747		

price of insurance and stock market return appear to be important variables associated with the demand for life insurance. The current and the lagged two periods values of the savings deposits rates, plus the lagged one period and two periods values of the price of insurance and of the stock market return are statistically significant. These variables have a significant relationship with the demand for life insurance. While both the savings deposits rate and stock market return are positively related to the demand for life insurance, the relationship between the price of insurance and the demand for life insurance is inconsistent.

A close examination of Table 2 further reveals that the signs of the original and lagged regressors are inconsistent (except for the variable of stock market return). They tend to have a mixture of positive and negative signs. The initial estimation equation has been

subject to the simplification process and the insignificant variables have been deleted sequentially from the estimation equation after confirming that there is no evidence of residual serial correlation. Through the simplification process, variables such as $LNFD_{t-2}$, $FERTILITY_t$, $LNIPC_t$, CPI_{t-2}, $BIRTH_t$, $LNIPC_{t-2}$, $LNLIFE\_M_t$, $LNFD_t$, $DEATH_t$, $DEMAND_{t-1}$, $SAVINGS_{t-1}$, $STOCK_t$, $LNFD_{t-1}$, CPI_t, $LNIPC_{t-1}$, CPI_{t-1}, $LNPRICE_{t-2}$ and $SAVINGS_{t-2}$ are removed sequentially from the estimation equation. However, the insignificant variables such as $STOCK_{t-1}$ and $STOCK_{t-2}$ cannot be removed from the estimation equation because residual serial correlation is detected when trying to delete them from the equation. At this stage, the prevailing estimation equation is respecified. The first-difference term for the price of insurance has been used in place of its current regressor and its lag one period, i.e. ?$LNPRICE_t$ is used to replace $LNPRICE_t$ and $LNPRICE_{t-1}$. The respecification is carried out in this way because the current and the lagged one period values of this variable have a contradictory sign. The respecified estimation equation is then subject to the simplification process and the testing for residual serial correlation is repeated.

In the second round of simplification, the insignificant variables such as $STOCK_{t-1}$ and $STOCK_{t-2}$ still cannot be deleted from the estimation equation because their deletion causes serial correlation in the residuals. Hence, the simplification process is forced to stop here and the final regression model is obtained.

Table 3 exhibits the findings on the OLS estimation for the final test equation. The final estimation equation passes the residual serial correlation tests (first order residual serial correlation: F-statistic = 3.178499, P-value = 0.085460; second order residual serial correlation: F-statistic = 2.719959, P-value = 0.083914) and the heteroscedasticity test (F-statistic = 0.266566, P-value = 0.971084). The test for normality indicates that the residuals are normally distributed (JB statistic = 1.015885, P-value = 0.601732), and the variables in the final estimation equation have a low to moderate pair-wise correlation (i.e. in the range of –0.560 to 0.683).

From Table 3, the OLS estimation reveals that there are two major types of macroeconomic variables which appear to be statistically significantly related to the demand for life insurance: the current savings deposits rate and a change in the price of insurance.

The current savings deposits rate has a significant positive relationship with the demand for life insurance. This finding is contrary to the hypothesized proposition that savings deposits rate is negatively related to the demand for life insurance. The savings deposits rate is regarded as a competing yield on alternative savings products for comparison against the interest rate being credited to the insurance policy in the accumulation of cash values under the policy. Therefore, one would naturally expect that higher interest rate on savings deposits tends to cause insurance products to become a less attractive savings instrument. However, the findings on this variable have failed to show the expected negative sign. This finding does not support the findings of Cargill and Troxel (1979) that the competing yield tends to be frequently negatively related to the demand for life insurance. Moreover, this finding is in contrast to the finding of Rubayah and Zaidi

Table 3: The OLS Estimation for the Final Test Equation for the Regression of the Demand for Life Insurance on Macroeconomic and Demographic Variables

Dependent Variable: DEMAND n = 34 (1968 - 2001)

Variable	Coefficient	Std. Error	t-Statistic	P-value
Constant	24.86524	2.274150	10.93386	0.0000
$SAVINGS_t$	1.255131	0.351203	3.573801	0.0013
? $LNPRICE_t$	-39.40319	16.35567	-2.409145	0.0226
$STOCK_{t-1}$	0.019857	0.013502	1.470638	0.1522
$STOCK_{t-2}$	0.018822	0.014025	1.342099	0.1900
R^2		0.595196		
Adjusted R^2		0.539361		
S.E. of regression		3.235946		
F-statistic		10.65991		
P-value (F-statistic)		0.000019		

(2000) that the personal savings rate significantly and negatively influences the demand for life insurance. The contradictory result of this study compared to those of past studies might be due to the way in which this variable has been compiled from a combination of three different savings deposits rates that have caused this variable to have a wrong sign. Further, from the results shown in Tables 2 and 3, they indirectly imply that there is no significant relationship between the savings deposits rates in the past and the demand for life insurance.

A change in the price of insurance has a significant negative relationship with the demand for life insurance. A negative price change tends to associate with an increase in the demand for life insurance. More formally, a decline in the price change of 1%, on average, leads to about 0.394% (being the coefficient of ? $LNPRICE_t$ multiply by –0.01, i.e. –39.40319 * –0.01 = 0.394) absolute increment in the demand rate for life insurance in Malaysia. In other words, the estimated price change elasticity is –1.115 (being the coefficient of ? $LNPRICE_t$ divided by the mean value of DEMAND, i.e. –39.40319 / 35.32529 = –1.115). The percentage change in the demand rate is 1.115% for a given small percentage decline in the price change. The findings on this variable lend support to the findings of Babbel (1985) and Browne and Kim (1993) that the price of insurance is significantly inversely related to the demand for life insurance. When the cost of purchasing life insurance becomes more expensive, it tends to discourage people from owning life insurance policies.

It can be noted from Table 3 that the performance of the stock market in the immediate previous period and two periods ago have a direct relationship with the demand for life insurance. However, the past performance of the stock market is not statistically significantly related to the demand for life insurance in Malaysia.

A close scrutiny of Table 3 further reveals that the savings deposits rate, the change in the price of insurance, together with the stock market return in the last two periods collectively and significantly explain about 60% of the variance in the demand for life insurance in Malaysia (R^2 = 0.595196, P-value = 0.000019). This finding indicates that

about 40% of the variance in the demand for life insurance is not being explained. There are other variables that are important in explaining the demand for life insurance that have not been considered in this study.

When the non-stationary variables in the final estimation equation are subject to Johansen's Cointegration Test, the findings indicate that there is one cointegrating equation at a 5% significance level among the variables of the demand for life insurance, savings deposits rate and stock market return. Since cointegration is found among the non-stationary variables, we are not concerned about the spurious regression problem that would render the OLS estimation meaningless. The demand for life insurance, savings deposits rate and stock market return have a long-term (or equilibrium) relationship. The cointegrating equation for these variables at their level series indicates that the long run multiplier on the demand for life insurance with respect to savings deposits rate is 2.98 and with respect to stock market return is 0.55.

Other macroeconomic variables such as the financial development, income per capita, inflation, lags of savings deposits rate, the price of insurance two periods ago and the current stock market return, plus all of the demographic variables investigated such as the crude live-birth rate, crude death rate, total fertility rate and life expectancy at birth, appear not to have an important association with the demand for life insurance. The results of the redundant variables test have proven the statistical significance of these variables that they all jointly have zero coefficients. Therefore, it is appropriate to delete these variables from the estimation equation.

The finding on financial development is in line with the finding of Outreville (1996) that it does not have a significant relationship with the demand for life insurance. The finding on income does not lend support to the findings of Cargill and Troxel (1979), Babbel (1985), Browne and Kim (1993), Outreville (1996) and Rubayah and Zaidi (2000) that it is positively and significantly related to the demand for life insurance. Likewise, the finding on inflation also does not confirm the findings of Browne and Kim (1993) and Outreville (1996) that inflation has a significant negative relationship with life insurance demand. Further, the finding on life expectancy at birth does not provide further evidence for the finding of Outreville (1996). Even though life expectancy at birth in this study is found to be positively related to the demand for life insurance, it is not statistically significant and is eventually removed from the estimation equation.

8.0 CONCLUSION

The major findings of this study indicate that savings deposits rate and the price of insurance are two important macroeconomic variables associated with the demand for life insurance in Malaysia. The finding that the savings deposits rate fails to show the expected negative sign needs further research to confirm the relationship between these two variables. A change in the price of insurance has a significant negative relationship with the demand for life insurance. The elasticity of demand with respect to price change is −1.115. The demand for life insurance tends to have a greater magnitude of change when there is a small change in the price change of insurance. A small percentage

reduction in the price change would help to increase the demand for life insurance. This finding has an important implication on policy formulation for the policy makers of the central bank and the marketing directors of life insurance companies. This finding may be helpful to them in developing pricing strategies to achieve a specific sales target for life business.

The findings reported in this paper are a preliminary finding of a research project undertaken to investigate the demand for and lapsation of life insurance. Further research in this area is warranted. The current study will continue to investigate the demand for life insurance more deeply by examining other proxies for the macroeconomic variables included in this study. For example, the ratio of quasi-money to broad money, economic growth rate and fixed deposits rate (and the discount rate on Treasury Bills) will be used as an alternative proxy for the financial development variable, the income variable and the interest rate variable respectively. Furthermore, life insurance demand defined differently by number of policies and by premium will be examined, and a comparative investigation in this area involving data from the United States will be undertaken.

ABOUT THE AUTHORS

Chee Chee Lim is a research student undertaking the doctoral program of the Faculty of Actuarial Science and Statistics at Cass Business School. (E-mail: C.C.Lim@city.ac.uk)

Steven Haberman is a Professor of Actuarial Science and the thesis supervisor of Chee Chee.

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NOTE

1. We note that the fair premium for life insurance is related indirectly to the life expectancy at birth.

2. Prior to 23 October, 1978, the interest rates of financial institutions in Malaysia were regulated by the Central Bank. The interest rates were fixed by the Central Bank, and changes in these rates were being made and announced by the Central Bank from time to time to become effective at a specific date. However, with effect from 23 October, 1978, the financial institutions were free to quote their interest rates. Since then, the data on interest rates were reported in terms of the lowest, the highest, and the most frequently (mode) quoted rates. These kinds of data are available for years 1979-1997. Later, starting from January 1998, there was a change in the way the data were reported. The interest rates reported are the rates that reflect the average maturity of the deposits and loans. These data are available for years 1980-2001.

3. The initial selection of the number of lagged terms of the macroeconomic and demographic variables in the initial estimation equation is arbitrary, so long as the initial equation constructed is free of residual serial correlation so that the initial equation can be subject to simplification. Other forms of the initial estimation equations have been formulated but unfortunately residual serial correlation is detected in these equations. Two similar models with more lags of the dependent variable being the explanatory variables in the estimation equation (i.e. one with two lags and another one with three lags of DEMAND as explanatory variables) and yet another similar model with two lags of each of the demographic variables have been explored but without success due to there being evidence of residual serial correlation.

4. The spurious regression problem occurs when the error terms (the residuals) of the regression model have a unit root. The non-stationary behaviour in the error terms is caused by the same behaviour contained in the non-stationary variables that are not cointegrated. If the non-stationary variables are not cointegrated, they do not trend together but tend to diverge from one another over time. This results in the errors having a trend and becoming increasingly large over time. These variables do not satisfy an equilibrium relationship among themselves. Due to the spurious regression problem, the usual OLS estimation can yield results that are misleading and incorrect.

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