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The Case of Canada

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Article abstract

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Determinants of Demand for Life Insurance: The Case of Canada

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This study examines the determinants of demand for life insurance in Canada. Lewis (1989) model is used to identify the determinants of life insurance demand. However, based on the findings by Stock and Watson (1988) of possible spurious regression, especially in light of our limited dataset, we focussed on testing for co-integration to establish long-run equilibrium among identified variables rather than estimating a demand model. The Johansen co-integration methodology was applied. The results confirm that education, income, inflation, social security, interest rates, dependency ratio, financial development and life expectancy have long term equilibrium relationship with life insurance. An interesting result was that co-integration between income and demand for life insurance occurred after a 3-year lag period. On the basis of the permanent income hypothesis, an interpretation of this result could be that people wait to make sure that their increase in income is permanent before they increase their spending on certain items, including life insurance. While this study does not produce a definitive structural demand model for life insurance, the results provide a valid basis for governments and other life insurance policy makers across the globe to focus on certain key variables as potential drivers of demand for life insurance.

1. Introduction

The demand for life insurance is a topic that has been given considerable attention throughout the economic development of world markets after World War II. This was so because for the last 50 years researchers have tried to identify the factors that drive the demand for life insurance. Most of these earlier studies were developed without any theoretical model to back up the findings. As a result, they met conflicting results and a lot of criticism. According to Fortune (1973), the results have suffered from the inability to establish a theoretical framework for comparing the studies and coming to the most reasonable conclusions. Later studies then sought to develop the theory that all pointed out to Yaari's (1965) theory of the consumer as a starting point. However, majority of the studies thereafter were still without any theory and comprised mostly cross-country studies of either developing and/or developed countries. The most comprehensive of those studies included among others, Beck and Webb (2003) who sought to find demographic, economic and institutional determinants of demand for life insurance across countries using three different measures of life insurance consumption.

Though the two main categories of such studies were empirical versus theoretical, other criticisms came from studies on specific countries whose supporters assert that the determinants of life insurance consumption vary from country to country and therefore cross country studies offer inconclusive results. One of such country-specific studies was carried by Hwang and Gao (2003) who sought to find the determinants of demand for life insurance in an emerging economy such as China. Their argument was that the factors that influence the demand for life insurance are complex and therefore varied from country to country. We support Hwang and Gao (2003) assertion based on inconclusive results from most cross country studies. This is so because the determinants tested were only applicable to a few of the selected countries (Back and Webb, 2003) and as thus there was always a country specific bias.

The motivation of this study is to find the determinants of demand for life insurance in Canada and link them with a theory such that the much debated separation of theory from empiricism in the studies on demand for life insurance is addressed. This study also includes more variables than Hwang and Gao (2003)'s study. Their research only looked at four key variables. Moreover, Canada is chosen since none or few studies have been done on determinants of life insurance consumption in Canada as a whole. The only notable study conducted on Canada was done by Di Matteo and Emery (2002), who looked at wealth and demand for life insurance holdings of male probated decedents in Ontario in 1892. However, Ontario is a small sample of Canada and therefore would not be a true representative of the whole country. Additionally, Canada was selected due to higher prospects of available data which would allow the researchers to derive reasonable conclusions.

Rest of the paper is arranged as follows: objectives and brief history of life insurance in Canada as part of the introduction in chapter 1, literature review in chapter 2, and chapter 3 is the methodology. Empirical findings are found in chapter 4 and finally chapter 5 presents summery and conclusions.

1.1 Objectives

The objective of this research is twofold: First, to perform co-integration analysis to understand the presence of a long term relationship across the life insurance determinants in Canada; second, to link the determinants of demand for life insurance with a theory to address the likely separation of theory from empiricism in most studies.

1.2 Brief History of Life Insurance in Canada

The insurance industry is a key component of the economy by virtue of the amount of premiums it collects, the scale of its investment and, more fundamentally, the essential social and economic role it plays in covering personal and business risks. Vela and Faubert (2002) indicated that in recent years, Canada's financial services industry has undergone tremendous and pervasive change and it is now mature. Banks, investment dealers, trust companies, credit unions and insurance companies underwent a convergence that stemmed from globalization of financial markets, technological advancements, changing demographics and businesses' greater access to capital markets outside. These changes in the marketplace

contributed to legislative and regulatory revisions that broadened the scope of financial institutions and placed financial groups in direct competition with each other. The regulatory authorities now permit certain banks to establish insurance subsidiaries and to sell property and casualty insurance products. Likewise, certain life insurance companies can now establish banks and offer financial intermediation services, hence consolidation.

A point to note is that the rising level of investment in human capital through work experience and education has driven much of real incomes throughout economic development in Canada (Di Matteo and Emery, 2002). As a result, most households in North America depended on educated workers. This was tragic if the household head dies. More importantly, Di Matteo and Emery (2002) added further that a common theme in historical studies of life insurance in developing countries was that life insurance was an unsought asset due to the ignorance or improvidence of consumers, or due to consumers perceiving the insuring of a life as a suspect or immoral contract. As such, the rise of the life insurance industry and extent of insurance coverage was largely a function of the aggressive sales efforts of life insurance salesmen. Moreover, observations point out the importance of problems of asymmetric information between buyers and sellers of life insurance precluding households from purchasing coverage at affordable rates. Information and social barriers and market imperfections frustrate the demand for life insurance and as a result the growth of life insurance markets is largely explained by changing preferences and the reduction of market imperfections and can be shown as an increase in the level of insurance coverage for households.

According to Di Matteo and Emery, the development of life insurance market also reflects favourable changes in the relative price of life insurance contracts versus its alternatives. As an example, favourable income tax treatment of life insurance premiums provided through the workplace, and/ or employers subsidizing the insurance premium for employees, is an obvious explanation for the expansion of life insurance coverage after World War II (Di Matteo and Emery, 2002). As a result, an understanding of a households' demand for life insurance over the life cycle can shed light on the demographic forces that were behind the rapid growth of Canadian financial markets in the late 19th century as Canada went from being a relatively young frontier society to an older, more settled economy.

Furthermore, Vela & Faubert (2002) emphasized that throughout the decade, the insurance industry earned about 20% of the financial sector's operating revenue. This industry's stability may arise from the intrinsic nature of insurance products offered and consumer demand for those products. Revenues for the life and health insurance industry rose gradually throughout the period except for a surge in 1997 when revenues rose 20% from $35.9 billion to $42.1 billion. A catalyst for the large surge in revenues in 1997 may have been the federal budget change effective in 1996 that required Canadians to mature their retirement plans two years earlier, at age sixty-nine. As Vela & Faubert (2002) shows, the demutualization of insurers coincided with changing investment mixes throughout the period. From 1996 to 1998, investment in stocks doubled for Canadian life and health insurance companies. The return on capital employed for life and health insurers grew modestly throughout the 1990s with the largest return (5.6%) occurring in 1997. At the same time, annuity claims have more than doubled owing to an aging demographic in Canada. O'hagen (2005)'s view was that savings rate has declined during the 1990s

and has continued to reach current historical lows but the aging of the population is believed to continue to play an increasing role in the evolution of personal saving through life insurance and annuities. Meanwhile, Gaedeke (1995) indicates that the powers of life insurance are felt worldwide by the many fortunate individuals whose loved ones had purchased policies before their death that have provided security and protection in their dependents' lives. Life insurance in Canada is indeed an important financial asset whose exact determinants need to be investigated.

2. Literature Review

According to Brown and Kim (1993), theoretical models of the demand for life insurance have been derived by Yaari (1965), Fischer (1973), Pessarides (1980), Campbell (1980), Karni and Zilcha (1985,1986) and Bernheim (1991). All these models point out to Yaari (1965) theory of the consumer who viewed life insurance as the means by which uncertainty in the household income stream related to premature death of the household primary wage earner was reduced.

2.1 Theory of Life Insurance

Yaari (1965) is the first to develop a model based on the life cycle framework in which households maximize expected utility of their life time consumption. Other theorists such as Fisher (1930) and Marshal (1920) failed to account for how rational such a consumer might be expected to behave which Yaari has done (Brown and Kim, 1993).

In Yaari's framework, a consumer purchases life insurance to increase his expected lifetime utility given by:

$$U(c) = \int_0^T \alpha(t)g[c(t)]dt + \beta(T)\varphi[S(T)] \quad (1)$$

where:

φ	= utility of bequeaths and is non- decreasing and a negative S(T) subtracts from utility,
T	= the consumer's lifetime,
$\varphi[S(T)]$	= the instantaneous utility of bequeaths,
$g(c(t))$	= the instantaneous utility from consumption,
$\alpha(.)$ and $\beta(.)$	= discount factors.

This equation indicates that the consumer's preference depends on the rate of consumption at every moment and S(T), which represents bequeaths at time of death.

Meanwhile Lewis (1989) treatment of demand for life insurance differs from prior theoretical studies by setting the household's goal as maximization of beneficiaries expected utility. In the Lewis model, there are two types of beneficiaries-a spouse and children, with a spouse having a bequeath motive and

capital stock at the time of wages earner's death and children having neither bequeath motive nor capital stock at the wage earner' death (Brown and Kim, 1993). Assuming that all family members have the same degree of risk aversion, Lewis (1989) shows that total life insurance written is simply the sum of purchases by spouse and each offspring. The total life insurance ownership is therefore given by:

$$(1\text{-}lp)F = \max \{[1\text{-}lp/l\ (1\text{-}p)]1/\delta\ TC\text{-}W,0\}, \quad (2)$$

where:

l	= policy loading factor (ratio of costs of insurance to its actuarially fair value),
p	= the probability of wage earners death,
F	= the face value of all life insurance written,
δ	= a measure of the beneficiary's relative risk aversion,
TC	= the present value of total consumption of each offspring until he/she leaves the household,
W	= the household's net worth.

Equation 2 indicates that life insurance consumption increases with the wage earners probability of death (p) and the present value of the family's consumption assuming that the wage earner survives (TC). Life insurance consumption also increases with the family's degree of relative risk aversion (δ) and negatively related to the policy loading charge (l) and the family's wealth (W).

Consistent with adopted theory as shown by equation 2, life expectancy affects the demand for life insurance by hypothesis since life expectancy is correlated with the probability of death (p). Lewis (1989) model also shows that family member's future consumption (TC) is dependent upon the survival of the wage earner which indirectly suggests that personal disposable income (inc), dependency ratio (dr), and some level of education (educ) would all affect demand for life insurance, also cited in Brown and Kim (1993). The degree of risk aversion (δ) in a given country may be related to the predominant religion, and as a result a predominant religion in a country may affect the demand for life insurance. However, emphasis will be given to Islamic religion in this study because it is believed to be negatively related to life insurance (Brown and Kim (1993). Social security payments by governments are also a source of income to the recipients and can be viewed as a proxy for wealth and therefore they reduce demand for life insurance (Lewis, 1989). The price of insurance or loading factor (l) is also hypothesised to reduce demand for life insurance according to Lewis (1989) model. A reasonable assumption made here is that when less insurance is supplied the price of insurance will be higher and the amount of insurance will be lower.

2.2 Empirical Review of Determinants of Life Insurance

Premium expenditures have been consistently used in previous studies as a measure of life insurance consumption. For example, Hwang and Gao (2003) used average amount of life insurance premium per person and premium expenditure per

worker. However, Brown and Kim (1993) emphasized that life insurance premiums are not a perfect measure of insurance coverage since premiums vary from country to country due to differences in types of policies sold, costs of writing life insurance, government regulation and competitiveness of the market. Meanwhile Beck and Webb (2003) added depth and capitalised on this deficiency by testing demand for life insurance on the three measures of life insurance consumption: life insurance density (premiums per capita), life insurance penetration (premiums per GDP) , and life insurance in force to GDP. However, premiums data have still been widely used because of their availability.

Studies examining the effect of education on life insurance demand generally presume that a positive relationship exists. Li, Moshirian, Nguyen and Wee (2007) emphasized that education is associated with a stronger desire to protect dependents and safeguard their standard of living. On the other hand, Beck and Webb (2003) suggested that education offers a better understanding of the benefits of risk management and long-term savings that may encourage risk aversion. In the meantime, Hwang and Gao (2003) specified that education increases the recognition of the availability of life insurance products. With a different perspective from developing countries, Outreville (1996) contended that education is a source of comparative advantage in financial services. In conclusion, these studies hypothesise a positive relationship between education and life insurance consumption.

Life Expectancy has also been identified as a determinant of life insurance demand. Average life expectancy is defined as the number of years the average individual in a country is expected to live. This appears to be the proxy for probability of death (p) which is hypothesized to have a positive relationship with life insurance consumption (Lewis, 1989; Levy et al, 1988). Brown and Kim (1993) suggest that probability of death is positively related to life insurance by hypothesis, therefore life expectancy is hypothesised to be negatively correlated with demand for life insurance. Interestingly, Beck and Webb (2003) found that longer life expectancies lead to lower mortality coverage costs and lower perceived need for mortality coverage but higher savings through life insurance. Though more studies including Lim and Haberman (2004) hypothesised a positive relationship, the study of Brown and Kim (1993) suggested a negative relationship, hence their argument makes the expected relationship a bit ambiguous.

Lewis (1989) further showed that the demand for life insurance increases with the number of dependents in a household. Campbell (1980) and Li et al (2007) had also argued that the protection of dependents against financial hardships is the major force driving life insurance demand. The authors used age dependency ratio (ratio of dependents under 15 and over 64/working age population aged between 15 and 64) to capture the relationship. Interestingly, Beck and Webb (2003) found an ambiguous relationship for young dependency ratio and a positive relationship for old dependency ratio. Overall, the demand for life insurance is hypothesised to be positively related to dependency ratio.

Religion has also appeared in other studies. Understanding of the predominant religion in a country is important to the extent that it affects the nation's degree of risk aversion (δ). Black and Skipper (2000) asserts that some Islamic scholars have argued that insurance is an attempt to defy fate as predetermined by God, and thus Western-style insurance can be dismissed as a form of gambling which is prohibited

by the Koran. Beck and Webb (2003) emphasizes this view when they mentioned that followers of Islam are known to disapprove life insurance because it is considered a hedge against the will of Allah. Similarly, Brown and Kim (1993) showed that other things equal, life insurance consumption was less in predominantly Muslim countries. Outreville (1996) suggested that the percentage of Muslim population in a country can be used to capture the hypothesized negative relationship between Islamic religion and life insurance. As a result, there is a hypothesised negative relationship between Islamic religion and life insurance consumption.

The positive relationship between income and life insurance demand has appeared in most studies and among others; Hwang and Gao (2003), Outreville (1996), Li, Moshirian, Nguyen and Wee (2007) and Beck and Webb (2003). It has been argued that as income increases, the need to absorb surplus funds and wealth (W) increases of which life insurance is one of the instruments for absorption of such funds. Moreover, income is thought to increase the affordability of life insurance products, hence increasing its consumption. This is also supported by the theoretical study of Fortune (1973) who emphasized that human income (wages and salaries) are lost to the family when the bread winner dies therefore life insurance protects consumers from that loss of utility. Most of the studies showed a strong positive relationship except Beck and Webb (2003) who found a weak predictive power of income from regression even though the bivariate correlation analysis suggested a high income elasticity of life insurance consumption. They found that there was no independent effect on the income level on life insurance in force to GDP even though other two measures were showing a strong positive effect. Social security has also been viewed as a proxy for wealth and was considered a substitute for life insurance by Li et al. (2007), hence negatively affect life insurance demand. This has also been confirmed by Lewis (1989).

Meanwhile the negative effect of inflation on life insurance is widely confirmed. Liam and Rulli (2006) suggested that inflation has a dampening effect on demand for products offered by life insurance companies. This view is also supported by Li et al (2007), who argued that inflation erodes the value of life insurance, making it less attractive. On a different viewpoint, Beck and Webb (2003) specified that countries with higher inflation rates experience lower life insurance consumption. Meanwhile, Outreville (1996) suggested that inflation alters consumption patterns of insurance products and savings. Therefore, inflation is hypothesized to affect demand for life insurance negatively. Black and Skipper (2000) further argued that it is impossible to discuss inflation without discussing interest rates, for inflation expectations affects interest rates. They argued that in times of high inflation and significant economic volatility, consumers seek shorter-term, more liquid investments and avoid longer-term, fixed commitments. Therefore, high inflation and the resulting high and volatile interest rates caused many existing and prospective policyholders in the US in the late 1970's to question where their older policies offered sufficient value and flexibility. However, Li et al (2007) offered ambiguous relationship as they showed that low interest rates decrease the cost of insurance thereby increasing its consumption while consumers reduce their number of purchases given anticipation of higher returns in other investments. Therefore the relationship between interest rates and life insurance consumption is ambiguous.

Policy loading factor (price or cost) is critically important determinant of life insurance demand. According to Black and Skipper (2000), the prices that the insurers charge are influenced by their cost structures, competitiveness of particular line of life insurance, government tax and some other policy. Unfortunately, no completely satisfactory measure of price exists and proxies are used. For example, Brown and Kim (1993) used the ratio of total expenditures on life insurance premiums to the amount of life insurance in force which is interpreted as the cost per dollar of life insurance coverage. Lewis (1989) also shows that the price of insurance directly affects household's total wealth if the insured dies. Therefore price is expected to be negatively related to life insurance consumption. With regard to financial development, Beck and Webb (2003) argues that a good banking sector increases confidence consumers have in their financial institutions such as life insurers. On a similar note, Outreville (1996) indicated that banking sector is thought to be a predominant financial institution in developing countries. Although he found the expected positive relationship insignificant, financial development is hypothesized to positively affect demand for life insurance as in the study of Beck and Webb (2003). Table 1 below presents hypothesised relationship among the variables.

Table 1. Summary of the Hypothesized Relationship between the Variables

Type	**Number**	**Variable**	**Hypothesized Relationship**
Demographic	1	Education	Positive
	2	Life Expectancy	Ambiguous
	3	Dependency Ratio	Positive
	4	Religion (Islam)	Negative
Economic	5	Income	Positive
	6	Inflation	Negative
	7	Interest Rates	Ambiguous
	8	Social Security	Negative
	9	Loading Factor	Negative
	10	Financial Development	Positive

3. Methodology

The Johansen (1988) multivariate co-integration approach is used in this study. Johansen methodology is preferred to the Engel-Granger (1987) two-step approach due to the asymptotic properties, which is illustrated below in 3.2. Model Specification. Furthermore, as illustrated by Otuteye et al (1992), the Johansen approach is more robust to departures from normality and examines all the possible co-integrating vectors in a multivariate system unlike the Engle-Granger procedure that focuses only on the dominating vector.

3.1 Data

The data for this study consists of annual aggregate data from 1990 to 2006. The data points were constrained by the data on the dependent variable (gross life insurance premium) which could not be found on quarterly or monthly basis. The available data only spanned the period from 1990 to 2006 which was obtained from the Organization for Economic Cooperation and Development (OECD), Statistics Canada and World Bank Group. By and large, the data points were constrained by fragmented data on the concerned variables especially prior to 1990. We also used 2006 as the ending data point because the study was conducted in 2007 and the only available annual data was up to 2006.

3.2 Model Specifications

Price and religion variables were dropped with the former due to lack of data and the latter due to low composition of Islam in Canada. Therefore, the following variables were tested and the model was as shown below:

$$DEMAND2=\beta 0+ \beta 1\ inc+ \beta 2\ inf + \beta 3ir + \beta 4ss + \beta 5fd + \beta 6educ+ \beta 7lifex + \beta 8dr+\varepsilon$$

where:

demand2	= life insurance density (premiums per capita)
inc	= total disposable income
inf	= inflation
ir	= real interest rate
ss	= social security expenditure
fd	= financial development
educ	= education
lifex	= life expectancy
dr	= young dependency ratio
ε	= the error term

Due to data limitations which translated into low degrees of freedom, Ordinary Least Squares (OLS) regression was expected to produce insignificant results. Granger and Newbold (1974) indicated that usually the first difference of the time series is used whenever the variables are assumed not to be stationary. Even though it does not always provide a solution, Granger and Newbold asserted that this has been widely used in most studies. As a result, the first and second differences were used and they still yielded insignificant statistical results. Therefore, rather than estimating a demand model, we focussed on testing for co-integration, with the rationale being to fully explore the co-integrating or long run equilibrium relationships between these variables and the demand for life insurance.

3.3 Testing for Co-integration

Testing for co-integration if there is a hypothesised value of β (from $y_t - \beta x_t$) is simple because it is testing whether y_t and x_t are co-integrated, which could be done by defining a new variable $s_t = y_t - \beta x_t$ and then applying either DF or ADF test to test the variable $\{s_t\}$. If a unit root in $\{s_t\}$ is rejected in favour of the I (0) alternative, then y_t and x_t are co-integrated (Wooldridge, 2008). Therefore the null hypothesis is that y_t and x_t are not co-integrated.

Co-integration determines whether non-stationary variables have a long run equilibrium relationship between them. This implies that the variables tend to move together, and whenever they drift away from each other, there is a system that will drive them back to equilibrium. If such a relationship exists, then the variables are said to be co-integrated. Engle and Granger (1987) pointed out that testing whether a set of variables is co-integrated is frequently of interest. This is so because of the economic implications such that some system is in equilibrium in the long run, or it may be sensible to test such before estimating a dynamic multivariate model.

One of the solutions to inadequate data had been to run regressions on first difference. However, Mills (1991) indicated that regression on first difference of time series provides no information about the long run relationship, which can only be provided by a regression estimated on levels. Thus only if integrated series are co-integrated can inference be carried out on models estimated on levels, and only if they are co-integrated is there a meaningful relationship among them. If the series is not co-integrated, then there is no equilibrium among them. This notion was supported by Stock and Watson (1988) who specified that it has been recognized that the usual techniques of regression analysis can result in highly misleading conclusions when the variables contain stochastic trends. This has been known as the problem of spurious regressions. Largely influenced by the techniques of Box and Jenkins, the accepted solution to the problem of non-stationarity (integration) has been to transform the variables so that they appear to be stationary; in practice this typically means using first differences of the series. Unfortunately, by simply using first differences of the data in the regressions generally will not suffice to uncover the true relations as Mills (1991) reiterated above.

A test of co-integration is therefore necessary to obtain a meaningful long run relationship between each variable and the dependent variable rather than trying to transform and estimate an insignificant demand model. Another possibility is to carry out Granger Causality Test which again is not meaningful because the data points are narrow. Otuteye (1987) indicated that testing for causality in annual data can be a problem in that you cannot specify many lags whereas with quarterly data it was plausible to specify four lags. The author indicated that with annual data only 2 lags could be specified citing an example that it was not plausible for advertising four years ago to cause today's consumption.

Due to the spurious regression problem and limitations on the data, we tested only for co-integration. The estimators in this process are also expected to behave better than the regression estimates because they take into account the error structure of the underlying process, which regression estimates do not (Johansen, 1988).

Nonetheless, co-integration can only be carried out if integrated series is of order 1, I (1) or greater. Therefore it is necessary to first test the variables for stationarity i.e. I (0) or in other words, rejection of unit root before co-integration is done. This is usually done by means of the unit root tests. According to Otuteye et al (1992), the two commonly used tests in the literature are the Augmented Dickey-Fuller (ADF) due to Dickey and Fuller (1979, 1981) and the Philips-Perron (PP) test due to Phillips (1987). In this study both ADF and Phillips-Perron tests will be used. PP is used more specifically in that it is robust over a wide range of statistical properties of time series and it is applicable to time series that are weakly dependent and heterogeneously distributed.

4. Empirical Findings

To determine if the variables have any long run relationship with demand for life insurance, 17 observations and a test of co-integration were performed. Results of these tests are presented below in 4.1 and 4.2.

4.1 Descriptive Statistics

The actual annual data is comprised of 17 observations. Summary descriptive statistics of the levels are presented in Table 2 below:

Table 2. Descriptive Statistics Levels

Variable	Obs	Mean	Std.dev	Min	Max
Demand2	17	927.5433	1.370	484.657	1528.396
inc	17	2.609176	0.030	0.0165	0.026
inf	17	0.01976	0.013	0.01	0.056
lifexp	17	76	1.27	74	78
ir	17	0.05341118	0.26	0.025	0.1304
ss	17	0.0600529	0.002	0.0527	0.0635
fd	17	103.0588	23.8	69.1	151.2
dr	17	0.2854118	0.021	0.246	0.309

Demand 2 (life insurance density) has a mean of CAN $ 927.54 million which is almost midpoint between the minimum value and the maximum value so the data is evenly distributed. The other variables also show no presence of outliers. However, the variance in most variables is small as indicated by lower standard deviations, which could make these variables not good candidates for OLS regression. This is so because the slope estimator $\beta\hat{}_1$ is given by total covariance between x and y divided by the total variance in x $[\hat{\boldsymbol{\beta}}_1 = \sum_{i=1}^{n}(\boldsymbol{xi} - \overline{\boldsymbol{x}})\boldsymbol{yi} / \sum_{i=1}^{n}(\boldsymbol{xi} - \overline{\boldsymbol{x}})\boldsymbol{\hat{}}\mathbf{2}$. If there is no variance in x, then β is undefined. Therefore we need more variance in the independent variables, x_i.

A test of co-integration was performed to determine if the variables have any long run relationship with demand for life insurance. However, the test for co-integration required formal tests on unit root carried out first.

4.2 Results of Unit Root Tests

Both the Augmented Dickey Fuller and Phillips Perron unit root tests were used. The tests were done with Stata Software both with a trend and a 1%, 5% and 10% level of significance respectively. As with Lim and Haberman (2004), a 5% significant level was adopted and a trend selected in all variables since they were presumed to exhibit a trend. The ADF unit roots are done on both the levels and their first difference and the results are presented in Tables 3 and 4 below respectively. If the order of integration is higher than one, that will be evident with the first difference being I (1) or higher. The null hypothesis of unit root is rejected in the two levels of life expectancy and interest rates and under ADF test.

Table 3. Unit Root Results under Augmented Dickey-Fuller (ADF) Test-Levels

The hypothesis: H0:$\delta=0$(Unit root) H1: $\delta\neq0$ where $\delta=\rho-1$

Decision rule: If t* > ADF critical value, => not reject null hypothesis

If t* < ADF critical value, => reject null hypothesis

Variable	**n**	**Test Statistic (With Trend)**	**Critical value**	**1% Critical value**	**5% Critical value**	**10% Non-stationary (at 5% + trend)**
demand 2	16	-2.230	-4.380	-3.600	-3.240	Yes
inc	16	-0.063	-4.380	-3.600	-3.240	Yes
inf	16	-2.957	-4.380	-3.600	-3.240	Yes
lifexp	16	-3.634	-4.380	-3.600	-3.240	No
ir	16	-3.893	-4.380	-3.600	-3.240	No
ss	16	-3.185	-4.380	-3.600	-3.240	Yes
fd	16	-0.878	-4.380	-3.600	-3.240	Yes
educ	16	-2.516	-4.380	-3.600	-3.240	Yes
dr	16	-3.307	-4.380	-3.600	-3.240	Yes

A 5% significant level was adopted and trend added since the variables had trends. All the variables except life expectancy and interest rate had a test statistic that is greater than the critical value. Therefore we failed to reject the null hypothesis of existence of unit root.

Table 4. Unit Root Results under ADF Test-First Difference

Variable	n	Test Statistic (With Trend)	Critical value	1% Critical value	5% Critical value	10% Non-stationary (at 5% + trend)
Diffdemand 2	15	-3.439	-4.380	-3.600	-3.240	Yes
diffinc	15	-3.149	-4.380	-3.600	-3.240	Yes
diffinf	15	-6.846	-4.380	-3.600	-3.240	No
difflifexp	15	-5.053	-4.380	-3.600	-3.240	No
diffir	15	-3.589	-4.380	-3.600	-3.240	Yes
difss	15	-2.379	-4.380	-3.600	-3.240	Yes
diffd	15	-1.766	-4.380	-3.600	-3.240	Yes
diffeduc	15	-4.249	-4.380	-3.600	-3.240	No
diffdr	15	-4.488	-4.380	-3.600	-3.240	No
changeinc	15	-3.146	-4.380	-3.600	-3.240	Yes
changefd	15	-2.253	-4.380	-3.600	-3.240	Yes

The existence of unit root was tested in the first difference of time series which is believed to be stationary in most studies and as was illustrated by Granger and Newbold (1974). The null hypothesis is that unit root exists and we fail to reject it if t>ADF critical value. A 5% significance level was adopted and a trend added. The null hypothesis of unit root was rejected in demand1 (gross premiums), inflation, life expectancy, education and dependency ratio. Therefore they are stationary after the first difference. The remaining variables failed to reject the null; therefore they were not stationary even after first difference. Changeinc (rate of change in income) and changefd (rate of change in financial development) were also non-stationary.

By using a more robust PP test which corrects for autocorrelation of the residuals, the null hypothesis of unit root was not rejected at 5% in all levels. Therefore, all variables are I (1) in their level form (have unit roots). The results for PP test are presented in Table 5 below:

Table 5. Unit Root Results under Phillips Perron (PP) Test-Levels

Hypothesis Ho: $\delta=0$ unit root (not stationary) H1: $\delta\neq0$

Decision Rule Reject Ho if t < CV

Variable	n	Test Statistic	Test Statistic (Trend)	Critical value-1%	Critical value-5%	Critical value-10%	Non-stationary (at 5%)
demand 1	16	Z(rho) Z(t)	-7.54 -2.148	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes
demand 2	16	Z(rho) Z(t)	-7.54 -2.148	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes

demand 3	16	Z(rho) Z(t)	-7.54 -2.148	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes
inc	16	Z(rho) Z(t)	-0.097 -0.063	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes
inf	16	Z(rho) Z(t)	-10.941 -2.957	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes
lifexp	16	Z(rho) Z(t)	-16.126 -3.634	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes
ir	16	Z(rho) Z(t)	-10.792 -3.893	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes
ss	16	Z(rho) Z(t)	-7.753 -3.185	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes
fd	16	Z(rho) Z(t)	-2.030 0.878	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes
educ	16	Z(rho) Z(t)	-10.746 -2.516	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes
dr	16	Z(rho) Z(t)	-14.095 -3.307	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes
changefd	16	Z(rho) Z(t)	-7.290 -2.255	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes
changeinc	16	Z(rho) Z(t)	-13.595 -3.146	-22.5 -4.38	-17.9 -3.60	-15.6 -3.24	Yes

By testing the unit root on the first difference to countercheck the order of integration; income, social security, interest rates, and financial development did not reject the null hypothesis of unit root which shows that they are integrated of order higher than 1. The outcomes from Phillips Perron test reveal that all the variables are integrated of order 1 or higher which is a prerequisite for co-integration test.

4.3 Results of Co-integration

After finding that the time series of the variables have unit roots i.e. I (1) or higher, a Johansen co-integration test was used to examine the question of whether these independent variables have an equilibrium (long run) relationship with life insurance demand, and among themselves, in order to identify the source of any linear relationship. The existence of a long term relationship will indicate that these variables are possible determinants of demand for life insurance. Since a test on co-integration tends to eliminate the spurious regression problem, an insignificant demand model will probably be due to lack of adequate data, otherwise known as a small sample bias.

First, a co-integration test is performed on each of the 8 variables with the dependent variable (life insurance demand) to check if they move together (have a long run relationship). Secondly, a co-integration test was done on all the possible combinations of independent variables to identify the source of any linear relationship. The same method was applied by Otuteye et al (1992).Table 6 below

shows the results of univariate co-integration test based on demand for life insurance and each of the 8 variables.

Table 6. Results of Co-integration-Life Insurance Demand vs. Independent Variables

Hypothesis: 1. H0: r =0 => no co-integration H1:r ≥1

2. H0: r =1 => 1 co-integrating vector H1:r >1

Decision Rule: Reject H0 if Trace > CV

Linear combination(Y-βX)	Maximum Rank	Trace Statistic (With Trend)	Critical value 5%	Cointegrated (trend, lag=2)
Demand 2 vs. Income (inc)	0 1	16.3096 0.1389	18.17 3.74	No
Demand 2 vs. Income (inc)	0 1	24.089 0.2675	18.17 3.74	Yes (lag=3)
Demand 2 vs. *Changeinc*	0 1	20.242 4.401	18.17 3.74	Yes
Demand 2 vs. Inflation (inf)	0 1	34.867 7.592	18.17 3.74	Yes
Demand 2 vs. Interest Rate (ir)	0 1	27.185 5.836	18.17 3.74	Yes
Demand 2 vs. Life Expectancy (lifexp)	0 1	24.406 4.983	18.17 3.74	Yes
Demand 2 vs. Social Security (ss)	0 1	31.749 6.7717	18.17 3.74	Yes
Demand 2 vs. Financial Development (fd)	0 1	27.576 0.0964	18.17 3.74	Yes
Demand 2 vs. Education (educ)	0 1	18.7703 8.510	18.17 3.74	Yes
Demand 2 vs. Dependency Ratio(dr)	0 1	25.304 8.987	18.17 3.74	Yes

We start with H0: r =0 and if the trace statistic is greater than the 5% critical value, the null hypothesis of rank (r) = 0 or simply no co-integration is rejected. If this occurs, then this is evidence of co-integration and there is no need to test H0: r =1 because emphasis in this study is not in obtaining the rank of co-integration. We fail to reject the null hypothesis of no co-integration if the trace statistic is less than the critical value. By adopting a maximum lag of 2 as proposed by Otuteye et al (1992) when data is annual, a 5% significance level and a trend component suggested by Lim and Haberman (2004), all the eight variables except income were co-integrated with demand for life insurance. Therefore they have a long term equilibrium relationship with life insurance premiums hence they are key determinants. However, we are not sure of the sign of their relationship. The result for income is surprising because it is expected to show a co-integrating relationship

with life insurance premiums. Furthermore, income showed a strong significant relationship in the univariate regression. However, when a lag of 3 was used, then co-integration occurred.

Further analysis on the pair-wise combinations of the explanatory variables was performed as shown in table 7 below. All the possible 30 pair-wise combinations of the independent variables were tested. This approach helps to explain lack of co-integration in the original model. Majority of the combinations showed evidence of co-integration (t > CV, under Ho:r =0 therefore null is rejected). However, since income was the only variable not co-integrated with life insurance premiums, it is shown here that it is also not co-integrated with financial development (M3), even up to a maximum of lag of 5.

Table 7. Results of Cointegration-Possible Combinations of Independent Variables

Linear combination (Y-βX)	**Maximum Rank**	**Trace Statistic (With Trend)**	**Critical value 5%**	**Cointegrated (at 5% + trend)**
Income (inc) vs. Inflation (inf)	0 1	23.961 0.395	18.17 3.74	Yes
Income (inc) vs. interest rate (rir)	0 1	18.557 0.245	18.17 3.74	Yes
Inc vs. Lifexp	0 1	16.018 0.878	13.74 3.74	Yes
Inc vs. Ss	0 1	21.759 1.318	18.17 3.74	Yes
Inc vs. fd	0 1	11.143 1.470	18.17 3.74	No
Inc vs. educ	0 1	24.675 1.196	18.17 3.74	Yes
Inc vs. dr	0 1	19.348 0.418	18.17 3.74	Yes

Linear combination (Y-βX)	**Maximum Rank**	**Trace Statistic (With Trend)**	**Critical value 5%**	**Cointegrated (at 5% + trend)**
Inflation (inf) vs. ir	0 1	32.816 9.6439	18.17 3.74	Yes
Inflation (inf) vs. Lifexp	0 1	35.598 9.962	18.17 3.74	Yes
Inflation (inf) vs. SS	0 1	32.710 6.014	18.17 3.74	Yes
Inflation (inf) vs. Fd	0 1	23.954 0.689	18.17 3.74	Yes
Inflation (inf) vs. educ	0 1	41.006 6.7482	18.17 3.74	Yes
Inflation (inf) vs. dr	0 1	40.101 13.916	18.17 3.74	Yes

Linear combination (Y-βX)	**Maximum Rank**	**Trace Statistic (With Trend)**	**Critical value 5%**	**Cointegrated (at 5% + trend)**
Interest rate (ir) vs. lifexp	0 1	30.109 7.105	18.17 3.74	Yes
Interest rate (ir) vs. ss	0 1	35.598 9.962	18.17 3.74	Yes
Interest rate (ir) vs. fd	0 1	32.710 6.014	18.17 3.74	Yes
Interest rate (ir) vs. educ	0 1	31.185 7.139	18.17 3.74	Yes
Interest rate (ir) vs. dr	0 1	23.954 0.689	18.17 3.74	Yes

Linear combination (Y-βX)	**Maximum Rank**	**Trace Statistic (With Trend)**	**Critical value 5%**	**Cointegrated (at 5% + trend)**
Life Expectancy (lifexp) vs. SS	0 1	35.250 2.474	18.17 3.74	Yes
Life Expectancy (lifexp) vs. fd	0 1	18.564 0.354	18.17 3.74	Yes
Life Expectancy (lifexp) vs. Educ	0 1	31.032 6.883	18.17 3.74	Yes
Life Expectancy (lifexp) vs. dr	0 1	20.937 4.602	18.17 3.74	Yes

Linear combination (Y-βX)	**Maximum Rank**	**Trace Statistic (With Trend)**	**Critical value 5%**	**Cointegrated (at 5% + trend)**
Social Security(ss) vs. Fd	0 1	7.004 0.423	18.17 3.74	No
Social Security (ss) vs. Educ	0 1	16.516 0.4219	18.17 3.74	No
Social Security(ss) vs. Dr	0 1	20.674 2.359	18.17 3.74	Yes

Linear combination (Y-βX)	**Maximum Rank**	**Trace Statistic (With Trend)**	**Critical value 5%**	**Cointegrated (at 5% + trend)**
Financial Development (fd) vs. Educ	0 1	15.919 0.141	18.17 3.74	No
Financial Development (fd) vs. dr	0 1	18.261 0.4028	18.17 3.74	Yes

Linear combination (Y-βX)	**Maximum Rank**	**Trace Statistic (With Trend)**	**Critical value 5%**	**Cointegrated (at 5% + trend)**
Education (educ) vs. dr	0 1	19.627 6.116	18.17 3.74	Yes

This result prompted a test done with income and demand for life insurance at higher lags, which indicated co-integration at lag 3. This result is strange because income and premiums are expected to have a long run relationship with no lag period or few lags. This is so because income increases purchasing power in real time. However, in this case the long term relationship (equilibrium) is obtained after 3 year lag period which could possibly be that people wait to make sure that the increase in income is permanent before they increase their spending on life insurance i.e. there is a lag between when income changes occur and when people actually become convinced that this is a permanent or long term change in income. This could be so because M3 is the broad definition of money, which includes savings and investments.

Almost all the other possible combinations are co-integrated with each other which are the source of the linear relationship between each of them and demand for life insurance. Financial development versus education, social security versus education, and social security versus financial development were the only ones not co-integrated. This makes sense because these variables are not expected to move together.

5. Summary and Conclusion

For the summary, we have analyzed the determinants of demand for life insurance in Canada. Unlike previous studies, an attempt was made to bridge the gap between theory and empiricism. All the models of life insurance tend to validate Yaari (1965) theory of the consumer who viewed life insurance as the means by which uncertainty in the household income stream related to premature death of the household primary wage earner is reduced.

However, in this study emphasis was placed on the Lewis (1989) model. According to Lewis, life expectancy affects the demand for life insurance by hypothesis since life expectancy is correlated with the probability of death. Lewis (1989) model also shows that family member's future consumption is dependent upon the survival of the wage earner which indirectly suggests that personal disposable income, dependency ratio, and some level of education would all affect demand for life insurance. The degree of risk aversion in a particular country may be related to the predominant religion, and as a result a predominant religion in a country may affect the demand for life insurance. Social security is also hypothesized to affect the demand for life insurance. Social security payments by governments are a source of income to the recipients and can be viewed as a proxy for wealth and therefore may reduce demand for life insurance in accordance with Lewis (1989). Theory has identified life expectancy, national income, dependency ratio, education, social security, religion and price (loading factor) as the determinants of demand for life insurance. Other variables such as interest rates, financial development and inflation were added to this study due to their inconclusive results in previous studies.

With the limited availability of data, only 8 determinants of income, education, inflation, social security, interest rates, dependency ratio, financial development and life expectancy were tested. The data points were restricted by data on life insurance premiums which was only annual and was available from 1990 to present. With

these few data points, a preliminary OLS yielded insignificant statistical results. This result prompted testing to see if there is causality between each variable and dependent variable which again would not yield any meaningful result due to inadequate data (Otuteye, 1987).

Another concern is that the variables might be integrated and therefore are not stationary due to their stochastic trends. Granger and Newbold (1974) showed that even when yt and xt are independent and yields a statistically significant t-statistic, it is possible that there is no sense that the two are related even though OLS indicate a relationship. Thus only if integrated series are co-integrated can inference be carried out on models estimated on levels, and only if they are co-integrated is there a meaningful relationship among them. This notion was supported by Stock and Watson (1988) who specified that it has long been recognized that the usual techniques of regression analysis can result in highly misleading conclusions when the variables contain stochastic trends. This has been known as the problem of spurious regressions. Therefore the methodology was changed from estimating a demand model into testing for co-integration. The estimators in this process are also expected to behave better than the regression estimates because they take into account the error structure of the underlying process, which regression estimates do not. Before any formal co-integration tests were carried out, graphs were plotted on each variable to identify trends and the ADF and PP unit root tests were carried out which indicated that the series were integrated of order 1 (not stationary). After finding that the time series of the variables have unit roots i.e. I (1) or higher, a Johansen co-integration test was used to examine the question of whether these independent variables have an equilibrium (long term) relationship with life insurance demand. If there is an equilibrium relationship, then the identified variables will be the determinants of demand for life insurance. A causal relationship in terms of a demand model would have to be performed in the future using the identified variables when there is adequate data in Canadian life insurance premiums.

By adopting a lag of 2 as proposed by Otuteye et. al (1992), a 5% significance level and a trend component as suggested by Lim & Haberman (2004), all the eight variables except income were co-integrated with demand for life insurance. Therefore they have a long term relationship with life insurance premiums hence they are the key determinants. The result of income was very surprising. Through analysis of pairwise combinations of the explanatory variables as a way of finding this income result, it became evident that income is not co-integrated with financial development up to lag 5. This result prompted a test done with income and demand for life insurance at higher lags which indicated co-integration at lag 3. This result is still strange because income and premiums are expected to have a long term relationship without any lag period because the more income you have the more you would like to spend more in real time. However, in this case the long term relationship (equilibrium) between income and demand for life insurance is obtained after 3 year lag period which could possibly be that people wait to make sure that the increase in income is permanent before they increase their spending on certain items and life insurance is one of them.

For conclusion, the findings in this study bring some concerns and recommendations. The first one regards previous studies. Majority of these studies never carried out co-integration tests, which suggests that they might have been running spurious regressions. For example, even when y_t and x_t are independent and

yields a statistically significant t-statistic, Granger and Newbold (1974) indicated that it is possible that there is no sense that the two are related even though OLS indicate a relationship. However, unlike in this study, authors in previous studies might have found significant statistical results due to the large amount of data that they had because majority of them were doing cross-country analysis.

To avoid this spurious regression problem, a co-integration test was carried among variables that are integrated to check if they have a long term relationship. Since the preliminary OLS was insignificant, only a co-integration test was done. The purpose of this approach is to determine if the variables have a long term equilibrium relationship among them or they tend to move together. The results of co-integration confirm education, inflation, social security, interest rates, dependency ratio, financial development and life expectancy as having a co-integrating relationship with life insurance demand. Income was the only variable that showed no signs of co-integration and it will need more emphasis in future studies. In the future, with a large amount of data, it will be possible and plausible to estimate a formal demand model with the identified variables.

While the outcome of this study does not yield a demand function for life insurance, the results are very instrumental in that they will assist government and life insurance decision makers with creation of economic policy on life insurance knowing its key determinants. This is so because the insurance industry is a key component of the economy by virtue of the amount of premiums it collects, the scale of its investment and, more fundamentally, the essential social and economic role it plays in covering personal and business risks. However, with the right amount of data and more time, a formal demand model will have to be estimated in the future to determine the causal relationships among the identified variables and the demand for life insurance.

The findings of this study also shed more light on the international managerial implications on life insurance and its determinants. This is so because insurance is a key component of each and every economy therefore the findings of existence of some co-integrating relationship among certain determinants in life insurance in Canada implies that there is a need for other countries across the globe to identify country-specific determinants of life insurance so that policy makers and managers can direct specific policies based on the relationship that the identified determinants have with life insurance.

However, the limitation of this study is the inadequate dataset. With a total of 17 observations, the degrees of freedom were limited. Therefore, it was no coincidence that the OLS regression yielded insignificant results. This insufficient data also made it difficult to tackle the other suspected problem of multi-collinearity. Therefore, co-integration was performed to deal with spurious regression problem. However, the limitation of co-integration is that it does not tell us the sign of the co-integrating relationship. As a result, a demand model will still have to be performed in the future when the data set is enough. There was also a structural break in the education variable as it declined dramatically from 1,763,105 to 1,179,395 between 1997 and 1998. This corresponds with a major regulatory change that occurred requiring Canadians to mature their retirement plans two years earlier. This poses a problem in that when there is a structural break, the variables that affect the demand for life insurance before the break might be different from those affecting the demand model

after the break. If the dataset was large enough, then it could have been possible to estimate the model before the break and after the break to check if there are any interactions between the two periods, or if the same results will be obtained.

References

Beck, T. and Webb, I. 2003. Economic, demographic, and institutional determinants of life insurance consumption across countries. *The World Bank Economic Review*, 17(1): 51–88.

Black, Jr. K. and Skipper, Jr. H.D. 2000. *Life and Health Insurance*, 13th Edition. Prentice Hall.

Browne, Mark J. and Kim, Kihong. 1993. An international analysis of life insurance demand. *Journal of Risk and Insurance*, 60: 616–634.

Campbell, R. A. 1980. The demand for life insurance: An application of the economics of uncertainty. *Journal of Finance*, 35: 1155–1172.

Di Matteo, L. and Emery, J.C.H. 2002. Wealth and the demand for life insurance: Evidence from Ontario, 1892. *Exploration of Economic History*, 39 (3): 446–469.

Dickey, D. and Fuller, W. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74: 427–431.

Dickey, D. and Fuller, W. 1981. Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49: 1057–1072.

Dickey, D., Jansen, D. and Thornton, D. 1991. A Primer on cointegration with an application to money and income. *Economic Review*, 74: 58–78.

Engle, Robert F., and Clive W. J. Granger. 1987. Co-integration and error correction: Representation, estimation and testing. *Econometrica*, 55 (2): 251–276.

Fortune, P. 1973. A theory of optimal life insurance: Development and test. *The Journal of Finance*, 28(3): 587–600.

Gaedeke, A. 1995. The magic of life insurance. *Managers Magazine*, 70(11): 31.

Granger, C.W.J. and Newbold, P. 1974. Spurious regressions in econometrics. *Journal of Econometrics*, 2(2): 111–120.

Hjalmarsson, E. and Osterholm, P. 2007. Testing for cointegration, using the Johansson methodology when variables are near-integrated. *IMF Working paper*, WP/07/14.

Hwang, T. and Gao, S. 2003. The determinants of the demand for life insurance in an emerging economy- The case of China. *Managerial Finance*, 29(5–6): 82–96.

Johansen, Soren. 1988. Statistical analysis of cointegrating vectors. *Journal of Economic Dynamics and Control*, 12: 231–254.

Lenten, Liam J.L. and Rulli, David N. 2006. Time series analysis of the demand for life insurance companies in Australia: An unobserved component approach. *Australian Journal of Management*, 31(1): 41–66.

Levy, H., Simon, J.L., and Doherty, N.A. 1988. Optimal term life insurance-A practical solution. *Insurance Mathematics and Economics*, 7(2): 81–93.

Lewis, Frank, D. 1989. Dependents and the demand for life insurance. *American Economic Review*, 79: 452–466.

Li, D. Moshirian,F., Nguyen, P. and Wee,T. 2007. The demand for life insurance in OECD countries. *Journal of Risk and Insurance*, 74(3): 637–652.

Lim, C.C. and Haberman, S. 2004. Modelling life Insurance demand from a macroeconomic perspective: The Malaysian case. *Research paper: The 8th International Congress on Insurance, Mathematics and Economics, Rome*.

Mills, Terrence. M. 1991. *Time Series Techniques for Economists*, Cambridge University Press.

OECD. Stat Extracts. Insurance Indicators. Available at: http://stats.oecd.org/wbos/Index.aspx?usercontext=sourceoecd

O'hagen, P. 2005. Trends in savings and net lending in the national accounts. *Statistics Canada Database*.

Otuteye, Eben. 1987. Testing for causality between aggregate advertising and consumption in Canada. *Proceeding of the Annual Administrative Sciences Association of Canada, Marketing*, 8: 226–235.

Otuteye, E., Lin, E., and Zhou, K. 1992. Cointegration and efficiency of foreign exchange markets. *Working Paper Series*, University of New Brunswick, Fredericton, NB.

Outreville, J. F. 1996. *Life insurance markets in developing countries*. Journal of Risk and Insurance, 63: 263–278.

Perron, P. 1988. Trends and random walks in macroeconomic time series. *Journal of Economic Dynamics and Control*, 12: 297–338.

Statistics Canada. 2007–2008. Historical statistical supplement. *Canadian Economic Observer*, Catalogue no. 11-210-X.

Stock, James H., and Mark W. Watson. 1988. Variable trends in economic time series. *The Journal of Economic Perspectives*, 2(3): 147–174.

Vela, M.A. and Faubert, R. 2002. Adapting to change: The life and health industry amidst a changing financial services landscape. *Statistics Canada*. Accessed on 11/11/08 from Statistics Canada Database.

Wooldridge, Jeffrey M. 2008. *Introductory Econometrics-A Modern Approach*, 4th Edition. South-Western Cengage Learning.

World Bank Group. 2007. *World Development Indicators*, Quick Query. Available at: http://ddp-ext.worldbank.org/ext/DDPQQ/report.do?method=showReport

Yaari, M. 1965. Uncertain lifetime, life insurance and the theory of the consumer. *Review of Economic Studies*, 32: 137–150.