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Estimation of Iran's Life Insurance Demand Function using Panel Data Method from 2006 to 2014

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ABSTRACT

Background: Insurance industry is recognized as a major economic entity. Development of insurance, and particularly life insurance, is among the necessities of industrial societies as this plays a substantial role in reinforcement of the society's economic power and, thus, establishes security and confidence. Aimed at analyzing the economic-social factors affecting insurance demand, the present study deals with estimation of life insurance demand function using panel data from 2006 up to 2014 in Iran.

Methods: The present research is a descriptive-analytical study of the retrospective cohort applied type. Information registered in Iran's Statistics Center encompassing the interval from 2006 to 2014 was analyzed. Benefitting from economic evaluation mechanism and macro-scale economic and social variables affecting life insurance demand were investigated in 30 provinces of Iran. Finally, the country's demand function of life insurance was estimated using $Stata_{12}$ and Eviewes8 software packages with panel data method.

Results: Life expectancy rate has the largest impact on life insurance demand among the variables analyzed. In addition, urban settlement rate leaves the smallest effect on life insurance demand.

Conclusion: Results of the study indicate that increase and rise of variables such as life expectancy rate, dependency rate, urban settlement rate, literacy rate, likelihood of family head's death, population, and average net annual expenditures of urban family lead to increased tendency of individuals to life insurance. Furthermore, increase of other parameters like inflation rate and interest rate result in reduction of people's tendency toward life insurance.

Keywords: Life Insurance; Demand; Inflation Rate; Interest Rate; Life Expectancy Rate

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Introduction

Thinking of a reliable and carefree future is considered among the attributes of risk-averting people (1). As the greatest achievement of human life development, insurance has been merged with governments' planning and policy-making. The insurance market was announced as one of the requirements of economic growth in the first United Nations Conference on Trade and Development (UNCTAD) in 1964 (2). Since insurance efficiency is improving, it is necessary to verify its actual position in the economic and social scope of people's life (3).

The current world is witnessing astonishing transformations and changes in all dimensions. The advanced technology resulting from these transformations have further complicated humans' surrounding environment, exposing them to a multitude of threats. These include loss of properties and assets, physical injury in work environment, disability, inability, and death (4). As a way of coping with danger, insurance is a proper response to uncertain circumstances aimed at mitigating risk and ensuring financial security (2). Therefore, the fundamental goal of insurance is economic security, and consequently, social security and stabilization of physical and psychological states so that life expectancy of all society members will be enhanced (5).

Studying insurance growth trend in general and life insurance trend in particular during the last decade indicates the exceeding role of life insurance in families' economy among well-developed and developing countries (2). Life insurance is a crucial economic means and serves as the most effective and accepted method of securing and guaranteeing the future of families. It has been adopted in most countries across the world (4, 6). Another important role of life insurance is its saving nature, deriving and benefiting as one of the financial means for governments' investment. In a majority of the countries, immense amounts of money are acquired via life insurance and these account for a large portion of the society's revenue. Generally, countries whose people enjoy such securities and benefits exhibit more productive and active participation in planning of economic-social development with confidence and strength (5).

Among other positive benefits of life insurance is enjoyment of insurance securities against variety of risks threatening the head of family, including death, inability to work, disease, incidents, unemployment, and so on (7). Coverage of the risk resulting from such hazards and also lack of revenue due to death or inability of the head of family is one of the principal reasons for families for demanding life insurance (7). Unawareness of occurrence time and intensity of hazards like death age of the head of family is a source of uncertainty for insurers (8). Therefore, risk management and search for tranquility in the future are regarded as motivations of individuals for purchasing life insurance (9).

In general, development of insurance and life insurance is among the necessities of current industrial and developed countries (10). Furthermore, one of the recognized indices in evaluation of people's security and welfare is access level of different social strata to various insurance services and the expansion and development of insurance programs (5). Along with the pervasive progress of life insurance in developed and developing countries, the influence of life insurance has increased in Iranian society as well. Yet, its minor share in the consumption portfolio of Iranian families is cause for interrogation.

Analysis of the national statistics and figures and comparison of indexes such as amount of the premium, premium per capita, and its share in Gross National Product (GNP) with countries at the same level as Iran indicates that life insurance has not secured a reliable position in Iran and its demand is significantly lower than other types of insurance despite more than eighty years of insurance history in the country (11). The most important concern of insurance industry authorities in Iran is the low share of life insurance in the household basket, and as a result, low growth of its penetration coefficient in the national economy and

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insurance portfolio (12). Around 60% of the collected premiums and also approximately 57% of the production premium in global insurance industry belong to life insurance. On the other hand, the share of life insurance in total premiums in Iran is only 6%, a figure which indicates that there has not been significant growth in Iran's economy and insurance industry (13–15). This existing gap and discrepancy are indicative of a tangible underdevelopment regarding life insurance in Iran. Accordingly, the present study is focused on the significance of efficient investment with regard to life insurance coverage and its influence on the economic growth of Iranian families. It deals with estimation of life insurance demand function using panel data from 2006 to 2014 aimed at analyzing economic-social factors affecting life insurance demand on a provincial basis.

Materials and Method

The present research is a descriptive-applied type of continuous and retrospective cohort studies seeking for the identification and analysis of economic-social factors affecting life insurance demand function. The research population of the current study is in all provinces of Iran. The duration of study covers the eight-year time series from 2006 to 2014 for all of these provinces. To gather all information of the target population, a checklist was designed and data analyzed via the Stata12 software.

Panel data models contain detailed information, display greater variability and lesser collinearity between variables, have more degrees of freedom, and higher efficiency. Low degree of freedom and extremely high collinearity in time series data prevents economists from specifying the individual effects of each explanatory variable because the information gained from one sample is not sufficient and appropriate for specification of the model. Furthermore, in comparison with pure sectional and times series, panel data is capable of specifying and testing more intricate behavioral models; panel data collection is also less expensive and more comprehensive as compared to time series (16).

Selecting suitable variables is the first step in executing the model. The variables used in the present research include premium per capita, actual age, inflation rate, bank interest rate, population of Iran's provinces, urban settlement rate, life expectancy rate, dependency rate, literacy rate, and death likelihood of family's head). As result of evaluations in the literature and theories of life insurance, aforementioned variables are considered to be the most important issues related to life insurance (17–20). Data was checked in terms of being panel or pooled so as to select the estimation model of panel data. Then, two methods of fixed effects and random effects were applied to determine the correlation among variables. Significance test of individual effects or Freamer test was used to adjust heterogeneity and define the difference between sections.

H_0 hypothesis of Limer F test suggests that the data is pooled, while H_1 hypothesis asserts that data is panel data. The result of the respective tests based on F statistic is rejection of null hypothesis, which implies superiority of panel data assertion over pooled data assumption. To estimate life insurance demand function, the criterion is result of the Hausman test in which null hypothesis is confirmed using Eview8 software. Therefore, random effects method was used. In addition to this, variance-heterogeneity was evaluated for the estimation model. Heterogeneity test was done for each season and each year separately by white test: this showed no heterogeneity in the model.

F-Limer test hypotheses are expressed as Equation 1:

Eq. 1:

In panel data, the simplest regression is its linear form. The dependent variable in linear regression is a combination of coefficients (parameters) according to Equation 2:

Eq. 2:

Finally, panel data was estimated using two-way logarithmic linear model. The parameters used in the present study are:

Eq. 3: Ln (LPre) = y + ln (Net Cost) + ln (Urb) + ln (Pop) +ln (Lex) + ln (Dep) + ln (Deth) + ln (Edu) + ln (Inf) + ln (Int)

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LPre = Life premium
y = y - intercept
Net Cost = Average net annual costs of urban family
Urb = Urban settlement rate
Pop = Population
Lex = Life expectancy
Dep = Dependency rate
Deth = Death likelihood of family's head
Edu = Literacy (education) rate
Inf = Inflation rate
Int = Interest rate

This Research was approved by the Ethics Committee of Iran University of Medical Sciences (Medical ethic No: 93/n/155/2007).

Results

The present research entailed sectional data of 30 provinces of Iran (n = 30) and time interval of eight continuous years (T = 8) from 2006 up to 2014. Using random effects model, impact level of each independent variable was determined and effects of the respective factors were illustrated. Results of two tests, namely Limer and Hausman, are provided in Table 1:

In the section which follows, variation trends are described for each parameter for all of these respective time intervals separately for all 30 provinces. Diagram 1 illustrates variation trends of variables on a provincial basis.

In the present study, two-way logarithmic linear model was used and the coefficients derived from estimation were found equal to elasticity. Taking this into account, it means that life expectancy demand equals the premium paid. Elasticity of life insurance demand was computed with respect to each of the explanatory variables of the model. Estimation results of life insurance demand function for the country's provinces are reported in Table 2. Based on the results of these estimations, life insurance demand function for all provinces of Iran is presented as Equation 4 below during the time interval 2006 to 2014.

Table 1. Estimation results of Limer and Hausman tests for Iran's provinces

Test Summary	Chi-Sq. Statistic	Chi- Sq.d.f	Prob
Test cross-section fixed effects			
Cross-section chi-square	78.960	29.201	0.000
Test cross-section random effects			
Cross-section random	6.630	29.201	0. 670

Table 2. Estimation results of life insurance demand for Iran's provinces

Variables	Coefficient	Standard Deviation	t-statistic	Prob
Logarithm of inflation rate	- 0.100	0.210	- 2.500	0.003
Logarithm of interest rate	- 0.420	0.600	- 1.980	0.050
Logarithm of average total net annual costs of family	0.810	0.180	4.450	0.000
Logarithm of urban settlement rate	0.080	0.042	1.880	0.060
Logarithm of population	0.180	0.154	1.710	0.110
Logarithm of life expectancy rate	1.470	0.040	3.180	0.001
Logarithm of dependency rate	0.160	0.220	1.730	0.080
Logarithm of death likelihood of family's head	0.500	0.360	1.920	0.050
Logarithm of literacy rate	0.150	0.210	0.730	0.460
Y-intercept	- 7.30	-17.85	-0.400	0.680
R-squared = 0.42				
F-Statistic = 5.47				
Prob (F-statistic) = 0.000				

Eq. 4: Ln (LPre) = -7.3 + 0.81 ln(Net Cost) + 0.08 ln(Urb) + 0.18 ln(Pop) + 1.47 ln(Lex) + 0.16 ln(Dep) + 0.50 ln(Deth) + 0.15 ln(Edu) – 0.10 ln(Inf) – 0.42 ln(Int)

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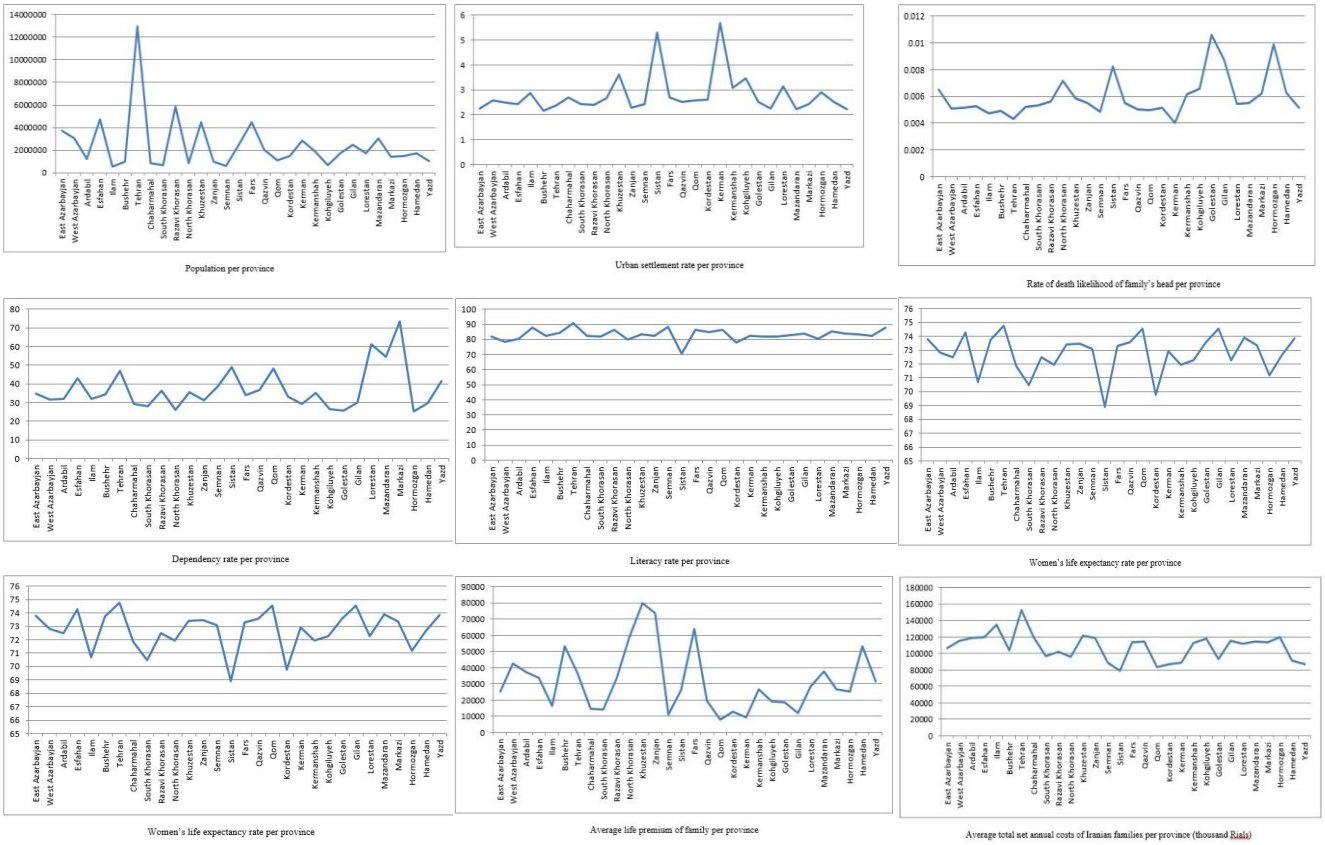


Diagram 1. Variation trends of the analyzed parameters during the time interval 2006–2014 on a provincial basis

Discussion

In the present study, effects of macro-economic parameters like inflation, interest rate, annual net costs of urban family, and social variables like urban settlement rate, population, life expectancy rate, dependency rate, death likelihood of family's head, and literacy rate were tested on life insurance demand level in Iran's provinces during the time interval 2006 to 2014 based on combined data. Demand model in the present study is represented as logarithmic. The coefficients for each variable denote the elasticity of the respective variable and are reflective of the percentage of variations of life insurance demand per one percent of change in other parameters.

Coefficient of inflation variable in life insurance demand model was estimated equal to -0.1. This value is indicative of negative and slight impact of inflation on life insurance demand. Since life insurance normally has an investment aspect, actual value of accessible assets and also purchase ability of individuals decline with increasing inflation rate, hence people tend to spend less money on life insurance. Results of numerous studies have reported negative and significant effect of inflation on life insurance demand. These include findings of studies carried out by Pazhoian et al. (6), Loura (21), Mahdavi (2), and Nourai (22), all of which corroborate the results of the current study.

Life insurance is considered a long-term investment and its profitability rate matters to every applicant. Actual interest rate is one of the most significant parameters for assessment and evaluation of profitability in insurance market. Since life insurance constitutes a negligible share in Iran's insurance industry and it is mainly short-lived as well, one percent increment of actual interest rate would have a great impact on life insurance demand and would reduce it by nearly 0.42. The results acquired by this study are aligned with the documents published different researchers, all of which imply negative effect of interest rate with high impact factor (6, 11, 22–25).

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Demand coefficient of population in the estimation model of the present study is equal to 0.18%. This means that life insurance demand is positively and significantly correlated to population such that life insurance demand would increase with an impact factor of 0.18% with increasing population of society. The results of some other researchers differ in this regard though. Afrang reported no effect of population of insurance demand and stated that individuals feel the necessity of purchasing the policy regardless of the population of society (26). On the other hand, studies conducted by Nourai (22), Sehat (27), Pazhoian et al. (6), and Mantis (24) have reported positive effect of population parameter via analysis and assessment of life insurance demand.

Coefficient of life expectancy variable was estimated to be positive and equal to 1.47 in accordance with the research hypotheses. This coefficient signifies a very strong and significant correlation of life expectancy rate and life insurance demand in Iran's provinces such that 1% increment in life expectancy rate would lead to 1.47% increase in life insurance demand. In other words, greater need for services will be felt with decreasing life expectancy. To justify this argument, revenue effects can be mentioned. It means that improvement of income level of individuals will lead to improvement of their living welfare level, which is presumed as increased life expectancy. Accordingly, individuals will have more demand for life insurance. The study carried out by Nourai (22) reported impact factor of life expectancy equal to 0.12. However, research by Sehhat (27), Azizi (23), and Sen (28) also suggested a more positive and stronger correlation between life expectancy and life insurance demand.

The coefficient of dependency rate variable in the estimation model is positive and equal to 0.16%, suggestive of elasticity of demand with respect to the mentioned variable. This indicates that there are more individuals with higher ratio of dependency to the family's head, which in turn signifies further purchase of life insurance services. Since most people are insured by private insurance programs and abovementioned premiums, impact factor of dependency is variable for adolescents and the elderly. This parameter acquires greater significance with increasing age: for the elderly, more money is paid for life insurance coverage with increasing dependency and rising need for services. On the other hand, the conditions of families with dependency on younger and healthier individuals dictate reduction of life insurance demand in order to meet the expenses of other commodities. The studies carried out by Pazhoian et al. (6), and Hosseinzadeh (29) estimated elasticity of life insurance demand with respect to dependency as positive and equal to 1.85%, which is a stronger impact factor when compared to the results of the present study. Additionally, the variable of annual total net costs of urban families is represented with an impact factor of 0.81% in the two-way logarithmic linear equation: this, in turn, reflects the effect of life insurance payments on the increase of families' expenses. In other words, it can be inferred that families will further benefit from life insurance services provided that family costs increase.

Mehrara et al. (10), estimated the coefficient of death likelihood of family's head equal to 0.76. The present study also incorporates this parameter with a coefficient of 0.50% in the estimation model calculations, indicating its positive correlation with life insurance demand. Furthermore, Dehghani et al. (30), described impact of death of family's head due to religious and cultural notions and belief in destiny and providence as insignificant and meaningless. Also, the same researchers reported numerical values of coefficients of literacy rate and urban settlement rate related to life insurance demand equal to 0.15% and 0.08% respectively. Among the research parameters, urban settlement rate did not significantly influence life insurance demand. Literacy variable was affected by social level and average revenue of individuals and contributes to improvement. This fact influences the mindset of life insurance customers and will lead to rise of demand for life insurance. On the other hand, higher level of education will be accompanied by increased duration of children's

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dependence. Consequently, families' requirement to purchase life insurance will increase for supporting their children during the years of their education. These results are confirmed by findings of numerous researches, particularly those carried out by Shahani, Niazi, and Kardgar (31–33).

Numerous factors might affect individuals' tendency toward life insurance demand. Level of individuals' need for life insurance versus need for other commodities is among the factors which overshadow utility of life insurance. Significance of life insurance services and their utility depends on environmental, cultural, economic, and social agents. Yaari (35) holds the opinion that demand of the family's head for life insurance depends on the number of family members: in the concept of lifecycle model with uncertain life span, it has been demonstrated that individuals increase their expected utility by purchasing life insurance and receiving annual pension. Additionally, Lewis (34) believes that this relationship is affected by other preferences of family members and that life insurance is affected by opinions of dependent members of the family's head. He believes life insurance demand is dependent on lifecycle model based on life span of the family's head where revenue is uncertain due to uncertainty about life span of the family's head. Consequently, the children of the family will be faced with uncertain revenue as well. Assuming separable utility function, the researcher assumes that limited provision of the exogenous transferred revenue by the family's head is aimed at maximization of their expected utility. Lewis points out that death likelihood of the family's head, present value of family's consumption, and also risk-aversion of the family have positive correlations with life insurance demand. He also suggests that the family's wealth and overhead costs have negative coefficients.

Conclusion

Analyses demonstrate that the aforementioned factors affect insurance industry and its growth and development. Comprehensive recognition and identification of these respective factors, taking measures for alleviation and control of negative impacts of each one, and also identification of factors affecting potential demand of insurance purchase could in turn be effective in potential progress of the insurance market, especially in the life insurances sector.

Taking into account application of the present research results, more extensive research is recommended in conjunction with requirement assessment of life insurance based on economic, social, and political conditions affecting supply and demand of life insurance as the framework for its promotion and development in the entire country. Additionally, separation of premium rates for different societal strata depending on their revenue and wealth and also development of life insurance as an alternative to other insurance services should be taken into account by insurer organizations.

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Conflict of interests

Authors have no conflict of interests to declare.

Authors' contributions

Hadian M and Noorai S designed research. Lotfi N and Ghasepour S participated in data collection and the related information. Noorai S developed data collection, analyzed data, and contributed to the writing paper and several editing of the manuscript. Lotfi N and Hadian M prepared the draft of final report, Ghasempour S participated in study work, writing the paper, and is guarantor. This study have no significant limitation and authors declare that they have no competing interests. All authors verified the final version of paper.

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