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Meta-Analysis of the Relationship between Life Insurance and Economic Growth[1]

Hayat Sigortası ve Ekonomik Büyüme Arasındaki İlişkinin Meta-Analizi

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Abstract:The aim of this paper is to review in detail the empirical literature on life insurance-growth nexus. The empirical part explores whether or not the estimated impacts reported in literature to date are the result of publication selection bias. This paper considers 17 empirical studies. Only estimates related to the relationship between economic terms of interest are retained, which provides 98 unique observations. In order to test for publication bias, formal and informal tests are conducted. Informal test is so-called funnel plot while formal test regresses the estimated impact size as a function of standard error. The most important findings indicate a positive impact of life insurance on economic growth. Formal test shows little evidence on publication bias. Results of multivariate meta-analysis indicate that the reported impacts are heterogeneous due to the differences arose from the research design as well as real factors. The results of this paper are addressed to life insurance companies to help them to price life insurance products and create more attractive life insurance products.

Keywords: Economic Growth, Life Insurance, Meta-Analysis, Publication Bias

Öz: Bu makalenin amacı, hayat sigortası-büyüme arasındaki ilişkinin ampirik literatürünü ayrıntılı olarak incelemektir. Ampirik kısım, literatürde bugüne kadar açıklanan tahmini etkilerin, yayın seçim yanlılığının bir sonucu olup olmadığını araştırmaktadır. Bu makale 17 ampirik çalışmayı ele almaktadır. 98 gözlem sağlayan, sadece faizle ilgili ekonomi terimlerin arasındaki ilişkilerle ilgili tahminler tutulmaktadır. Yayın yanlılığını test etmek için resmi ve gayri resmi testler yapılmaktadır. Resmi olmayan test, huni grafiği olarak adlandırılırken, resmi test, standart hatanın bir fonksiyonu olarak tahmini etki büyüklüğüne indirgenmektedir. En önemli bulgular, hayat sigortasının ekonomik büyüme üzerindeki pozitif etkisini göstermektedir. Resmi test, yayın yanlılığı hakkında çok az kanıt göstermektedir. Çok değişkenli meta- analizin sonuçları, açıklanan etkilerin, araştırma tasarımından ve gerçek faktörlerden meydana gelen farklılıklar nedeniyle heterojen olduğunu göstermektedir. Bu makalenin sonuçları; hayat sigortası şirketlerine, hayat sigortası ürünlerini fiyatlandırmalarına ve daha cazip hayat sigortası ürünleri oluşturmalarına yardımcı olmak amacıyla ele alınmıştır.

Anahtar Kelimeler: Ekonomik Büyüme, Hayat Sigortası, Meta-Analiz, Yayın Önyargıları

1. Introduction

The role of the development of financial sector in economic growth has been a popular issue of debate and authors in general agree on the positive link between these two variables of interest (Rousseau and Wachtel, 2011). The role of the life insurance as a financial institution in economic growth has also been explored quite extensively in research to date. However, empirical evidence provides mixed results. Yet, the sign and direction of the relationship between life insurance and economic growth is still an open issue of debate (Satrovic, 2018; Satrovic and Muslija, 2018a). This was the motivation to collected studies published to date and to provide a detailed summary.

Some of the authors (Concha and Taborda, 2014; Dhiab and Jouili, 2015; Petrova, 2015)indicate that life insurance has a significant positive impact on economic growth. This is due to its role in reducing the asymmetry of information and promoting financial stability. On the other hand some of the authors indicate a negative impact of life insurance on economic growth (Kjosevski, 2011) while some indicate no significant relationship (Zouhaier, 2014). Hence, theimpact of life insurance on economic growth has been explored quite extensively in research to date but there is no consensus on the direction of causality. Hence, the research question states: does life insurance foster economic growth? To provide an answer to this question, meta-analysis technique has been employed.

Richterkova and Korab (2013) have explored the impact of insurance on economic growth by employing meta-analysis. However, this paper has several limiting factors. Firstly, the paper analyses the impact of overall insurance industry without division on life and non-life insurance. Secondly, the sample includes only 10 published and unpublished studies. They also did not test for the publication bias. Hence, the motivation of this paper aims to deal with the disadvantages of Richterkova and Korab (2013). In addition, here will be tested whether or not the reported impacts are heterogeneous due to the differences arose from the research design or from real factors.

This paper is organized as follows. After the introductory part, short overview of the studies used in meta-analysis is given in Section 2. Section 3 provides detailed explanation of the data used and methodology employed. The existence of publication bias is explored in Section 4. The empirical evidence on the potential heterogeneity is given in the Section 5. The concluding remarks are given in closing section.

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2. Overview of the Empirical Studies Used in Meta-Analysis

Meta-analysis conducted in this paper uses 17 studies. These studies differ: in the number of observations and regressors, dependent variable, analyzed countries, observed periods. Author has selected only models that analyze the life insurance-growth nexus.

Banking and insurance sector is found to drive the efficiency of the capital allocation in Webb et al. (2002). In terms of methodology they have used three stage least squares simultaneous estimation. They have collected data for the sample of 55 countries in the period between 1980 and 1996.

Arena (2006), Satrovic (2017), Satrovic and Muslija (2018b) suggest that life insurance companies as financial intermediaries have a positive impact on economic growth. Arena (2006) has tested for the causal relationship between variables of interest. The database consisted of 56 countries. The data are collected over the period ranging between 1976 and 2004. The empirical evidence of this paper suggests a causal impact of life as well as non-life insurance on economic growth. Haiss and Sumegi (2008) have conducted a cross-country panel data analysis. They have collected annul data over the period ranging between 1992 and 2004.

The impact of insurance sector on economic growth in transition countries is explored by Curak et al. (2009). 10 transition European Union member countries are analyzed. The observed period is ranging between 1992 and 2007. The applied methodology includes panel data methodology. The findings of this paper suggest a positive impact of insurance sector on economic growth. The positive impact is found for total, life and non-life insurance.

Han et al. (2010) have investigated the impact of insurance industry on economic growth in 77 countries over the period 1994-2005. They have employed GMM. The empirical findings indicate that insurance industry positively impacts economic growth. Non-life insurance is found to have a great role in developing countries. Azman and Smith (2010) report that life insurance positively impacts economic growth. They have collected data for the sample of 55, both developed and developing, countries. The observed time span is between 1981 and 2005. Life insurance is found to be independent from banking sector.

The impact of life insurance sector on economic growth has explored by Chen et al. (2011). GMM methodology is employed. Panel database consists of 60 countries over the period between 1976 and 2005. The empirical evidence suggests a positive relationship between variables of interest. Zouhaier (2014) support these results in the period between 1990 and 2011.

The purpose of Kjosevski (2011) is to explore the relationship between insurance and economic growth. The analyzed country is the Republic of Macedonia. Multiple linear regression is applied. The observed period is 1995-2010. According to results, insurance sector development positively and significantly affects economic growth. Cristea et al. (2014) report that life insurance significantly influence the economic growth in the case of Romania over the period between 1997 and 2012 and Concha and Taborda (2014) in the case of 11 Latin American countries over the period between 1980 and 2009.

Dhiab and Jouili (2015) report a positive impact of insurance sector on economic growth in Tunis in the period between 1998 and 2013. Petrova (2015) suggests a positive relationship between the insurance sector and economic growth for the sample of 80 countries in the period between 2001 and 2012.

3. Data and Methodology

The growth model below is taken into account while collecting data to conduct empirical research in this paper:

$$Y_{it} = \alpha + \beta Li_{it} + \gamma X_{it} + \eta_i + u_{it} \ (1)$$

wherei is the notation for individual and t for the time period; Y is the outcome variable (economic growth) and Li regressor (life insurance); the remaining are control variables (proxy variables of banking sector and stock market development, the initial income, education, openness, inflation etc.); $\eta_i$denotes an unobserved country-specific impact; and u is an error term.

Seventeen empirical studies are analyzed. Author has searched in the ProQuest and Scholar Google databases and identified more than 200.000 papers for the keywords “life insurance” and “economic growth”. Studies that were fully available (257) were read. Those with empirical estimates were retained (63). After eliminating these studies that do not fit the objective of the research, 17 potential studies and 98 unique observations are retained. Literature search is terminated on December 17, 2016.

The author follows Doucouliagos and Stanley (2013) approach while defining the sample of studies that will be analyzed. Hence, only published studies are included since publication status is considered to be indicator of paper quality. Furthermore, only studies that report measures of precision of the impact of life insurance on economic growth are included.

In order to ease the comparison with previous studies, only those taking the growth rate of real or nominal GDP per capita, nominal GDP per capita or real GDP as an outcome variable are analyzed.Studies with any other measure of life insurance sector activity but life insurance premium are not included.Those studies written in a different language than English were excluded. Only studies using linear regression models (OLS, GMM, FE, RE, DOLS) are analyzed. Those that use Granger causality or VAR (vector autoregression) were excluded as well as studies employing long-term relationship models (e.g. cointegration).

Author aims to explore the relationship between life insurance and economic growth. This is why there is the interest to calculate the coefficient β from equation (1). Partial correlation coefficients (PCCs)is considered appropriate while standardizing impact size in Doucouliagos and Ulubasoglu (2006). In addition, there is a need to calculate the standard error.

11 out of the 98 unique observations are not reported to be significant at the 5% level of significance, 1 is significant and negative while 86 are positive and significant. These numbers indicate heterogeneity in the reported impacts. However, a significant positive impact prevails (in 88% of cases).

4. Publication Bias, Results and Discussion

Publication bias arises from the preference to publish results that are either significant or support economic theory. In order to test publication bias, there are formal and informal tests. One of the informal tests is graphical inspection so-called funnel plot. This inspection is suggested by (Deeks and Altman 2001; Valickova et al. 2013). More dispersed estimates are considered to be more imprecise while the true impact is represented by more precise estimates. If there is not publication bias, symmetrical inverted funnel will be graphed. Figure 1 presents funnel plot for the studies used in this paper.

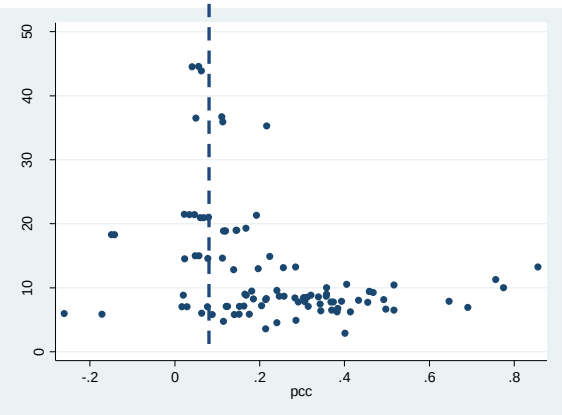

Figure 1. Funnel Plot for the Studies Used in This Paper
Source: Author

Figure 1 suggests the imbalance in the impacts that are reported i.e. right-hand side appears to be heavier. Hence, there tends to be preference to publish positive results. However, funnel plot is just an informal method that is often very subjective. Therefore, the empirical part of this paper proceeds to formal test to detect the publication bias following Valickova et al. (2013):

$$PCC_{ij} = \beta_0 + \beta_1 SEpcc_{ij} + u_{ij} \quad (2)$$

whereN is equal to 17 in this case, idenotes a regression injthstudy consisted ofS estimates. Magnitude of publication bias is represented by the coefficient β_1, while β_0 measures the true impact. Formal evidence on asymmetry is given in the case when $H_0: \beta_1 = 0$ is rejected. The direction of the bias can be read from the sign of β_1. Positive results suggest the preference to publish positive results.

Table 1. Publication Bias Test

SE	*0.105 (0.053)***
Con.	*0.571 (0.698)*
F	*3.96*
F (p value)	*0.050*
Within-study correlation	*0.171*
Observations	*98*
Studies	*17*

** significance at 95% level. Dependent variable: t-statistic. Standard errors in parantheses. Mixed impacts multilevel estimator is used.
Source: Author

Negative sign with constant term suggests that negative results are preferred. If null hypothesis that $\beta_0 = 0$ is rejected, this indicates an impact of life insurance on economic growth beyond publication bias. Since 98 observations are analyzed, this test is considered appropriate. Table 1 summarizes the obtained results.

Even though Figure 1 indicates possible asymmetry, formal test does not confirm these assumptions. Table 1 suggestsa positive life insurance-growth nexus. However, the impact is found to be small (Doucouliagos, 2011). Robustness check indicates robust error term.

5. Multivariate Meta-Regression, Results and Discussion

Heterogeneity in research may rise from the research design or real factors (the categories of variables in this paper). Following Valickova et al. (2013) equation (2) is estimated:

$$t_{ij} = \beta_1 + \beta_0 \left(\frac{1}{SEpcc_{ij}}\right) + \sum_{k=1}^{K} \frac{\gamma_K Z_{ijk}}{SEpcc_{ij}} + \alpha_j + \varepsilon_{ij}, \quad k = 1, \dots, K, (3)$$

where Z are the set of variables that can potentially influence the reported results. In order to control for homoskedasticity, Z areweightedby $1/\mathrm{SEpcc_{ij}}$. The number of variables is presented by K.

Table 2. Description of Variables Assumed to Affect the Reported Results

Variable	*Description*	*Mean*	*St. deviation*
Characteristics of the data			
Countries	*The number of estimated countries*	*38.286*	*24.578*
Time periods	*The number of time periods*	*11.255*	*6.882*
The size of sample	*Observations used (logarithm value)*	*5.261*	*1.002*
Logarithm	*Will equal 1 if study applies logarithmic transformation*	*0.816*	*0.389*
Panel	*Will equal 1 if study employs panel data*	*0.827*	*0.381*
Time series	*Will equal 1 if study employs time series data*	*0.175*	*0.382*
Cross-country	*Will equal 1 if study employs cross-country data*	*0.096*	*0.248*
Hom.	*Will equal 1 if study employs homogenous sample*	*0.408*	*0.494*
Dependent variable			
Real GDP per capita growth	*Will equal 1 if growth rate if real GDP per capita is used*	*0.439*	*0.499*
GDP per capita	*Will equal 1 if GDP per capita is used*	*0.276*	*0.449*
Real GDP	*Will equal 1 if real GDP is used*	*0.071*	*0.259*
GDP per capita growth	*Will equal 1 if growth rate of GDP per capita is used as a dependent variable*	*0.031*	*0.173*
Life insurance proxies			
Penetration	*Will equal 1 if life insurance penetration is considered appropriate*	*0.388*	*0.490*
Density	*Will equal 1 if life insurance density is considered appropriate*	*0.612*	*0.490*
Joint	*Will equal 1 if more than one insurance indicator is included in the regression*	*0.082*	*0.277*
Financial development proxies			
Dep.	*Will equal 1 if financial depth is considered appropriate*	*0.082*	*0.277*
Act. 1	*Will equal 1 if private domestic credit provided by deposit money banks to GDP is considered appropriate*	*0.062*	*0.242*
Act. 2	*Will equal 1 if private credit is considered appropriate*	*0.031*	*0.174*
Deposits	*Will equal 1 deposits to GDP is considered appropriate*	*0.021*	*0.143*
Bank	*Will equal 1 if bank ratio is considered appropriate*	*0.144*	*0.353*
Market capitalization	*Will equal 1 if this variable is considered appropriate*		
Market activity	*Will equal 1 if this variable is considered appropriate*	*0.186*	*0.391*
Turnover ratio	*Will equal 1 if turnover ratio is considered appropriate*	*0.041*	*0.200*
Other	*Will equal 1 if other indicator is considered appropriate*	*0.041*	*0.200*

The characteristics of estimation			
OLS	*Will equal 1 if OLS is considered appropriate*	*0.245*	*0.432*
DOLS	*Will equal 1 if DOLS is considered appropriate*	*0.062*	*0.242*
FE	*Will equal 1 if fixed effect is considered appropriate*	*0.330*	*0.473*
RE	*Will equal 1 if random effect is considered appropriate*	*0.021*	*0.143*
GMM	*Will equal 1 if GMM is considered appropriate*	*0.206*	*0.407*
GMM-SYS	*Will equal 1 if this estimator is considered appropriate*	*0.144*	*0.353*
Endogeneity	*Will equal 1 if the endogeneity issue is taken into consideration*	*0.337*	*0.475*
Additional determinants of economic growth			
Regressors	*The number of independent variables*	*5.633*	*2.501*
Macroec. stability	*Will equal 1 if macroeconomic stability is controlled*	*0.663*	*0.475*
Political stability	*Will equal 1 if political stability is controlled*	*0.061*	*0.241*
Openness	*Will equal 1 if the impacts of openness is estimated*	*0.602*	*0.492*
Initial income	*Will equal 1 if initial income is estimated*	*0.454*	*0.500*
Human capital	*Will equal 1 if human capital is estimated*		
Investment	*Will equal 1 if investments are estimated*	*0.485*	*0.502*
Government spending	*Will equal 1 if government spending is estimated*	*0.327*	*0.471*
Savings	*Will equal 1 if the savings is estimated*	*0.536*	*0.501*
Interest rate	*Will equal 1 if interest rate is estimated*	*0.021*	*0.143*
Publication characteristics			
Time	*Publication year*	*0.000*	*2.491*
Real factors			
1970s	*= 1 if observed period covers 1970s*	*0.173*	*0.381*
1980s	*= 1 if observed period covers 1980s*	*0.551*	*0.500*
1990s	*= 1 if observed period covers 1990s*	*0.969*	*0.173*
2000s	*= 1 if observed period covers 2000s*	*0.786*	*0.412*

Source: Author

Different proxy variables of life insurance have been used in analyzed studies. It is expected that the use of different proxy variables of life insurance may differently impact economic growth. This is why dummy variables oflife insurance proxies are initially used. Joint variable is included to test whether the interaction of life and non life insurance in the same model impacts economic growth.

Furthermore, studies differ in proxy variables of financial development. This difference is also taken into account. In addition, it is expected that additional determinants of economic growth may lead to the differences in the obtained results. Moreover variables assumed to impact the reported results (moderator variables) that capture the differences in regression models are examined as well as the impact of total number of regressors and additional determinants of economic growth (Macroeconomic stability, Political stability, Openness, Initial income, Human capital, Investment, Government spending, Savings, Interest rate). Data characteristics such as: number of observed countries, type of data, number of time periods and sample size are also observed. Lastly, this study explores the impact of the year of publication and real factors. Table 3 summarizes the results of the multivariate meta-regression.

Table 3. Results of the multivariate meta-regression

Moderator variables			*Coefficients*	*Model significance statistics*	*p value*
Research design differences	*Nature of dependent variable*	*Real GDP per capita growth*	*2.095* (0.487)*	*LR chi2(3) = 15.36*	*0.001*
		Real GDP	*6.460* (0.929)*		
		GDP per capita growth	*7.734* (1.363)*		
		Constant	*0.411 (0.341)*	*LR chi2(7) = 28.65*	*0.005*
	Data characteristics	*No. of countries*	*0.085* (0.026)*		
		No. of time units	*0.061 (0.068)*		
		Sample size	*-2.508* (0.567)*		
		Log	*-5.050* (0.951)*		
		Time series	*4.584* (1.357)*		
		Panel	*6.937* (2.856)*		
		Homogeneous	*-1.320 (0.892)*		
		Constant	*16.761* (2.724)*		
		Density	*2.250* (0.501)*	*LR chi2(2) =18.54*	*0.000*

	Proxy variables of life insurance	*Joint*	*0. 944 (1.422)*		
		Constant	*2.585*** *(0.868)*		
	Proxy variables of financial development	*Activity 1*	*2.373**** *(1.394)*	*LR chi2(8) = 23.97*	*0.000*
		Activity 2	*-0.348 (1.826)*		
		Deposits	*-1.486 (3.051)*		
		Bank	*1.677**** *(0.962)*		
		Market capitalization	*0.032 (0.889)*		
		Market activity	*-0.156 (2.148)*		
		Turnover ratio	*-0.428 (1.635)*		
		Other	*-1.637*** *(0.673)*		
		Constant	*2.269** *(0.429)*		
	Estimation characteristics	*OLS*	*-3.460*** *(1.287)*	*LR chi2(6) = 14.88*	*0.005*
		RE	*-5.821*** *(2.097)*		
		FE	*-5.915** *(1.811)*		
		GMM	*-3.489*** *(1.225)*		
		GMM-SYS	*-3.814**** *(2.155)*		
		Endogeneity	*-2.095*** *(1.054)*		
		Constant	*7.750** *(1.360)*		
	Additional determinants of economic growth	*Regressors*	*-0.358 (0.314)*	*LR chi2(9) = 24.77*	*0.016*
		Macroec. stability	*-1.947*** *(0.838)*		
		Political stability	*2.285 (1.476)*		
		Openness	*2.696**** *(1.378)*		
		Initial income	*0.935 (0.938)*		
		Human capital	*0.594 (0.735)*		
		Investment	*1.729**** *(1.019)*		
		Government spending	*-0.500 (1.209)*		
		Savings	*-0.418 (2.150)*		
		Constant	*2.576*** *(0.871)*		
	Publication characteristics	*Publication year*	*0.489** *(0.114)*	*LR chi2(1) = 7.23*	*0.000*
		Constant	*-0.070 (0.565)*		
Real factor differences	*Real factors: differences between observed periods*	*1970s*	*0.371 (0.726)*	*LR chi2(3) = 7.92*	*0.048*
		1990s	*-9.104** *(1.556)*		
		2000s	*-1.228**** *(0.670)*		
		Constant	*11.754** *(1.658)*		
	Observations	*98*			
	Studies	*17*			

Dependent variable: t-statistics; mixed impacts multilevel estimator. Standard errors in parentheses; ***, **, * denote significance at the 10%, 5%, and 1% level respectively.

Source: Author

Starting with the dependent variables, it can be seen that the impact of life insurance on economic growth depends significantly on the proxy variable of economic growth. Significant positive impacts are found for all three variables. GDP per capita is used as a comparison variable. All three dependent variables provide higher impact compared to GDP per capita. Furthermore, results indicate that: sample size; the type of data (panel, time series or cross-country) as well as number of analyzed countries have a significant impact on the relationship between life insurance and economic growth. In addition logarithm transformation of the variables impact aforementioned relationship. Cross-country data are used for comparison. Obtained results indicate that on average, studies that use panel and time-series data provide higher impact of life insurance on economic growth compared to cross-country studies.

When it comes to the proxy variables of life insurance, it can be seen that the impact of life insurance density on economic development is on average higher than the impact of life insurance penetration. Individual analysis indicates that both variables are having a significant positive impact on economic growth. In addition, it is important to emphasize that joint analysis of life and non life insurance variables has the same direction of the impact as life insurance penetration. Proxy variables of banking sector development (Activity 1 and Bank) as well as of stock market development (Market activity) indicate the need for using these variables when analyzing the relationship between life insurance and economic growth.

Obtained results indicate that the selection of estimator matters. Hence, on average papers that use: OLS; RE; FE; GMM and GMM-SYS report lower impact compared to DOLS. Results stress the need to take into consideration the endogeneity issue. In terms of publication characteristics (publication year), the obtained result indicates that lastly published studies reported on average stronger impacts compared to older studies.

Furthermore, a set of additional determinants of economic growth is analyzed. Results indicate that studies that control for macroeconomic stability, report on average lower impact of life insurance on economic growth compared to studies that analyze the impact of interest rate (comparison variable). When it comes to trade, obtained result indicate higher impact of life insurance on economic growth in studies that include this control variable compared to studies that include interest rate. Obtained result for political stability indicates no significant differences in impact of political stability in studies with (out) interest rate. Furthermore, all other regressors in this section are not proved to have significant impact on the relationship between life insurance and economic growth. In terms of real factors, the relationship between life insurance and economic growth decreases in the 1990s and 2000s compared to 1980s.

6. **Concluding Remarks**

The aim of this study was to provide an overview of empirical studies to date on life insurance-growth nexus. For this purpose, the author uses meta-regression analysis. 11 out of 98 unique observations concerning the impact of life insurance on economic growth are not reported to be significant at the 5% level, 1 is significant and negative while 86 are positive and significant. Therefore, the heterogeneity in the reported estimates is assumed to exist. Nevertheless, using meta-analysis methods, a significant impact of life insurance on economic growth is reported.

Formal and informal tests for publication bias are conducted. Informal tests indicate the possibility that researchers, referees, or editors prefer positive results while formal tests show little evidence that publication bias may exist.

The results of this paper suggest that heterogeneous impacts arose from the design of previous research as well as real factors. The relationship between variables of interest decreases in the 1990s and 2000s compared to 1980s. Hence, this should be taken into account while analyzing determinants of life insurance demand. These results are addressed to life insurance companies to help them to price life insurance products and create more attractive life insurance products.

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