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Investigating the factors influencing the life insurance market in Ethiopia

Abstract

The insurance firms as financial intermediaries play a significant role within a nation's financial system by mobilizing funds from the surplus economic unit and channeling it to the deficit investment unit of the economy. Life insurance business as an aspect plays a crucial role in supporting investments by accommodating all life insurable risks and financial consequences. Considering this crucial role, the study investigates the factors that influence life insurance market from Ethiopian perspective. It employs secondary data on eleven independent variables – six of which are economic and five demographic variables for a period of 28 years from 1979/1980 to 2007/2008. The error correction mechanism (ECM), the Johansen cointegration test and the Augmented Dickey-Fuller test were utilized in its econometric analysis. The result shows a long-term balanced connection amongst the variables. Inflation had a statistically noticeable negative impact on the demand and supply in the life insurance market. In addition, there was a statistically significant negative effect of young dependency ratio on life insurance market demand while old dependency ratio had a statistically significant positive relation to life insurance supply. Based on the results, it is recommended that during high inflation, life insurance companies should revise price decisions to enhance the life insurance market. To minimize the inverse effect of young dependants, insurers need extensive sensitization on the young age through their families and promote products that suit the young children – such as children's education policies. With the increase in life expectancy of individuals and groups, which results in an increase of the life insurance market, insurers have to develop products that can make provision for such societal dynamic.

Keywords: demand, supply, demographic variables, economic variables, life insurance, error correction model, Ethiopia.
JEL Classification: G2, M00, M29.

Introduction

The role played by insurance institutions in a monetized economy cannot be over emphasized. The insurance firms as financial intermediaries play a significant role within a nation's financial system by mobilizing funds from the surplus economic unit and channeling it to the deficit investment unit of the economy. An aspect of the insurance business is the life insurance. These companies provide for citizens and the entire nation at large with varieties of key financial services. They play a crucial role in supporting investments by accommodating all life insurable risks and financial consequences. In addition, they provide benefits to households upon a person's death or disability in exchange for the premium paid in the present, to benefitting the beneficiaries in the future.

Data provided by Smith and Chamberlain (2010) revealed that the insurance sector's contribution in Ethiopia during the 2006/07 fiscal year was US$105 million. When this is compared to the Gross Domestic Product (GDP) of the country, it amounts to about 0.2 percent. A breakdown of the above value showed that life insurance premiums constituted only US$6 million or 6 percent of total premiums, while general insurance premiums totaled US$99 million or 94 percent of total premiums (Smith and Chamberlain, 2010). This is relatively small because life insurance policies encourage both public and private savings and investment in the long-run (Beck and Web, 2003). Life insurance is now seen as a major way of raising funds for investment, and it also encourages capital market growth. In addition, life insurance industries have taken steps to ensure risk management by individuals and families (Beck and Webb, 2003). Numerous researchers had reported that a particular economic environment and variables have profound effects on the life insurance market (Sen, 2008; Li and Moshirian, 2007; Lim and Haberman, 2004; Beck and Webb, 2003) and several others. Their submission was based on the investigation of the effect of demography and macroeconomic parameters on the life insurance market in Asia, OECD and several other developing nations.

In the case of Ethiopia, as in most developing countries, the insurance sector, and specifically life insurance is small and underdeveloped (Zeleke, 2007). Ethiopian insurance industry has passed through different economic stages in its history. During the Imperial era (1914 up to 1974), life

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insurance growth declined at a declining rate from 15.1 percent to 7.9 percent and the average percentage of life insurance premium to the total gross written premiums during the years 1979/80 – 1993/94 was 4.5 percent. A similar trend continued after 1994. For example, during the period 2000/01 – 2004/05 the gross written premiums of the long-term insurance industry (dominated by life insurance policies) was fluctuating within the range of 4 percent to 5 percent (Zeleke, 2007). This shows that life insurance business impact on the nation's economy as compared to other African countries is small and declining which calls for serious attention. During the 2006/07 fiscal year total premiums received by insurance companies as a percentage of GDP of certain African countries indicated a higher percentage than Ethiopia. For example, South Africa contributes 15.2 percent, Namibia 8.1 percent, Botswana 3.9 percent, Morocco 3.4 percent, Kenya 2.5 percent, Tunisia 2.0 percent, Angola 1.4 percent, Egypt 0.9 percent, Nigeria 0.6 percent, Algeria 0.6 percent, and Uganda 0.6 percent (Smith & Chamberlain, 2010). The level of the insurance sector can be said to be in its embryonic stage. There may be some factors that have affected the growth of the insurance market, particularly the life market in Ethiopia which requires an investigation.

Studies conducted on the general insurance business in Ethiopia include Abdurrahman (2006), and Zeleke (2007). However, it appears that no study has been conducted on economic and demographic determinants of the life insurance market in Ethiopia. Specifically no study has employed the total market approach – that is considering both the demand and the supply side of the market in Ethiopia. This is a research gap which has to be filled. Hence, the major objective of this study is to investigate the impact of economic and demographic factors on the life insurance market in Ethiopia. It is suggested that the result from this study can be used by insurance companies, policy makers, and other stakeholders working to improve the life insurance market in Ethiopia. This study complements the existing gap in the research on the life insurance industry, and to initiate further research on the topic in Ethiopia in particular, and the developing countries in general. The article is segmented as follows: literature is reviewed in section one, section two explains methodological approach, section three focuses on the results and discussion of findings, section four presents the conclusion, and final section gives policy recommendations.

1. Literature review

Several authors have written on the life insurance market from different parts of the world and at different times. These authors have generated bundles of empirical findings – following different methodologies, and utilizing different variables. A clear review of these empirical studies will be achieved by looking at the variables used in those studies one after the other.

Lim and Haberman (2004) did an assessment of the impact of a set of the demographic and economic parameters on the purchase of a life insurance in Malaysia. They found that financial growth (depth) has a direct influence on the performance of life insurance market. Outreville (1996) tested the relationship between financial development (certain scholars describe as financial depth) and the life insurance market in developing countries. The result indicated a direct association between financial depth and insurance industry's growth. The evidence from Sen's (2008) study also showed that financial system growth has a direct influence on the purchase of insurance products. In addition to the above, Beck and Webb (2003) submission was that an efficient banking system is a pivotal to life insurance sectors' growth and that the supply of life policies are improved with an increase in the level of financial development. All the studies reviewed above are unanimous on the impact of financial development on life insurance market despite the fact that they were conducted at different periods and geographical locations.

Bernhem, Forni, Gokhale and Kotlikoff (2003) examined life insurance, death and retirement. The study showed that life insurance policy reduces the average financial burden of dependants by almost 75 percent upon the death of the policy holders. The study concluded that when people are optimistic about long life and are concerned about their survivors, the life insurance market develops. Hakansson (1969) suggested that the rate of life insurance products' demand is determined by the policy price (premium rates), the income stream, present consumption and wealth of individuals. Hwang and Gao (2003) found that the development of insurance sector in China can be credited to the 1978 economic reforms and that the key factors include: improved educational levels which translate to higher income among others.

A number of studies on inflation as a key economic variable have reported that it had a noticeable inverse effect on the life insurance market demand (Ayaliew, 2013; Li and Moshirian, 2007; Outreville, 1996; Browne and Kim, 1993). This is because inflation affects the value of money and the general price level in the economy. Therefore, it reduces the willingness to purchase life policy because it will be expensive for an average household. The above results were

arrived at using various measures and parameters to capture inflation in their studies. On interest and lending rate as economic variables influencing the life insurance market, Beck and Webb (2003) using average lending rates as indicator, found that rate of interest had a statistically significant positive relationship to life insurance consumption. Lim and Haberman (2004), using saving deposit rate as real interest rate (RIR) indicator, concluded that interest rate had a statistically noticeable direct association with the demand for life insurance policies. Sen's (2008) finding of interest rate in Indian context showed that it had a statistically notable and direct influence on both life insurance supply and demand market. However, Sen (2008) assessment using cross-country analysis and Outreville's (1996) study found no evidence to support the statistical relevance of the real interest rates in connection to the life insurance market. Li and Moshirian (2007) conducted a study on OECD countries and found that interest rate is inversely related to the purchase of life insurance in these countries. A recent study by Ayaliew (2013) also confirmed the inverse connection between interest rate and life premium. A cursory look at these empirical studies shows that the results have not been consistent and vary as the sample size increases. For example, Sen (2008) reported varied results for the Indian market and the cross-country analysis.

A number of studies have confirmed that income levels are strong, positive and have a statistically major influence on the market for life insurance policies. This includes: Ayaliew (2013), Li and Moshirian (2007), Beck and Webb (2003), Rubayah and Zaidi (2000), Outreville (1996), Babble (1985), and Truett and Truett (1990) to mention but a few. The consumption of life policies increases with a rise in consumers' income level (Beck and Webb, 2003). However, Lim and Haberman (2004), based on the study conducted in Malaysia, suggested that income was not a key factor in explaining the demand in life insurance market. Also, saving as an economic factor was studied by Beck and Webb (2003), using personal saving as an indicator. Their results indicated that no relationship existed between the life insurance market and private saving. Oke, Ideji and Ibiwoye (2010) studied Nigerian's life policy consumption pattern for 35 years (1970-2005) and found that the key determinants are local interest rate and real gross domestic products. The real GDP affects the policy consumption directly and significantly while local interest rate is significantly negatively related. Other variables employed lack the ability to predict the nation's life policy consumption pattern.

Studies on the nexus between cost of life policy products and the market (demand and supply) have shown mixed results. The findings by Lim and Haberman (2004), Babble (1985), and Browne and Kim (1993) indicated that the cost of insurance was statistically significant and negatively associated with the purchase of life policy. This signifies that an increase in the prices of insurance policies reduces its consumption. However, Sen's (2008) study on Indian context found a positive correlation between the cost and the market (demand and supply) of life insurance. This result contradicts previous studies undertaken by Browne and Kim (1993), and Lim and Haberman (2004).

In addition, studies on the relationship and impact between the demographic factors which include: old dependency ratio, number of dependents, young dependency ratio, life expectancy, and the life insurance market are reviewed to ascertain the nature of the relationship. Beck and Webb (2003) found that life insurance market and a higher life expectancy are directly correlated. This result implied that optimism about long life encourages and improves the sale of life policies. A direct relationship exists between life insurance consumption and dependants' life time. Hence, the life policy is required to provide for the survivors at the death of the policy holders (Beck and Webb, 2003). A statistically significant direct association exists between old dependency ratio and life insurance market (Browne and Kim, 1993; Li and Moshirian, 2007). However, both old dependency ratio and young dependency ratio had an insignificant impact on life insurance market (Sen, 2008). He further showed that crude death rate is negatively related and a statistically significant factor affecting the life insurance market. On the contrary, Lim and Haberman's (2004) study on Malaysia indicated that crude death rate appeared to have no relationship with the demand for life insurance.

2. Methodology

2.1. Data related issues and criteria. Creswell (2009) stated that the criteria for the selection of a research approach include consideration of a research problem and the philosophy of different research approaches. In this context, the study adopted a quantitative research approach. This study used longitudinal secondary data for the period between 1979/80 to 2007/08. The data were sourced from the World Bank Reports, National Bank of Ethiopia (NBE), Birritu, Ethiopia Insurance Corporation (EIC), Ministry of Finance and Economic Development (MOFED), and Financial Statements and Accounts of Insurance Companies. Eleven economic and demographic factors were considered.

2.2. Model specification. The model for this study was specified following theoretical and empirical foundations. It is basically a combination of the specifications followed by Lim and Haberman (2004), Li and Moshirian (2007), and Sen (2008). The model is specified in such a way that it captured the various economic and demographic factors.

The model is stated in a functional form as follows:

Mkt Den = f {GDPPC, GDSPC, FIND, RIR, INFR, UPR, YDR, ODR, PRICE, CDR, LEXP}

Mkt Pen = f {GDPPC, GDSPC, FIND, RIR, INFR, UPR, YDR, ODR, PRICE, CDR, LEXP},

where: *Mkt Den* = market density (demand); *Mkt Pen* = market penetration (supply); *GDPPC* = = annual GDP per capita (income); *GDSPC* = = annual gross domestic saving per capita (savings); *FIND* = financial depth (M2) indicated by broad money; *RIR*= real interest rate (deposit); *INFR* = inflation rate (Addis Ababa CPI); *UPR* = rate of the population of the urban inhabitants; *YDR* = young dependency ratio (under 15 years/15-60); *ODR* = = old dependency ratio (over 60 years/15-60); *PRICE* = price of one unit of insurance coverage; *CDR* = crude death rate; *LEXP* = average life expectancy at birth.

The model for the life insurance market demand and market supply is presented in an error correction models as:

$$\Delta MktDen = \beta_0 + \beta_1 \Delta\Sigma \log GDPPC + \beta_2 \Delta\Sigma \log GDSPC + \beta_3 \Delta\Sigma \log FIND + \beta_4 \Delta\Sigma RIR + \beta_5 \Delta\Sigma INFR + + \beta_6 \Delta\Sigma UPR + \beta_7 \Sigma YDR + \beta_8 \Delta\Sigma ODR + \beta_9 \Delta\Sigma \log PRICE + \beta_{10} \Delta\Sigma LEXP + \beta_{11} \Delta\Sigma CDR + \gamma ECM + \varepsilon \quad (1)$$

$$\Delta MktPen = \beta_0 + \beta_1 \Delta\Sigma \log GDPPC + \beta_2 \Delta\Sigma \log GDSPC + + \beta_3 \Delta\Sigma \log FIND + \beta_4 \Delta\Sigma RIR + \beta_5 \Delta\Sigma INFR + + \beta_6 \Delta\Sigma UPR + \beta_7 \Sigma YDR + \beta_8 \Delta\Sigma ODR + \beta_9 \Delta\Sigma \log PRICE + \beta_{10} \Delta\Sigma LEXP + \beta_{11} \Delta\Sigma CDR + \gamma ECM + \varepsilon \quad (2)$$

β_0 = model intercept / constant; $\beta_1 - \beta_{11}$ = co-efficient of parameters; ε = white noise residual/ stochastic variable/error term; γ – coefficient of ECM.

2.3. Estimation techniques. The various techniques employed in the study are discussed below.

2.3.1. Time series analysis. Time series data analysis was employed in the study. The data collected cover the period from 1979/80 to 2007/08. The analysis was carried out using statistical and econometric analysis including the Johansen co-integration test, the augmented Dickey Fuller (ADF) unit root test, and the error correction mechanism (ECM) described in Gujarati (2003) and Green (2006). The study used PC GIVE 10 statistical software. The study followed procedures used in earlier similar studies including Sen (2008) and Lim and Haberman (2004). The following explanation indicates the steps used in the time series data analysis.

2.3.2. Augmented Dickey Fuller (ADF) unit root test. There is a need to ensure the stability of the data because time series data are assumed to be unstable. The unit roots tests considered is the augmented Dickey Fuller (ADF) test. The unit root test is performed on the model by taking the change from both sides of the function as specified in the model below and as applied by Sen (2008).

$$\Delta y_t = \phi y_{t-1} + \sum_{j=1}^{p-1} \alpha_j \Delta y_{t-j} + u_i \quad (3)$$

The hypotheses are: H_0: $\Phi = 0$ versus H_1: $\Phi < 0$.

The *t*-statistics *is* computed for the coefficient Φ. The hypothesis is then tested to confirm whether the data are stationary or not and decisions are either to accept or reject the null or alternative hypothesis.

2.3.3. Co-integration and the error correction model (ECM). Engle and Granger (1987) two stage approaches was used to test the Co-integration of the variables and confirm whether there exists a long-term balanced association. The concept of co-integration implies that even if many economic variables are non stationary, their linear combination may be stationary through time (Greene, 2006). The ECM is made by combining the error term with the first difference of the variables (short-run indicators). If the short-run dynamics *I* (0) variables are co-integrated then their dynamic specification can be written as ECM and vice versa. If the dynamic relationship between two I (1) variable can be written as an ECM then they are co-integrated. This shows that the variables have a long-run relationships.

2.3.4. Test of autocorrelation. Durbin Watson (DW) test is the most widely used test to measure the serial correlation in the residuals. As a rule of thumb, Durbin Watson value must be 1.5 and above as the evidence of serial correlation (Green, 2003).

2.3.5. Coefficient of multiple determination (R^2). The *R* squared (R^2) statistic confirms the robustness of the model and indicates the ability of the joint independent variables in forecasting the values of the dependent parameter. It also shows whether the regression line fits very well to the sample of data in the model.

2.3.6. F-statistic and probability value. The *F*-statistic test confirms whether the model is statistically significant while the probability value (*p*-value) determines the statistical significance of the parameters. The condition to establish a statistical significance for a parameter at 5% or 10% is that its *p*-value must be less than 0.05 or 0.1 respectively.

3. Result and discussions

The results obtained from the analysis are presented and discussed in this section. Inferences are then made for policy formulation.

3.1. Test for stationary of the data ADF unit root test. The unit-root test was conducted using the ADF and the results are presented in Table 1 (below).

Table 1. Results of ADF unit root tests

Serial No.	Lag length	Variables	ADF test with levels Critical value: 5%=1.954; 1%=2.652	ADF test with differencing Critical value: 5%=1.954; 1%=2.652
1	1	*Den*	0.89	4.019*
2	0	*Pen*	1.46	-3.930*
3	0	*GDPPC*	1.26	-2.771*
4	0	*GDSPC*	0.43	-5.608*
5	1	*FIND*	1.37	0.536
6	0	*RIR*	0.86	-4.805*
7	0	*INFR*	1.544	-7.981*
8	0	*UPR*	0.43	-5.250*
9	0	*YDR*	0.56	-5.220*
10	0	*ODR*	0.58	-5.434*
11	0	*PRICE*	0.15	-3.056*
12	0	*LEXP*	2.76*	-6.680*
13	0	*CDR*	2.72*	-4.519*

Note: *denotes variable is stationary.
Source: authors' computation.

The results above indicated that only life expectancy at birth (*LEXP*) and crude death rate (*CDR*) were stationary at level, while all other variables were not stationary at level I (0), and 1% and 5% significance level. When all these variables were differenced once and subjected to ADF tests, all the independent variables in the life insurance market demand (Mkt Den) and life insurance market supply (Mkt Pen) functions at I (1) became stationary at the first difference, except financial depth (*FIND*) which failed to be stationary. As a result, *FIND* was omitted from further regression analysis. After identifying the variables that were stationary and the order of integration, the co-integration test was applied to check whether there exists a meaningful long-term connection between the variables. The result showed the existence of a dynamic association between the I (1) variables and written as an *ECM*. This implied that ECM (residuals) is stationary at I (0). Thus, it can be concluded that the variables used in the life insurance market models are co-integrated and have a long-run relationships.

3.2. ECM results of life insurance market demand. The results of the error correction mechanism (ECM) is presented in Table 2 (below).

Table 2. ECM estimates for the life insurance market demand

Variables	Coefficient	Std. error	*t*-statistics	*p*-value
Constant	0.460550	1.052	0.438	0.667
GDPPC	0.0038813	0.1474	0.0263	0.979
GDSPC	0.372949	1.023	0.365	0.720
RIR	-0.00487434	0.01676	-0.291	0.775
INFR	-0.0114665	0.003377	3.40	0.003*
UPR	0.796586	2.209	0.361	0.723
YDR	-1.27983	0.6306	-2.03	0.058**
ODR	2.94593	2.161	1.36	0.191
PRICE	-0.001482	0.001893	-0.783	0.444
LEXP	0.009815	0.02325	0.422	0.678
CDR	-0.70409	-0.60851	-0.644	0.304
ECM	-1.49387	0.4061	3.68	0.002*
R^2 = 0.875521, DW =1.87, *F*-statistic=10.17, *N* = 28				

Note: *(**) denotes statistical significance of parameter at 5% (10%) significance levels.
Source: authors' computation.

Table 2 (above) shows the ECM results for life insurance market demand regressed against economic and demographic variables. The results indicated that inflation rate (*INFR*) had a negative and statistically significant (*p*-value = 0.003) effect on life insurance demand. It implied that an increase in inflation rate in the economy reduces the purchase of life insurance in the long-term. This result on inflation rate was consistent with the theoretical propositions. It also conforms to the results reported by Li and Moshirian (2007), Outreville (1996), Browne and Kim (1993), and Ayaliew (2013) which revealed that inflation had a significant negative influence and a damping impact on the purchase of life insurance. An increase in prices reduces people purchasing power and makes products more expensive which results in lower standard of living. Young dependency ratio is also statistically significant on life insurance market demand. The statistical significance of inflation and young dependency ratio show that they are the only determinants of the life insurance market demand in Ethiopia. The R^2 is 0.875521; implying that approximately 88% of variations in life insurance demand are explained by all the independent variables while the remaining 12% is captured by the error term. There is a significant linear association between the life insurance market demand and the economic and demographic variables.

3.2.1. Test for the overall significance of the model (F-test). The basis for conducting the test is to find out whether all the independent variables put together have any significant effect on the dependent variables. It is carried out on a tail test and by comparing the *F*-cal and the *F*-tab. The hypothesis for the test is formulated as:

H_0: There is no overall significance in the model.

H_1: There is overall significance in the model.

Decision rule: If *F*-cal is greater than (>) *F*-tab, accept H_1 and reject H_0 and if *F*-cal is less than (<) *F*-tab, accept H_0 and reject H_1.

F-test would be employed at 5% significance level.

Therefore, (F_{95} V_1, V_2) dof,

where: $V_1 = K - 1 = 11 - 1 = 10$; $V_2 = N - K = 28 - - 11 = 17$; ($F_{95} \approx 10, 17$) dof.

F-tab = 2.45 (as obtained from statistical table).

F-cal = 10.17 (obtained from ECM result output).

Since the *F*-cal (10.17) is greater than *F*-tab (2.45), it can be concluded that the whole model is significant in explaining the variations in the life insurance market demand.

3.2.2. Test for the presence of autocorrelation in the model (Durbin-Watson test). The Durbin-Watson test is employed to check for the presence or absence of serial correlation i.e. autocorrelation in the model. This test is carried out using the DW statistics.

DW Statistics value = 1.87.

Degree of freedom (dof) = $k^1 = k - 1 = 11 - 1 = 10$, $N = 28$; $D_L = 0.649$ and $D_U = 2.431$ at 5% significance level.

$4 - D_L = 4 - 0.649 = 3.351$ and $4 - D_U = 4 - 2.431 = = 1.569$.

Positive autocorrelation region falls between 0 and 4-D_U and negative autocorrelation region falls between D_U and $4 - D_L$ and the no autocorrelation region falls between 4-D_U and D_U. Therefore, the DW statistic value fall between 4-D_U and D_U, this implies that that the model is free from autocorrelation.

3.3. ECM results of life insurance market supply. The results of the life insurance market supply are presented in Table 3 (below).

Table 3. ECM estimates for life insurance market supply

Variables	Coefficient	Std. error	*t*-statistics	*p*-value
Constant	-0.00059	0.0008387	-0.710	0.488
GDPPC	7.41260	9.143e-005	0.811	0.429
GDSPC	-2.43939	0.0005981	-0.0408	0.968
RIR	-7.69773	9.733e-006	-0.791	0.441
INFR	-0.63039	2.143e-006	2.63	0.018*
UPR	0.00094	0.001268	0.747	0.466
YDR	-0.00047	0.0003861	-1.23	0.238
ODR	0.06229	0.001264	1.77	0.096**
PRICE	-1.03327e-006	1.153e-006	-0.896	0.384
LEXP	8.69247	1.337e-005	0.650	0.525
CDR	1.54428	8.689e-006	0.178	0.861
ECM	-0.957398	0.3264	2.93	0.010*
R^2 = 0.91, DW = 1.68, *F*-statistic =11.16, *N* = 28				

Note: * (**) denotes statistical significance of parameter at 5% (10%) significance levels.
Source: authors' computation.

Table 3 (above) shows the results of the life insurance market supply using ECM estimates. It was found that inflation rate (*INFR*) was statistically significant and has an inverse connection with life insurance market supply. It can be argued that an increase in inflation rate in the economy reduced the supply for life insurance in the long-run. The empirical results in relation to inflation rate are consistent with the theoretical expectation. This result is similar to the results of life insurance demand model obtained in the first scenario described above.

The result in Table 3 shows that the old dependency ratio (ODR) was positively and statistically related with the life insurance market supply at a 10 percent significant level. This implies that a higher rate of old dependants to working population stimulate increased saving through life insurance and annuities, and this, in turn, increases the supply for mortality coverage. This finding confirmed the theoretical expectation of old dependency ratio. The results with regard to *ODR* are confirmed by a number of researchers including Sen (2008), Li and Moshirian (2007), Beck and Webb (2003), and Browne and Kim (1993), and is found to be statistically significant and had positive relation with life insurance market supply. The statistical significance of inflation and old dependency ratio show that they are the key determinants of the life insurance market supply in Ethiopia. The R^2 is 0.91; implying that approximately 91% of changes in life insurance supply are predicted by all the independent variables while the remaining 9% is explained by factors outside the model but captured by the error term. The result also showed that a strong linear association existed between the life insurance market supply and the utilized variables.

3.3.1. Test for the overall significance of the model (F-test). The hypothesis is stated thus:

H_0: There is no overall significance in the model.

H_1: There is overall significance in the model.

Decision rule: if *F*-cal is greater than (>) *F*-tab, accept H_1 and reject H_0 and if *F*-cal is less than (<) *F*-tab, accept H_0 and reject H_1.

F-test would be employed at 5% significance level.

Therefore, (F_{95} V_1, V_2) dof.

Where $V_1 = K - 1 = 11 - 1 = 10$; $V_2 = N - K = 28 - - 11 = 17$; ($F_{95} \approx 10, 17$) dof.

F-tab = 2.45 (as obtained from statistical table).

F-cal = 11.16 (obtained from ECM result output).

Since the *F*-cal (11.16) is greater than *F*-tab (2.45), it can be concluded that the entire model is significant in explaining the variations in life insurance market supply.

3.3.2. Test for the presence of autocorrelation in the model (Durbin-Watson test).

DW statistics value = 1.68.

Degree of freedom (dof) = $k^1 = k - 1 = 11 - 1 = 10$, $N = 28$.

$D_L = 0.649$ and $D_U = 2.431$ at 5% significance level.

$4 - D_L = 4 - 0.649 = 3.351$ and $4 - D_U = 4 - 2.431 = = 1.569$.

Positive autocorrelation region falls between 0 and 4-D_U and negative autocorrelation region falls between D_U and 4-D_L and the no autocorrelation region falls between 4-D_U and D_U. Therefore, the DW statistic value falls between 4-D_U and D_U, this implies that the model is free from autocorrelation.

Conclusion

This study found that inflation (*INFR*) was statistically significant on both the life policy demand and supply markets. The young dependency ratio (*YDR*) and the old dependency ratio (*ODR*) had a statistically significant effect on the life insurance market demand and the life insurance market supply respectively. Inflation is a principal factor that determines the levels of the supply and demand in the life insurance market. The overall reliability test (*F*-test) of both models suggested that the economic and demographic variables put together are reliable predictors of the demand and supply in the life insurance market. This implied that the models were adequate to examine the factors that influence the life insurance market in Ethiopia. Outcomes observed in this study are consistent with findings reported in Li and Moshirian (2007), Outreville (1996), Brown and Kim (1993), Ayaliew (2013), Sen (2008), and Beck and Webb (2003). The models were free from autocorrelation which implied that there were no misspecifications of model in this study and that all the independent variables are strictly exogenous and uncorrelated with the error term. The findings of other economic variables which were statistically insignificant in this study needs further research consideration with using different economic indicators.

Policy implications

Based on the findings, old dependency ratio had a direct relationship with the life insurance market (supply). Inflation and young dependency ratio had an inverse correlation with the life insurance market (supply and demand). The policy implication of the inverse association between inflation and both the demand and supply in the life market is that inflation

is a key parameter and policy makers and regulatory bodies of life insurance should always consider this fact in policy formulation. Also young dependency ratio and old dependency ratio are influential factors in Ethiopia life insurance market. At the time of inflation (price instability), insurance companies should optimize life insurance product cost so as to encourage the potential of life insurance consumers. At the time of high inflation, individual households might refrain from investing in life insurance products. The insurance companies need to give key consideration to life insurance product price decisions during high inflation, since it affects both the life insurance market demand and supply. Young dependency (*YDR*) had a statistically significant negative effect on life insurance demand. The reason might be that the young populations are too immature to conceptualize the benefits of retirement savings, which in turn contributes to the low purchase of life insurance. Hence, insurance firms could persuade young dependants to improve the purchase of life insurance products via the families by providing tailored products to young children, such as children's education insurance policies. Since the old dependency ratio stimulates life insurance supply market, insurers should encourage the old groups through the provision of insurance services like annuities and longevity polices that suit these groups.

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