

The Determinants of the Foreign Exchange Exposure in the Life Insurance Companies in Egypt: An Applied Study

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Abstract

Exchange rate fluctuations generate high risk for the insurance companies in Egypt, such as bankruptcy and liquidity. This study aims to measure the foreign exchange exposure (FXE) for the life insurance companies in Egypt during the period from 2000-2016. After that, the study measures the determinants of this exposure. The problem of the study is concerned with the fluctuations of the foreign exchange rate in Egypt, which have a great effect on the financial performance. Following prior studies (e.g. Lee, 2011 and Ampomah 2012), this study uses Jorian model to measure the FXE. The results of the study show that the life insurance companies in Egypt were significant to the FXE; the results are robust to the choice of model design.

Keywords: foreign exchange exposure, life insurance companies, Jorian model, financial performance, foreign exchange rate

1. Introduction

Foreign exchange exposure (FXE) is an important subject to be discussed due to the recent floating of the Egyptian pound and high fluctuations in the foreign exchange rate. Following the adoption of a floating exchange rate, the volatility of the pound has thereafter been impacted by economic event and market force. For example, the exchange rate between the

Egyptian pound and the U.S dollar increases from 3.55 per dollar in 2000 to 18.929 per dollar in 2017. The most dangerous effect of the FXE is that it makes the company more exposed to bankruptcy during the fluctuation of the foreign exchange rate. Therefore, in order to grow and compete in the market, firms need to improve their protection against the fluctuation in the foreign exchange rate.

Life insurance companies' main object is to protect people against any financial loss that would cause from the premature death of an insured. The beneficiary receives the proceeds and protection from the financial impact of the insured death. The death benefit is paid by the life insurer in reflection for the premium payments made by the insured.

FXE has been studied by several authors. These authors arrived at different conclusions using different approaches. As Mwangi (2015) measured the FXE through measuring the types of the FXE (transaction- translation and economic exposure) applying it on the Oil Marketing Companies and Peter Blum (2001) applying it on the Reinsurance Companies. Moreover, some studies measured the FXE using the foreign sales and liability model dependent and cross sectional model such as Ngarifranco Gachua (2011) and Lee (2011) applying it on the Listed Companies and U.S Multinational Companies respectively.

However, other studies such as Ampomah (2012), d'Almeida (2016), Aggarwal (2010) and Nada (2017) used Jorion Model and FF Model to measure the effect of the FXE on the financial performance. Aggarwal (2010) approved that the U.S Domestic Companies face a FXE not less than the Multinational Companies.

The study will cover some of the most important cases, as it focuses on the insurance market because of the high uncertainty of their liabilities and their high effect on the economic growth through different channels.

The reminder of the paper is structured as follows: Section 2 is the problem identification. Section 3 is the objectives of the study. Section 4 is the literature review. Section 5 is the data and methodology. Section 6 is the empirical result. Finally, section 7 is the summary and conclusion.

2. Problem Identification

In this study, the first problem is that the fluctuating of the foreign exchange rate was very high during the referred period. As it was jumped from L.E 3.55/\$ in 2000 to L.E 18.929/\$ in 2017. This may harm the financial performance of the life insurance companies. In addition, the second problem is that the life insurance companies have no basis to measure the determinants of the FXE in order to control it.

3. Objectives of the Study

The specific objectives of the study are as follows:

- Set a basis for the life insurance companies to measure the FXE to control the risk of losses generated from the fluctuation of the foreign exchange rate.
- Find the most important variables that determine this exposure.

4. Literature Review

In order to achieve our objectives, we used the Statistical Package for Social Sciences (SPSS) as well as MS-Excel. Figure 1 shows the model framework of the study.

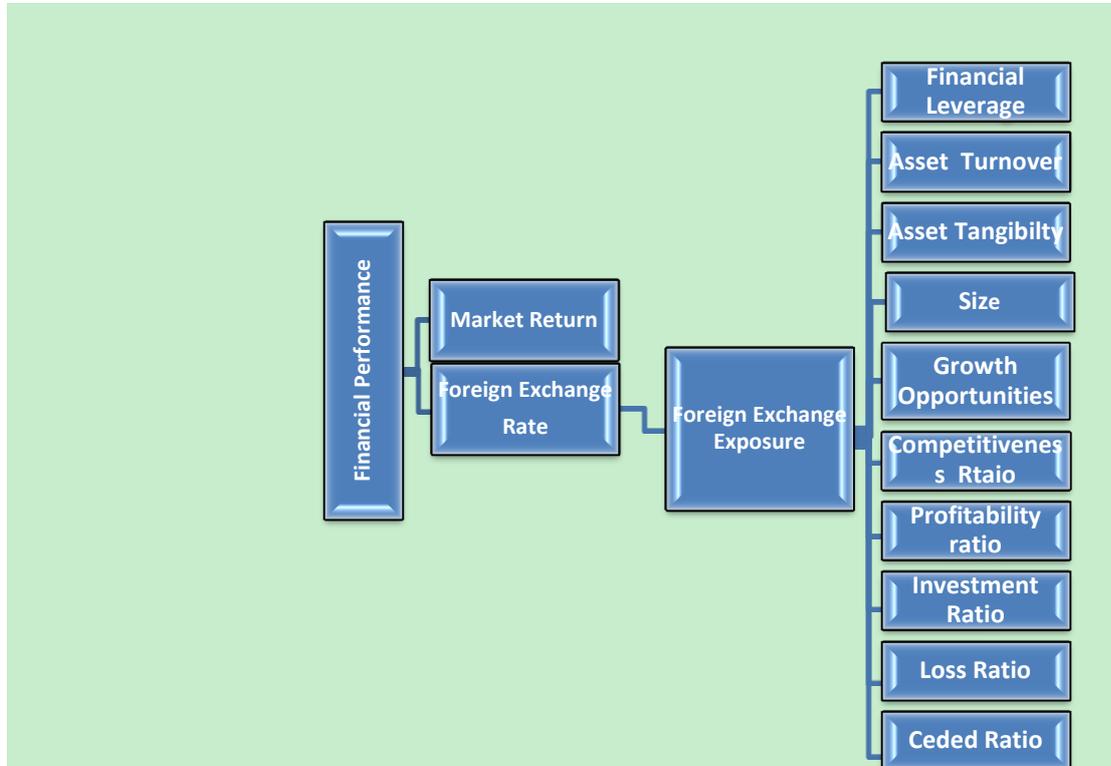


Figure 1. Model framework

Source: by researcher

Financial leverage is proxied by the debt ratio. Asset turnover is a proxy to the strength of the premium. Asset tangibility is a proxy to the strength of the assets. Growth opportunities is proxied by MTBK ratio. Competitiveness ratio is proxied by HHI. Profitability ratio is proxied by ROA. Investment ratio is a proxy to the strength of the investment. Underwriting ratio is proxied by loss ratio, and ceded ratio is proxy to the premiums moved for outside reinsurance companies.

Measuring the FXE can be made using Adler (1984) model, who states a procedure for assessing the FXE using a single factor to estimate the variability of the company's equity returns to exchange rates.

$$R_{i,t} = \alpha + \gamma_i XR_{j,t} + \epsilon_i$$

Where $R_{i,t}$ is the return on company i (financial performance), over the period t . $XR_{j,t}$ is the change in exchange rate. The coefficient γ_i measures the company's total exposure to foreign exchange rate.

After that, Jorion (1991) measured the exposure using two-factor model, which became the standard for controlling the exchange rate risk.

$$R_{i,t} = \alpha + \beta_1 R_{m,t} + \gamma_i XR_{j,t} + \epsilon_i$$

Where $R_{m,t}$ is the return on the market index. The rest of the variables are defined as above. Finally, Francis (2008) measured the exposure using three-factor model, also known as FF model, which studied the FX risk premia or risk premium (the difference between the expected return on a portfolio and the riskless exchange rate).

$$R_{i,t} = \alpha + \beta_1 MRP_t + \beta_2 SMB_t + \beta_3 HML_t + \gamma_i XR_{j,t} + \epsilon_i$$

Where MRP is the market risk premium, SMB is the return of the small minus large stocks. HML is the return for the value relative to growth stocks. Huffman (2010) found more FXE coefficients that are significant using FF three-factor model compared to the traditional market model.

Not all the life insurance companies in Egypt included in the stock market index. For that reason, Jorian model will be used to measure the FXE of the life insurance companies, but we will use the return on equity as a proxy for the financial performance. In addition, we will not use Fama-French model (three-factor model). As in FF model, all the sample should be included in the stock market to conclude the variables of the model stated before.

Then a model similar to Aggarwal (2010) will be used after making some modifications to identify the most important and significant variables causing this exposure.

$$\gamma_i = \alpha + \beta_1 \text{Debt} + \beta_2 \text{Turnover} + \beta_3 \text{Assettang} + \beta_4 \text{Size} + \beta_5 \text{MTBK} + \beta_6 \text{HHI} + \beta_7 \text{ROA} + \beta_8 \text{Inv} + \beta_9 \text{Loss} + \beta_{10} \text{Ceded} + \epsilon$$

Where debt is the debt ratio, turnover is the asset turnover, assettang is the asset tangibility, MTBK is the market to B.V ratio, HHI is average industry Herfindahl index, ROA is the return on asset, inv is the investment ratio, loss is the loss ratio, and ceded is the ceded ratio.

5. Data and Methodology

5.1 Data

The study is conducted on the life insurance companies using secondary data. All the data is collected over a period of 16 years from 2000 to 2016 for 12 life insurance companies.

5.2 Hypotheses Development

Kweh (2014) showed that the overall performance of life insurance companies in China was better than that of life insurance companies in Taiwan. However, Li (2009) showed that the U.S life and P&C insurance companies have the similar risk, so they will have the same risk management. In addition, Aggarwal (2010) and Huston (2014) showed that the FXE has a negative and positive exposure. According to these studies, we put the following hypothesis:

H1: There is a negative relationship between the firm's return and foreign exchange rate.

Various studies showed the positive effect of the financial leverage on the FXE (e.g. Nada (2017), Mazviona (2017), Aggarwal (2010), Ćurak (2014), and Chaieb (2013)). However, Çekrezi (2015) showed that there is a negative relation between the financial leverage and the FXE. In addition, Ampomah (2012) showed that there is no or little relationship between the financial leverage and the FXE. According to these studies, we put the following hypothesis:

H2: There is a positive relationship between the firm's financial leverage and FXE.

Nada (2017) showed the positive effect of the asset turnover on the FXE. However, Aggarwal (2010) showed that the asset turnover has a negative effect on the FXE. Moreover, Kamar (2015) showed that the asset turnover has no effect on the FXE. According to these studies, we put the following hypothesis:

H3: There is a negative relationship between the firm's asset turnover and FXE.

Aggarwal (2010) showed the negative effect of the asset tangibility on the FXE. However, Nada (2017) and Çekrezi (2015) showed that the asset tangibility has a positive effect on the FXE. According to these studies, we put the following hypothesis:

H4: There is a negative relationship between the firm's asset tangibility and FXE.

Nada (2017) and Daare (2017) showed that the size has a positive effect on the FXE. However, Aggarwal (2010), Chaieb (2013) and Mohapatra (2017) showed that there is a negative relation between the size and the FXE. Nevertheless, other studies found that there is no significant relation between size and FXE (e.g. Kripa (2016), Ampomah (2012) and Kamar (2015)). According to these studies, we put the following hypothesis:

H5: There is a negative relationship between the firm's size and FXE.

Nada (2017) showed that there is a negative relation between the growth opportunities and FXE. Nevertheless, Aggarwal (2010) and Mohapatra (2017) revealed that there is a positive relation between them. According to these studies, we put the following hypothesis:

H6: There is a positive relationship between the firm's growth opportunities and FXE.

Nada (2017) and Aggarwal (2010) showed that there is a positive relationship between the companies' competitiveness and the FXE. According to these studies, we put the following hypothesis:

H7: There is a positive relationship between the firm's competitiveness ratio and FXE.

Mwangi (2015) showed that the FXE has a significant relationship with the firm's profitability and investment ratio. According to that, we put the following hypotheses:

H8: There is a negative relationship between the firm's profitability ratio and FXE.

H9: There is a positive relationship between the firm's investment ratio and FXE.

Finally, the authors increase the variables to include loss, and ceded ratio. According to that, we put the following hypotheses:

H10: There is a positive relationship between the firm's loss ratio and FXE.

H11: There is a positive relationship between the firm's ceded ratio and FXE.

5.3 Identification of the Variables

The study uses two models.

5.3.1 The First Model

5.3.1.1 The Dependent Variable: (Return on Equity)

- Return on equity = $\frac{\text{Firm's Net income}}{\text{Firm's B.V equity}}$

5.3.1.2 The Independent Variables

- $R_{m,t}$ is the market return = $\frac{\text{Total life market Net income}}{\text{Total life market B.V equity}}$
- XR (Exchange Rate) = $\frac{(fx_t - fx_{t-1})}{fx_{t-1}}$

5.3.2 The Second Model

5.3.2.1 The Dependent Variable

The regression coefficient of the change in the foreign exchange rate on the financial performance of the life companies (FXE).

5.3.2.2 The Independent Variables

The study conducts 10 variables as follows:

- Financial leverage: It indicates the proportion of debt used by the company to finance its assets. A high debt/asset ratio generally means that a company has been aggressive in financing its growth with debt.

$$\text{Debt ratio} = \frac{\text{Total debt}}{\text{Total Asset}}$$

- Asset turnover: is a financial ratio that show the degree of the firm's efficiency use of its asset in generating sales. Firm with low profit margin will be likely to have high asset turnover and vice verse.

$$\text{Asset turnover} = \frac{\text{Sales premium}}{\text{Total Asset}}$$

- Asset tangibility: is the company's fixed asset compared to its total assets.

$$\text{Asset tangibility} = \frac{\text{Fixed Asset}}{\text{Total Asset}}$$

- Firm's size: the study uses the log. market value of the firm's capital.

$$\text{Size} = \text{Log (M.V of Capital)}$$

- Growth opportunity: The study uses MTBK as a proxy to the firm's growth opportunity. If market value is greater than book value, the ratio will be greater than one. On the other hand, if the ratio is lower than one, it indicates that the company reputation and shareholder expectations in the market is not favorable.

$$\text{MTBK ratio} = \frac{\text{M.V of capital}}{\text{B.V of capital}}$$

- Competitiveness ratio: (Herfindahl index) is a measure of the companies' premium in relation to the industry and an indicator of the amount of competition among them.

$$\text{HHI} = \frac{\text{Firm premium}}{\text{Total market premium}}$$

- Profitability ratio: This ratio measures how profitable a company is relative to its total assets. A high ROA indicates that management is effectively utilizing the company's assets to generate profit.

$$\text{ROA} = \frac{\text{Net income}}{\text{Total asset}}$$

- Investment ratio: It provides more accurate picture of the investment's actual value.

$$\text{Net investment ratio} = \frac{\text{Net investment income}}{\text{Net premium earned}}$$

- Loss ratio: It is the amount of a company's net premiums that were allocated to underwriting costs like; commissions to agents and brokers, state and municipal taxes, salaries, benefits and other operational expenses. It is the measure of an insurer's business efficiency to investor. The low ratio indicates that the company is more efficient.

$$\text{Loss ratio} = \frac{\text{Net claim}}{\text{Net premium earned}}$$

- Ceded ratio: It measures the amount of premium ceded to outside reinsurance companies.

$$\text{Ceded ratio} = \frac{\text{Premium ceded}}{\text{Gross premium written}}$$

6. Empirical Result

6.1 Descriptive Statistics

The FXE will be estimated using Jorian model. Table 1, shows the mean, standard deviation and proportion of the FXE in the life insurance companies from 2000 until 2016.

Table 1. Descriptive Statistics of FXE

	Full sample			Positive exposure			Negative exposure			Significant at 0.05 Level		
	N	Mean	Standard deviation	N	Mean	Standard deviation	N	Mean	Standard deviation	Total	+/-	%
12 month	192	2.002769	4.7824528	106	3.091954	5.9873581	86	.418500	.2399165	87	60/27	45%

Source: Result obtained using SPSS

Average FXE measures were estimated for annual time horizon; last three columns report the significant sample at 5% significance. Last column reports the percentage of the significant sample from the total sample. It revealed that 45% of the life insurance companies are significant to FXE. The result showed that 31% of the sample have a significant positive relation between the FXE and their financial performance. This means that they achieve profit during the inflation periods. However, 14% of the sample have a negative relation between the FXE and their financial performance. This means that they achieve losses during the inflation periods. According to that, the study will **reject H1**. The empirical result will exclude the 55% of the life insurance companies that not significant to FXE.

Table 2. The Descriptive Statistics of the Variables used on the Model

	Mean	Std. Deviation	Coefficient of variation	Minimum	Maximum
Debt	.657486551	.3023602326	0.459872878	.0237381	.9740630
AssetTurn	.286989160	.1930179531	0.672561825	.0018736	.9233244
Assettang	.043699736	.0714255769	1.634462436	.0003120	.3683630
Size	4.938290233	.5713088965	0.115689615	2.9127533	6.3305396
MTBK	6.1441	7.94932	1.293813289	-.20	37.48
HHI	.140182377	.1544999724	1.102135488	.0000521	.6486760
ROA	-.039143103	.1408293464	-3.59780742	-.7909151	.0958775
Inv	1.8039	7.29743	4.045362825	-.08	51.22
Loss	.3565	.33478	0.939074334	.00	1.73
Ceded	.1008	.17053	1.691765873	.01	1.05

Source: Output of SPSS

Notes: Debt is the debt ratio, Assetturn is the asset turnover, Assettang is the asset tangibility, MTBK is market to book value, HHI is average industry Herfindahl index, ROA is the return on asset, Inv is the investment ratio, loss is the loss ratio, and ceded is the ceded ratio.

From Table 2, we found that there are a good homogeneity in all the variables, as the minimum and maximum of each variable has a good convergence in their value, so it makes the model more appropriate.

Figures 2 and 3 show the normality of the FXE, so we can make the regression analysis for the determinants of the FXE.

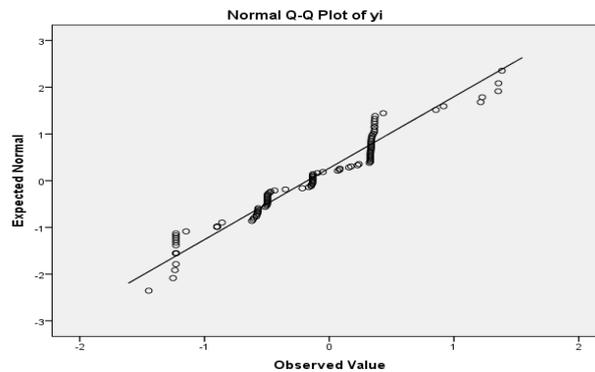


Figure 2. Normal Q-Q Plot of the FXE of life insurance companies

Source: Output of SPSS

From Figure 2, all the points are too close to the line, so we can conclude that we can make an appropriate model. In addition, the following histogram clarifies the normality of the FXE along the periods of the sample.

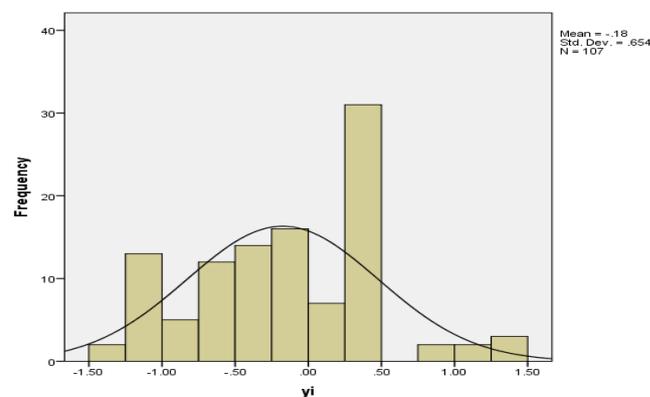


Figure 3. Horizontal for linear distribution for life insurance companies

Source: Output of SPSS

It is clear from Figure 3 that the data's behavior is normal, so we can use the regression models.

6.2 Regression Analysis

The following model used to estimate the FXE (γ_i) as discussed before, using the annual return on company (i) as a dependent variable and using the annual change in foreign

exchange rate and annual return on market as an independent variables.

$$R_{i,t} = \alpha + \beta_i R_{m,t} + \gamma_i XR_{j,t} + \varepsilon_i \quad \text{Eq. 1}$$

By using the annual data of the FXE for the life insurance companies, we estimate the regression coefficient of the model (Eq.2) as clarified in Table 3.

$$\gamma_i = \alpha + \beta_1 \text{Debt} + \beta_2 \text{Turnover} + \beta_3 \text{Assettang} + \beta_4 \text{Size} + \beta_5 \text{MTBK} + \beta_6 \text{HHI} + \beta_7 \text{ROA} + \beta_8 \text{Inv} + \beta_9 \text{Loss} + \beta_{10} \text{Ceded} + \epsilon \quad \text{Eq.2}$$

Table 3. Regression analysis for life insurance companies

	Independent Variables	R ²	F	LOS	DF
Debt	5.037 (2.844)**				
Assetturn	1.868 (3.44)				
Assettang	-15.572 (8.307)**				
Size	0.394 (1.491)				
MTBK	-0.054 (0.068)	0.737	17.081	***	(10-61)
HHI	-1.286 (3.768)				
ROA	-27.148 (3.727)***				
Inv	0.058 (0.286)				
Loss	0.110 (1.375)				
Ceded	20.603 (2.957)***				

Source: Result obtained using SPSS

Notes: debt is the debt ratio, assetturn is the asset turnover, assettang is the asset tangibility, MTBK is the market to book value ratio, HHI is Average industry Herfindahl index, ROA is the return on asset, Inv is the investment ratio, loss is the loss ratio, and ceded is the ceded ratio. LOS is the Level of Significant; DF is the Degrees of Freedom

***, **, and * indicate significance at the 0.01, 0.05 and 0.10 level, respectively.

Using stepwise method, in Table 4, the model shows that the dependent variable is the FXE and the significant independent variables are debt ratio, asset tangibility, ROA and ceded ratio.

Table 4. Regression analysis for life insurance companies

	Constant	Independent Variables				R ²	F	LOS	DF
		Debt	Assettang	ROA	Ceded				
B	-3.000	3.602	-16.322	-26.850	19.618	0.729	44.995	***	(4-67)
SEB	2.860946	1.900^a	7.515^a	2.763^a	2.448^a				
		1.896^b	-2.172^b	-9.716^b	8.013^b				
LOS	*	***	***	***	***				

Source: Result obtained using SPSS

Notes: B is the Regression Coefficient, SEB is the Standard Error of the Regression Coefficient, LOS is the Level of Significant, DF is the Degrees of Freedom***, **, and * indicate significance at the 0.01, 0.05 and 0.10 level, respectively. a-standard error, b-t-test value.

From the table, we found that there is a positive relationship between the debt ratio and FXE. Hence, when the debt ratio increases by one point, the FXE will increase by 3.602 point. Therefore, firms with high debt ratio and poor financial leverage can be expected to be more susceptible to additional risk. Therefore, it will exhibit high FXE. For that reason, we will **accept H2**.

There is a negative relationship between the asset tangibility and FXE. Hence, when the asset tangibility increases by one point, the FXE will decrease by 16.322 point. Therefore, when the firm has a high proportion of fixed asset compared to its total asset. It will be prevented from the exposure to foreign exchange risk through the high fair value of the fixed asset during the inflation period. Hence, we will **accept H4**.

There is a negative relationship between the ROA and FXE. So, when the ROA increases by one point, the FXE will decrease by 26.850 point. Therefore, when the firm has high profitability, it will have high flexibility in pricing services and high ability to absorb any shocks more easily than firms with low profitability. Therefore, it will have low FXE. For that reason, we will **accept H8**.

There is a positive relationship between the ceded ratio and FXE. So, when the ceded ratio increases by one point, the FXE will increase by 19.618 point. Therefore, when the firm has high amount of premium ceded outside the country, it will need to translate it into the foreign currency, so high translation exposure will lead to high FXE. Therefore, we will **accept H11**.

The result showed that the asset turnover, firm size, growth opportunities, competitiveness

ratio, investment ratio, and loss ratio have no significant effect on the FXE. For that reason, we will reject H3, H5, H6, H7, H9, and H10.

We can conclude that these variables interpret 72.9% from the change in the FXE. In addition, Figure 4 shows that there is a linear relationship between the FXE and the variables stated.

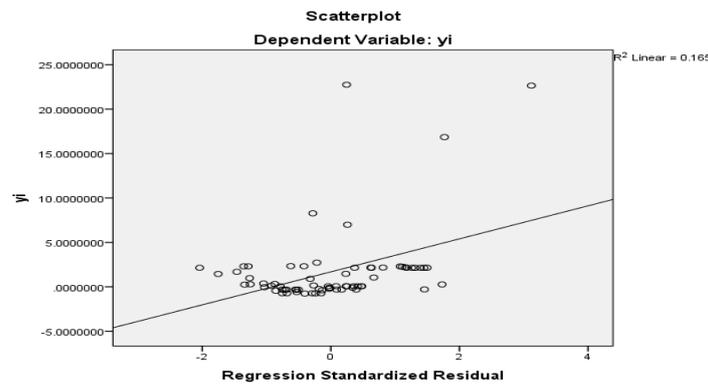


Figure 4. Scatterplot for life insurance companies

Source: Output of SPSS

7. Summary and Conclusion

The study used a sample of 12 life insurance companies in Egypt from 2000 until 2016. We used Jorian model to measure the FXE and we found that 45% of the life insurance companies were significant to FXE.

After that, we used cross-sectional model to identify the most variables that determine the FXE, and we found that the FXE is negatively related to asset tangibility and profitability ratio. However, it is positively related to debt ratio and ceded ratio.

Figure 5 shows the change in the FXE from 2000 until 2016 for the life insurance companies.

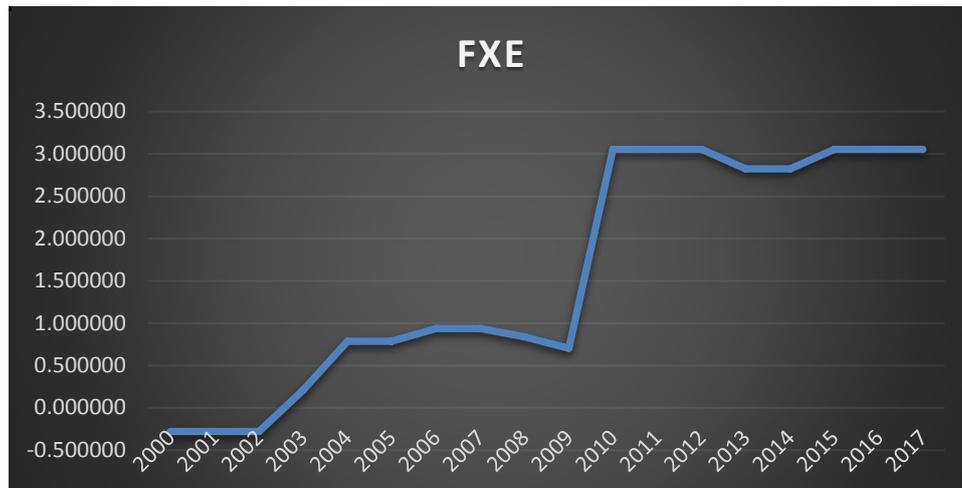


Figure 5. The Foreign Exchange Exposure

Source: output of SPSS

It can be concluded that FXE of the life insurance companies were affected positively from the floating of the Egyptian pound. As the FXE was low or negative before 2002.

However, after the floating of the Egyptian pound at 2002-2003, the FXE increased to a high point. Then, after 2008-2009 (the global financial crises), the FXE jumped to high point. Then the FXE continue to increase during 2011 because of the Egyptian revolution.

At 2013-2014, the FXE decrease by little amount. But unfortunately, it increased again during 2015-2016 because of the floating of the Egyptian pound.

According to the result, the study recommends the life insurance companies to set a basis for measuring the FXE in order to control its risk. They also should increase the fixed asset and profitability as they have a negative relation with the FXE. Moreover, they should decrease the debt ratio and the amount of premium ceded to the outside reinsurance companies, as they have a positive relation with the FXE.

The study also recommends the life insurance companies to improve the disclosure of the foreign operation and clarifying the foreign currency for each operation in order to measure the direct effect of the FX rate on the financial performance of the life companies.

The study limited to the indirect effect of the life insurance companies. It also did not use the transaction, translation and economic exposure measures to measure the FXE. Further studies can measure the direct FXE and its effect on the companies' financial statement.

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Abbreviations

1. FF: Fama-French
2. HHI: Average Industry Herfindahl Index
3. FXE: Foreign Exchange Exposure
4. FX: Foreign Exchange
5. MTBK: Market to Book Value
6. ROA: Return on Asset

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