IOSR Journal of Economics and Finance (IOSR-JEF)
e-ISSN: 2321-5933, p-ISSN: 2321-5925.Volume 9, Issue 6 Ver. I (Nov. – Dec.2018), PP 43-53
www.iosrjournals.org

Impact of Inflation on Insurance Claims in Nigeria: An Ardl Bounds F-Test Approach

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Abstract:*Inflation affects life and non-life insurance in a different way. For non-life insurers, unanticipated inflation leads to higher claims costs, thereby eroding profitability. This paper therefore, investigated inflation on insurance claims in Nigeria over the period 1981 - 2016 with data sourced from Central Bank of Nigeria (CBN) Statistical Bulletin. An unrestricted error correction model (UECM) version auto-regressive distributed lag (ARDL). The estimated result shows that there is a long run relationship between insurance claims and inflation in Nigeria and a rise in inflation will lead to a rise in cost of insurance claims in the short run but a decrease in the long run. Thus, high rate of inflation has a negative effect on returns of insurance claims in the short run but has an increasing non-significant effect in the long-run in Nigeria. Also, exchange rate has a proportionate and statistically significant influence on insurance claims. Thus, this study concludes that there is a long run relationship between insurance claims and inflation in Nigeria and a rise in inflation will lead to a rise in cost of insurance claims in the short run but a decrease in the long run. This study recommends that there is therefore need for insurers to evaluate the probability distribution of future adverse inflation events and their correlation with other macroeconomic variables and there is need to establish a higher level of coverage based on the original face value of an insurance policy and a maximum inflation adjustment.*

Keywords: *Insurance claims, Inflation, Exchange rate, ARDL bound F-test, Risk*

Date of Submission: 30-10-2018 Date of acceptance: 15-11-2018

I. Introduction

Inflation affects life and non-life insurance in different way. For non-life insurers, unanticipated inflation leads to higher claims costs, thereby eroding profitability. For life insurers, both inflation and deflation are risks. Inflation is often accompanied by rising interest rates, which reduce the value of return guarantees. Rising inflation can have a negative effect on demand, and may lead to policyholders cancelling their policies as well as increasing costs for insurers. In the case of deflation, or if very low inflation persists, interest rates tend to fall Bohnert, Gatzert, and Kolb, (2015). This makes it more difficult for life insurers with large portfolios of minimum interest rate guarantee savings products to earn the appropriate asset returns.

Findings of many studies have made reference to the important role played by insurance in a nation's economy. In addition to its basic functions of risk pooling, spreading and loss indemnification, insurance is said to be a catalyst of economic growth by promoting long- term savings, encouraging accumulations of capital, and channeling those funds to productive investments (Fatula, 2007; Oluoma, 2014).

One reason for a growing relevance of insurance is the role it plays in mitigating sudden and devastating occurrences that can cripple financially individuals and corporate organizations (Yinusa & Akinlo 2013). The availability of insurance services is essential for the stability of the economy as business organizations can take more risks in the course of their operations. In the developing economies, insurance is growing in importance due to its increasing share in the financial sector productivity (Oke, 2012).

Insurers concerned about inflation risk can mitigate this risk in several ways. On the asset side, insurers can invest in commodities, real estate and inflation indexed bonds, which are most viable inflation hedges. These investments have performed well during periods of high inflation.

Insurers can also modify insurance contracts to shorten the tail and hence the development risk. Insurers can introduce "claims made policies" or sunset clauses to address the issue of latent claims, they can also reduce "occurrence" policies. They can also add index clauses linking premiums, limits and deductibles/retention to an inflation-related index. It is important to understand the difference between the two most common types of professional liability insurance plans – "Claims-made" and "Occurrence".

Under a “claims-made” policy, the policy covers claims made against you only while the policy is in effect. The down side of this type of policy is that coverage must be continued indefinitely to assure coverage for claims filed in the future for actions that occurred in the past. Essentially, once the policy has lapse you no longer have coverage. Under the “occurrence” policy, you are covered for alleged acts of negligence that occurred while the policy was in effect. It does not matter if the coverage is in effect at the time the claim is made.

In general, inflation is measured as the percentage change in the overall level of prices measured by a price index such as the consumer price index (CPI). However, insurers are likely to be exposed to specific components of the CPI such as medical inflation rather than the overall level of price changes (Ahlgrim and D’Arcy, 2012a). For instance, measures the impact of inflation on insurers by isolating components of the CPI that are related to specific lines of business.

For non-life insurers, inflation associated with long-term liabilities represents one major risk source and can considerably impact the adequate estimation of technical provisions, thus directly influencing future earnings (Wüthrich, 2010; Ahlgrim and D’Arcy, 2012a; D’Arcy, Au, and Zhang, 2009). Furthermore, in the context of new risk-based capital requirements for insurers as imposed by Solvency, all material risks have to be considered in the calculation of solvency capital requirements and the Own Risk and Solvency Assessment (ORSA), implying that inflation risk should at least be taken into consideration within an internal model of an insurance company.

While the general rate of inflation as measured by the National Bureau of Statistics (NBS) and reported as a percentage change in consumers price index (CPI) is one indicator of price increases, the effects on insurers may be dramatically different. In effect, increases in retail prices are separated (through a hedonic regression) into pure price effects and additional manufacturing costs as a result of product improvement, often brought about by technological advances (Poole, Ptacek, and Verbrugge 2005). When measuring inflation, the reported consumer price index strips out the extra costs embedded in new products that reflect product upgrades. As an example, the retail prices of automobiles may have increased 25% over the last decade, but the component of the consumers price index related to automobiles may indicate a much lower increase since modern cars have much more advanced technology than one produced previously (Ahgrim, and D’Arcy, 2012a).The NBS argues that if we want a measure of a truly static basket of goods, this year’s cars are not the same as those manufactured earlier.

However, payments from insurers do not reflect these hedonic corrections. Auto insurers do not reduce payments for car repairs to adjust for differences in quality. Insurance reimbursements for medical care are especially prone to advancing technology. Increasing costs for insurers are affected by the continuous improvements in modern medical technology, not because the same outdated procedures of years ago are more expensive today (Ahgrim, and D’Arcy, 2012a).

If a new generation of prosthetics provides significant benefits over older devices, any increase in cost would likely be fully reflected in insurance claims, yet only part of the increase would be captured under the reported consumer price index. Insurers are likely to be exposed to specific components of the CPI rather than the overall level of price changes.

Also, inflation does not have an isolated impact on insurer performance. While high inflation by itself may increase claims of insurers, the interaction with other economic and financial variables may lead to a more complex risk assessment. For example, the traditional Phillips (1958) curve indicates that demand-pull inflation may be accompanied by low unemployment. Thus, at a time when an insurer may be experiencing higher claims caused by inflation, these effects may be offset by lower unemployment which might influence disability and workers compensation claims (Ahgrim, and D’Arcy, 2012a). Low unemployment may also improve insurer sales and retention. Also, low unemployment may lead to positive effects in the stock market, further cushioning the higher claim inflation exposure of insurers.

Another disparity between the CPI and insurance costs relates to the manner housing costs are reflected in the CPI. The CPI measures the cost of the owners’ equivalent rent of the primary residence, which measures the value of renting a residence and does not consider the selling price of the home (Poole, Ptacek, and Verbrugge 2005).. Based on the CPI approach, the cost of a residence reflects two elements, a consumption portion and an investment portion. The consumption portion is measured by the owners’ equivalent rent; the investment portion, or price appreciation in the value of the home, is ignored (Poole, Ptacek, and Verbrugge 2005). Thus, the CPI did not incorporate the rapid increase in housing prices during the 2000-2017, or the drop in prices that occurred subsequently. As the cost of claims for homeowners losses covers the full cost of the home, both the consumption and the investment portions, this discrepancy further removes the CPI from an appropriate measure of insurance costs (Ahgrim, and D’Arcy, 2012a).

Morrow and Conrad (2010) identify economic indicators, which best measure the inflation inherent in claims costs. In addition, Ahlgrim and D’Arcy (2012a) investigate the effects of inflation or deflation on the insurance industry in general, thereby indicating that property liability insurers are impacted by inflation in several ways, e.g. by means of costs of future claims on current policies and calculation of loss reserves.

Regarding loss reserves, D'Arcy and Au (2011) and D'Arcy, Au, and Zhang (2009) point out that loss reserves are commonly calculated based on the assumption that the inflation rate experienced in the recent past will continue until these claims are closed, which, however, can take decades. Thus, if inflation increases, costs will be more than expected, which in particular affects long-term liabilities. In this context, Taylor (1977) separates the impact of inflation from the runoff triangle, which allows incorporating a different inflation rate in the calculation of reserves.

Moreover, inflation also affects asset returns (Fama and Schwert, 1977) and thus the asset side of an insurer and this may offset or magnify reserving risks in the presence of inflation.

Property-liability insurers are impacted by inflation in several ways. The clearest impact is the cost of future claims on current policies. Workers compensation indemnity claims are based on wages at the time of a loss; wages tend to increase during inflationary periods, but not directly in line with on the CPI. For property policies, the values of the insured property are based on the cost to repair or replace the item at the time of loss in almost all cases. Very few contracts provide a pre-specified, fixed value. Thus, as inflation increases the value of the property, the cost of claims increases. During the last bout of high inflation, automobile manufacturers tried to minimize price increases on new vehicles, but made up the lost profits by increasing the cost of replacement parts for items frequently damaged in an accident at a level well above the inflation rate. Since most of these repairs are covered by insurance, then the effect on consumers was indirect. The insurance industry and automobile manufacturers engaged in many disputes over the need to use original manufacturer's replacement parts when repairing a car involved in an accident. That issue is not completely settled. Therefore, the insurance industry can expect collision damage repair costs to increase more rapidly than the general inflation rate if inflation were to increase significantly.

The Nigeria government through the Central bank has the responsibility of ensuring that the prevailing rate of inflation is favorable to the economy. To contain high rates of inflation, the government puts in place prudent monetary policy by ensuring that growth in money supply remains in tandem with economic trends and by ensuring stability of the shilling exchange rate in order to restrain increases in prices of imports. From the understanding of the level up to which the rate of inflation affects investment, the government would be able to determine the inflation rates that would be necessary in a developing economy like Nigeria.

It is also very necessary to determine how inflation affects insurance investment as this would guide the government in making the right economic policy adjustment necessary in containing inflationary levels.

The study would also be valuable to the investors in the insurance companies as it will provide an insight on how inflation on insurance claim among insurance companies in Nigeria. Companies need to know how inflation will affect claim and investments in insurance business. This is so that as they forecast into economic conditions, they can predict the effect on the interest rates that they will be charged, the cost of capital, the returns they can expect and how much capital goods they can procure to expand their business.

Based on our empirical findings and analysis, the result of this study will be of immense benefit to researchers who will rely on their contributions to the existing knowledge for further research given that very little on the impact of inflation on insurance claim in Nigeria had been empirically investigated thus making the paper strategic in the literature of inflation as it relate to insurance claim in Nigeria.

II. Theoretical framework and literature review

The theoretical underpinning of this study is anchored on the expected utility theory and the ruin theory.

2.1.1 Expected Utility Theory

The expected utility theory was developed by Von Neumann and Morgestern in 1944 to address the risk management aspect of the demand for reinsurance. It assumes that insurers are risk averse and will always choose to reinsure in order to eliminate risk (Garven & Tennant, 2003). Borch (1962) used this theory to show that if insurers have absolute risk aversion, they will demand reinsurance. Garven and Tennant (2003) extended the theory and argued that the decision to reinsure can be viewed as both a risk management and capital structure decision. Mayer and Smith (1990) state that the decision of an insurer to purchase reinsurance resembles the decision of any non-financial firm to purchase insurance. In view of this study therefore, the motivations that explain why firms' hedge and why insurers demand reinsurance may be similar. This approach has emphasized that reinsurers, because of their expertise in risk management, provide real services to primary insurers and are able to mitigate agency problems within insurance companies. Reinsurance is demanded to provide additional capacity to the market by facilitating the spread of risk.

Eden and Kahane (1990) further discussed the demand of reinsurance with objective of risk spreading.

However, risk sharing has been found as not the only motive for reinsurance. This was evidenced in a study by Mayers and Smith (1990) who found that less diversified firms demand less reinsurance a position inconsistent with the view of reinsurance as a diversification device. The evidence from Mayers and Smith (1990) that less diversified insurers demand less reinsurance is consistent with the view that highly capitalized insurers are more likely to develop the required expertise in-house therefore lowering the demand for reinsurance (Gerathewohl, Bauer, Glotzmann, Hosp, and Klein 1982).

2.1.2 Ruin Theory

The ruin theory was introduced by Filip Lundberg in 1903 and uses mathematical models to describe an insurer's vulnerability to insolvency. It is based on the premise that premiums arrive at a constant rate from insured's with claims arriving at a different rate. Mathematical models are used to investigate the probability that insurer's surplus level becomes negative as a result of settling claims therefore bringing the technical ruin of the insurer hence making the firm bankrupt (Khan, 1962). The same ruin principle applies to reinsurance as a result of settling diverse claims especially from catastrophic losses.

However, Swiss, (2003) states that the probability of reinsurance failure is small for three reasons which are, small total percentage of global premiums written, high credit ratings of reinsurers meaning low probability of risk from retrocession and that only a small number of reinsurance companies have failed in the past. Doherty and Tinic (1981) argued that reinsurance is irrelevant if the pricing of insurance is inelastic with respect to the insurer's ruin probability. But, Khan (1962) argues that reinsurance is necessary and is demanded by cedants to mitigate their risk of ruin.

2.2 Empirical literature

Eze and Okoye, (2013) in their paper use co-integration test and error correction model to examine the impact of insurance practice on the growth of Nigerian economy. Insurance premium capital, total insurance investment and insurance sector development are used as measures of insurance development. The paper concludes that there is a significant positive effect of insurance practice on the growth of Nigerian economy.

In addition, Yinusa and Akinlo, (2013) analyzed both the long and short run relationship between insurance development and economic growth in Nigeria over the period 1986 to 2010. Using error correction model (ECM), the study finds that insurance development is co integrated with economic growth in Nigeria. There is a long run relationship between insurance development and economic growth in Nigeria.

The results also show that physical capital and interest rate both at contemporary and one lagged value have significant positive effect on economic growth in Nigeria while physical capital and inflation have negative long run relationships with economic growth. The results generally indicate statistically significance contribution of insurance to economic growth in Nigeria.

Nderitu, (2012) investigated the effect of inflation on investment among insurance companies in Kenya. This study was conducted through the use of a descriptive design. The target population for this study was 46 insurance companies in Kenya. The study used purposeful sampling to pick 35 insurance companies authorized to transact miscellaneous class of insurance business and by extension bid bonds business. The secondary data was collected from the companies audited financial statements, the central bureau of statistics and also CBK. The data collected was run through various models so as to clearly bring out the effects of change in inflation on firm's investment. The results obtained from the models were presented in tables. The study concludes that inflation have a negative influence on the investment among insurance companies in Kenya.

Olayungbo, (2015) investigates separately the effects of life and non-life insurance on economic growth in Nigeria from 1976 to 2013. The Autoregressive Distributed lags (ARDL) was adopted given the different order of integration of the variables of interest. After estimating a growth model, the bound test shows a long run relationship to exist among economic life, non-life insurance and economic growth in Nigeria over the period of study. The long run and the short run dynamics further confirms the positive and significant contribution of life and non-life insurance on economic growth in Nigeria. The paper concludes that life and non-life insurance acts as complements to economic growth in Nigeria rather substitutes.

Olayungbo, (2015) investigated the asymmetric nonlinear relationship between insurance and economic growth in Nigeria from 1976 to 2010. The conclusion is that asymmetric effect is present in Nigeria's insurance market. Also, unidirectional causality runs from positive GDP growth to negative insurance premium growth. In addition, the robustness results, using variance decomposition and impulse response with control variables, show that low insurance promotes high growth in Nigeria. The impulse responses also show the presence of an asymmetric relationship between low insurance and high growth in Nigeria.

III. Model specification

The study explores the long run and short run effects (lagged values of key determinants) using unrestricted error correction model (UECM) version of the ARDL model. Data for the period from 1981 to 2017 were collected from various publications Central Bank of Nigeria and National Bureau of Statistics. This study employed insurance claims (INSLM) as the dependent variable while inflation in Nigeria is measured, in terms of consumer price index (CPI) and exchange rate (EXCHR) as the independent variables. Firstly a multivariate model is used to investigate the long run-equilibrium relationship between inflation (INFL) and insurance claim (INSCLM); while exchange rate (EXCHR) was introduce as an independent variable to make the model robust.

The ARDL bounds F-test procedure require step-by-step estimations: the following test is performed in this study thus: perform stationarity (unit root) test using the Phillip-Perron techniques; selection of the optimal lag length using Schwarz Akaike Information Criteria (AIC); estimation of UECM version ARDL model with appropriate diagnostic and stability tests and ARDL bounds F-test is used to investigation the long run co-integration equilibrium relationship and estimates from ARDL estimates.

Furthermore, to avoid general time series estimation problem due to omitted variable problem of a bivariate model. We express this in the functional form:

Inflation, $INSCLM_t = f\ (INFL_t, EXCHR_t)$ 1

Taking the natural logarithm of equation (1) to rearrange it in logarithmic form, where, X_t represents all exogenous determinants considered in the model.

$$\ln.\square_t = \sigma + \ln\sum_{t=1}^{k} A_t\, X_t + \varepsilon_t \quad (2)$$

In Eq. (2), $\ln\square_t$ is a dependent variable, is the vector of independent variable of insurance claims determinant and ε_t is the serially uncorrelated error term of the model.

The ARDL procedure does not require all the series in the model to be of equal order of integration; it allows different optimal lags of the series. It is irrespective of whether the regressors are mutually cointegrated, or it is I (0) and I (1).Moreover, it provides efficient estimator even if samples are small/finite and some of the regressors are endogenous (Khatun and Ahamad, 2012).

The augmented ARDL model can be expressed according to Pesaran et al. (2001) and Pesaran and Shin (1997) in the following form:

$$\Delta y_t = \sigma_0 + \sigma_{1t} + \varphi_{yx} V_{t-1} + \sum_{i=1}^{p-1} \theta_i\, \Delta y_{t-i} + \sum_{i=1}^{p-1} \theta_i\, \Delta x_{t-i} + \varepsilon_t \quad (3)$$

In Eq. (3), Δ, t and θ_i represent first difference operator, time trend and short run movements of the model. If the model variables show a linear trend and no quadratic trend, it can specify the UECM version of the ARDL equation as follows:

$$\Delta y_t = \sigma_0 + \varphi_{yy} y_{t-1} + \varphi_{yxx} x_{t-1} + \sum_{i=1}^{p-1} \theta_i\, \Delta y_{t-i} + \sum_{i=1}^{p-1} \theta_i\, \Delta x_{t-i} + \varepsilon_t \quad (4)$$

The ARDL cointegration approach requires two-step estimation method to explore the relationships between the model variables (series) both in the long run and in the short run. The first step is to examine the existence of long run equilibrium relationship among the series of the model. To do so, following Pesaran et al. (2001), the UECM specification of the ARDL model of long run relationship between inflation (INFL) and insurance claim (INSCLM); while exchange rate (EXCHR) can be represented thus:

$$\Delta InINSCLM_t = \sigma_1 + \sum_{i=1}^{\infty 1} w_{ii}\, \Delta InINSCLM_{t-i} + \sum_{i=1}^{\propto 1} \pi\, \Delta INFL_{t-j} + \sum_{k=0}^{\delta-1} \varphi_i\, \Delta EXCHR_{t-k} + ß_1 \Delta In.INSCLM_{t-1} + ß_2 \Delta In.INFL_{t-1} + ß_3 \Delta In.EXCHR_{t-1} + \varepsilon_{1t} \quad (5)$$

Δ is the first difference operator whileε_{1t}iswhite noise error term which is derived from residuals of the estimated cointegration and measure the magnitude of the past disequilibrium.

IV. Results and analysis

When data - generation process exhibits a random walk with infinite memory to shock, such model is said to have a unit root and the series is non-stationary. An Augmented Dickey-Fuller (ADF) unit root test is performed to check the stationarity of the series. ADFstationarity test employed in this study as evident in **table 1(Appendix I)**; shows that, insurance claim, inflation and exchange rate were not stationary at level, but became stationary at first difference. This implies that the variables employed in the stud have no unit root problem as its significant and stationary at 1%, 5%, 10% level respectively. Although the series of the model is integrated in order one, this study uses ADRL bounds test of co-integration to minimize the common time series estimation problem

The optimum ARDL model was selected using the AIC as seen in **table 6(Appendix II)** showed that the specification estimated model is that of ARDL (4, 2, 4). Result from the histogram normality test in **figure 3(Appendix VIII)** showed that the variables are rightward skewed. Therefore, we conclude the distribution to be approximately normal. Kurtosis measures the peakedness or flatness of the data relative to the normal distribution. The coefficient of the kurtosis of the variables indicates that the variables are peaked (leptokurtic) with the kurtosis value greater than 3.00 relative to the normal. The jarque-bera (JB) test measures the difference of the skewness and kurtosis of the series with those from the normal distribution. The model with the J-B value of 12.50 and a corresponding probability of 0.00 confirm the normality of the series and suitability of generalization as well as indicating the absence of outliers in the data. The ARDL Bounds Test in **table 3(Appendix III)** shows there is a long run equilibrium relationship between insurance claim, inflation and exchange rate at 5% significance level with F-value of 6.38 and critical values for the lower I (0) and upper I (1) bounds are 3.79 and 4.85 for 5% significance level respectively. This study proceeds to estimate the ARDL Co-integrating and Long Run Form result in table **4(appendix IV)** shows that the long-run elasticity of inflation rate is 0.052. This indicates that 1% increase in inflation will bring about 5% decreases in insurance claim in

Nigeria keeping other variables constant. Similarly, the long run elasticity of exchange rate is 0.526 which implies that 1% rise in exchange rate will cause insurance claim to rise by 52% with a significant t-statistic value of 7.24 and a probability value of 0.00

The Breusch-Godfrey Serial Correlation LM Test statistic in **table 5(appendix V)** rejected the first, second and third order serial correlation of the model with Prob. F(10,22)[0.2618]. Prob. Chi-Square (10)[0.1847].In **table 6(appendix VI)** the ARCH test also confirms that the residuals are homoskedastic at first, second and third order of the estimated model Prob. F(1,33)[0.6714] and Prob. Chi-Square(1)[0.6603]Also the individual components test of F-test, and Chi-Sq (χ^2) test also do not reject the null hypothesis of no cross term heteroskedasticity at 5 % level of significance.

The structural stability of the insurance claim equation is examined by employing CUSUM and CUSUM square (CUSUMSQ) tests which detects systematic change in the regression coefficients (Brown et al., 1975). **Figure 1 and 2** presents the plot of CUSUM and CUSUMSQ test statistics. These falls within the critical bound lines (red and dashed) at 5% level of significance that means that estimated coefficients in the UECM based ARDL model are stable over the sample period of 1981-2017. Therefore, evidences revealed from the estimated model can be used for practical policy-making purposes.

From the results inflation has the capacity to push claims that were previously below the retention over the level and also has the potential to increase claims that are already hitting retention levels, so reinsurers experiencing a much higher level of claim cost inflation than primary insurers were. This effect could be reduced by indexing retentions and when inflation begins to rise there is need for insurers to be prepared so as to incorporate strategic steps such as index retention in order to reduce the effect of inflation when inflation begins to rise on their claim costs by indexing coverage levels and deductibles

V. Conclusion

This research is aimed to evaluate inflation and insurance claim in Nigeria using unrestricted ARDL model. From the empirical investigation there is a long run relationship between insurance claim and inflation in Nigeria and a rise in inflation will lead to a rise in cost of insurance claims in the short run but a decrease in the long run. Thus, high rate of inflation has a negative effect on returns of insurance claims in the short run but has an increasing non-significant effect in the long-run in Nigeria. Also, exchange rate has a proportionate and statistically significant influence on insurance claim. Thus this study concludes that there is a long run relationship between insurance claim and inflation in Nigeria and a rise in inflation will lead to a rise in cost of insurance claims in the short run but a decrease in the long run. This study recommends that there is therefore need for insurers to evaluate the probability distribution of future adverse inflation events and their correlation with other macroeconomic variables and there is need to establish a higher level of coverage based on the original face value of an insurance policy and a maximum inflation adjustment.

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Appendix: I

Table 1: Augmented Dickey-Fuller Unit Root Test

Variable	Level	First difference	Lag(s)	Model	Order of integration
Ln.INSCLM	-2.114535	-8.150729***	1	Trend & Intercept	I(1)
Ln.INFL	-2.486278	-5.336237***	1	Trend & Intercept	I(1)
Ln.EXCHR	-1.204838	-5.517475***	1	Trend & Intercept	I(1)

Source: Author's computation.

Note: *(**) *** denotes statistically significant at 1%, 5% and 10% level respectively.

Appendix II

Table 2: Model Selection Criteria

Model Selection Criteria Table
Dependent Variable: LOG(INSCLM)

Model	LogL	AIC*	BIC	HQ	Adj. R-sq	Specification
11	-11.962299	1.512867	2.102400	1.711227	0.950146	ARDL(4, 2, 4)
86	-15.176407	1.525843	1.979330	1.678427	0.947325	ARDL(1, 2, 4)
36	-13.454897	1.542721	2.086906	1.725823	0.948024	ARDL(3, 2, 4)
81	-14.470178	1.543647	2.042483	1.711490	0.947238	ARDL(1, 3, 4)
6	-11.837843	1.565930	2.200812	1.779548	0.947916	ARDL(4, 3, 4)
31	-12.853438	1.566875	2.156408	1.765235	0.947379	ARDL(3, 3, 4)
61	-14.871141	1.567948	2.066784	1.735791	0.945940	ARDL(2, 2, 4)
1	-10.891767	1.569198	2.249429	1.798075	0.948086	ARDL(4, 4, 4)
26	-11.961881	1.573447	2.208329	1.787066	0.947523	ARDL(3, 4, 4)
76	-14.210804	1.588534	2.132718	1.771635	0.945588	ARDL(1, 4, 4)
56	-14.297379	1.593781	2.137965	1.776882	0.945302	ARDL(2, 3, 4)
65	-19.469663	1.604222	1.921663	1.711031	0.939555	ARDL(2, 2, 0)
60	-18.660264	1.615774	1.978563	1.737841	0.940147	ARDL(2, 3, 0)
85	-19.671983	1.616484	1.933925	1.723293	0.938809	ARDL(1, 3, 0)
55	-17.698649	1.618100	2.026238	1.755426	0.941183	ARDL(2, 4, 0)
75	-21.705414	1.618510	1.845254	1.694802	0.935728	ARDL(2, 0, 0)
51	-13.827816	1.625928	2.215462	1.824288	0.944178	ARDL(2, 4, 4)
100	-22.856827	1.627686	1.809081	1.688720	0.933459	ARDL(1, 0, 0)
90	-21.122079	1.643762	1.915855	1.735313	0.935663	ARDL(1, 2, 0)
70	-21.273661	1.652949	1.925041	1.744500	0.935069	ARDL(2, 1, 0)
64	-19.425778	1.662168	2.024958	1.784236	0.937304	ARDL(2, 2, 1)
30	-17.429950	1.662421	2.115908	1.815006	0.939617	ARDL(3, 4, 0)
84	-19.432332	1.662566	2.025355	1.784633	0.937279	ARDL(1, 3, 1)
40	-19.443892	1.663266	2.026056	1.785334	0.937236	ARDL(3, 2, 0)
80	-19.482687	1.665617	2.028407	1.787685	0.937088	ARDL(1, 4, 0)
35	-18.574647	1.671191	2.079329	1.808517	0.937975	ARDL(3, 3, 0)
74	-21.582717	1.671680	1.943772	1.763231	0.933841	ARDL(2, 0, 1)
59	-18.638828	1.675081	2.083219	1.812407	0.937734	ARDL(2, 3, 1)
50	-21.639175	1.675101	1.947194	1.766652	0.933615	ARDL(3, 0, 0)
95	-22.655291	1.676078	1.902822	1.752371	0.931919	ARDL(1, 1, 0)

Source: Eview's Output

Appendix III

Table 3:ARDL Bounds Test

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	6.387112	2

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

Test Equation:
Dependent Variable: DLOG(INSCLM)
Included observations: 33

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(INSCLM(-1))	0.129773	0.210752	0.615759	0.5450
DLOG(INSCLM(-2))	0.371267	0.195849	1.895679	0.0725
DLOG(INSCLM(-3))	0.216477	0.157316	1.376069	0.1840
DLOG(INFL)	-0.188292	0.162738	-1.157029	0.2609
DLOG(INFL(-1))	0.484857	0.155626	3.115536	0.0054
DLOG(EXCHR)	0.404454	0.327065	1.236616	0.2306
DLOG(EXCHR(-1))	-0.692170	0.385823	-1.794011	0.0879
DLOG(EXCHR(-2))	-0.665947	0.367640	-1.811408	0.0851
DLOG(EXCHR(-3))	-1.124393	0.357441	-3.145670	0.0051
C	4.150340	1.179360	3.519147	0.0022
LOG(INFL(-1))	-0.096368	0.147836	-0.651859	0.5219
LOG(EXCHR(-1))	0.981320	0.242012	4.054833	0.0006
LOG(INSCLM(-1))	-0.882249	0.213979	-4.123058	0.0005

R-squared	0.690591	Mean dependent var	0.175124
Adjusted R-squared	0.504946	S.D. dependent var	0.634757
S.E. of regression	0.446616	Akaike info criterion	1.512867
Sum squared resid	3.989310	Schwarz criterion	2.102400
Log likelihood	-11.96230	Hannan-Quinn criter.	1.711227
F-statistic	3.719955	Durbin-Watson stat	1.932637
Prob(F-statistic)	0.004694		

Source: Eview's Output

Appendix IV

Table 4: ARDL Cointegrating And Long Run Form

Dependent Variable: LOG(INSCLM)

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(INSCLM(-1))	-0.104443	0.210752	-0.495572	0.6256
DLOG(INSCLM(-2))	0.225209	0.195849	1.149913	0.2637
DLOG(INSCLM(-3))	0.216477	0.157316	1.376069	0.1840
DLOG(INFL)	-0.188292	0.162738	-1.157029	0.2609
DLOG(INFL(-1))	0.484857	0.155626	3.115536	0.0054
DLOG(EXCHR)	0.404454	0.327065	1.236616	0.2306
DLOG(EXCHR(-1))	-0.026223	0.427186	-0.061386	0.9517
DLOG(EXCHR(-2))	0.458446	0.448077	1.023141	0.3185
DLOG(EXCHR(-3))	-1.124393	0.357441	-3.145670	0.0051
CointEq(-1)	-1.862264	0.213979	-8.703007	0.0000

Cointeq = LOG(INSCLM) - (-0.0517*LOG(INFL) + 0.5270*LOG(EXCHR) +2.2287)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(INFL)	-0.051748	0.076801	-0.673796	0.5082
LOG(EXCHR)	0.526950	0.072729	7.245414	0.0000
C	2.228653	0.404045	5.515853	0.0000

Source: Eview’s Output

Appendix V

Table 5: Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.359413	Prob. F(10,22)	0.2618
Obs*R-squared	13.74914	Prob. Chi-Square(10)	0.1847

Test Equation:
Dependent Variable: RESID
Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.023366	0.251083	0.093061	0.9267
LOG(INFL)	-0.048449	0.102211	-0.474008	0.6402
LOG(EXCHR)	0.036795	0.051213	0.718481	0.4800
ECM(-1)	0.162307	0.741618	0.218856	0.8288
RESID(-1)	-0.333100	0.777785	-0.428268	0.6726
RESID(-2)	0.127085	0.401452	0.316564	0.7546
RESID(-3)	0.044614	0.262668	0.169849	0.8667
RESID(-4)	-0.100964	0.209516	-0.481892	0.6346
RESID(-5)	0.127909	0.190266	0.672265	0.5084
RESID(-6)	-0.479333	0.201824	-2.374999	0.0267
RESID(-7)	-0.478893	0.227959	-2.100784	0.0473
RESID(-8)	0.033563	0.253621	0.132336	0.8959
RESID(-9)	0.156802	0.283861	0.552390	0.5863
RESID(-10)	0.056403	0.291638	0.193399	0.8484

R-squared	0.381920	Mean dependent var	9.43E-16
Adjusted R-squared	0.016692	S.D. dependent var	0.503471
S.E. of regression	0.499251	Akaike info criterion	1.733887
Sum squared resid	5.483541	Schwarz criterion	2.349700
Log likelihood	-17.20997	Hannan-Quinn criter.	1.948822
F-statistic	1.045702	Durbin-Watson stat	2.003458
Prob(F-statistic)	0.447519		

Source: Eview's Output

Appendix VI

Table 6: Heteroskedasticity Test: ARCH

F-statistic	0.183181	Prob. F(1,33)	0.6714
Obs*R-squared	0.193211	Prob. Chi-Square(1)	0.6603

Test Equation:
Dependent Variable: RESID^2

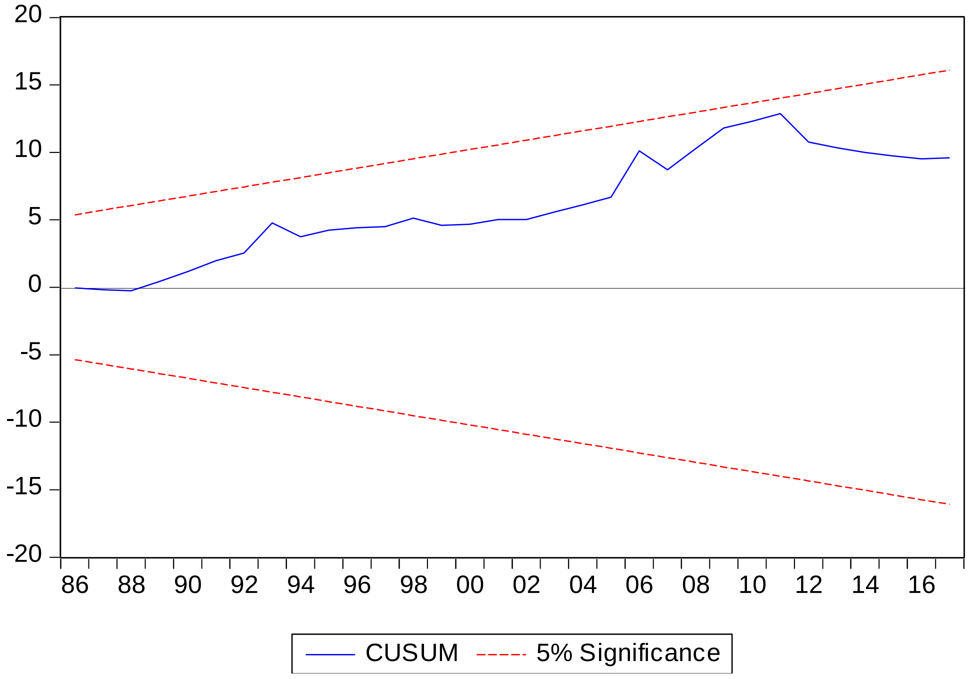
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.231192	0.098023	2.358539	0.0244
RESID^2(-1)	0.074488	0.174039	0.427997	0.6714

R-squared	0.005520	Mean dependent var	0.250070
Adjusted R-squared	-0.024615	S.D. dependent var	0.511626
S.E. of regression	0.517885	Akaike info criterion	1.577318
Sum squared resid	8.850755	Schwarz criterion	1.666195
Log likelihood	-25.60306	Hannan-Quinn criter.	1.607998
F-statistic	0.183181	Durbin-Watson stat	1.998081
Prob(F-statistic)	0.671434		

Source: Eview's Output

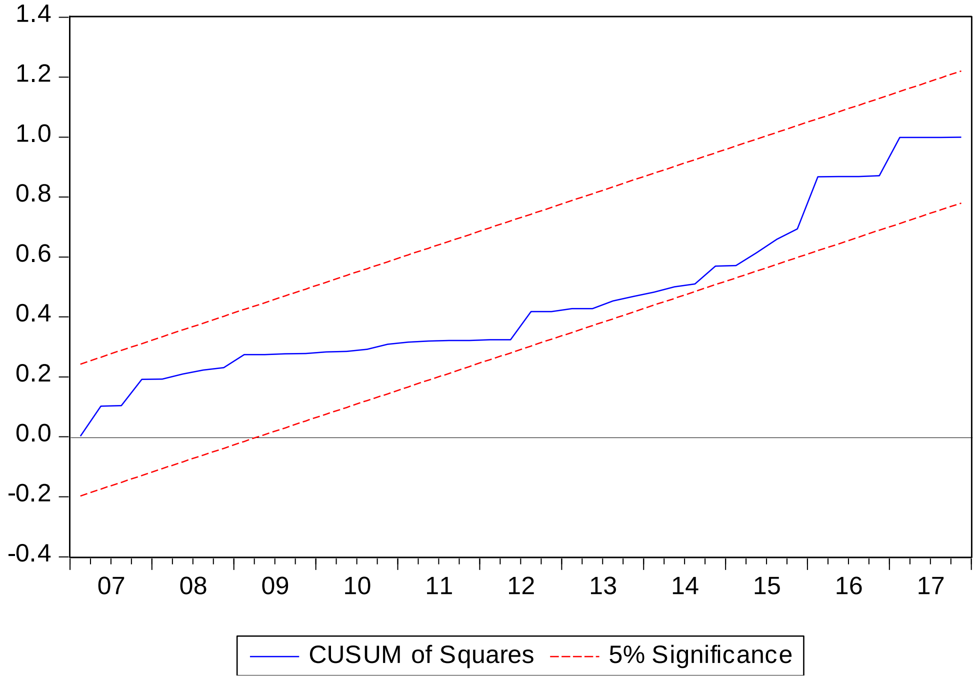
Appendix VII

Figure 1: Cummulative sum of square (CUSUM)



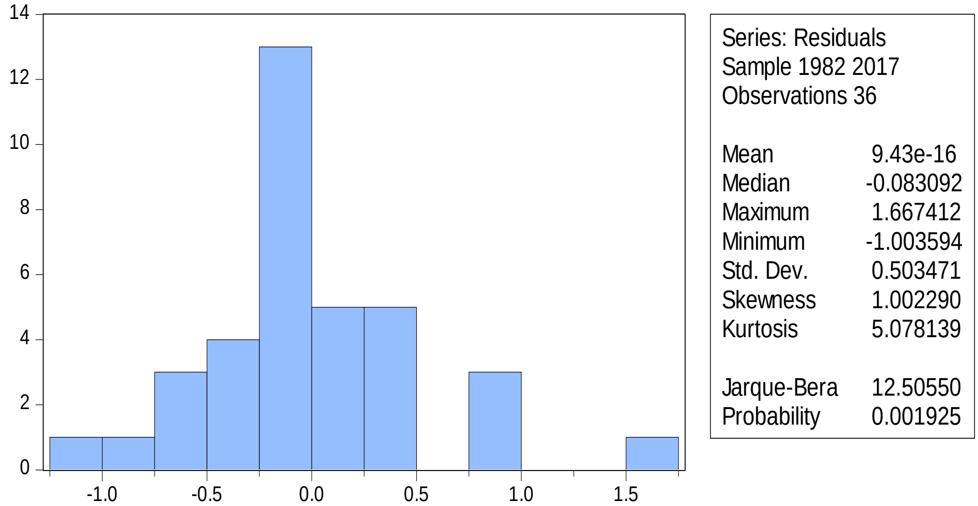
Appendix VIII

Figure 2: Cummulative Sum of Square (CUSUMSQ) test



Appendix IX

Figure 3: Normality Test



Uche Warlice Joel "Impact Of Inflation On Insurance Claims In Nigeria: An Ardl Bounds F-Test Approach "IOSR Journal of Economics and Finance (IOSR-JEF) , vol. 9, no. 6, 2018, pp. 43-53