

THE EFFECTS OF CORPORATE RISK ON FINANCIAL PERFORMANCE: EVIDENCE FROM LISTED DEPOSIT MONEY BANKS IN NIGERIA

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Abstract

This study assesses the effect of corporate risk on financial performance of listed Deposit Money Banks in Nigeria for the period of 2011-2016. The population of the study based on the availability of data in the Nigerian Stock Exchange is fourteen (14) listed Deposit Money banks. The study adopted Census sampling technique of which all the fourteen (14) Banks were studied. Corporate risk as the independent variable was proxied with liquidity risk, credit risk, operating risk and bank size, while the return on asset was used to proxy financial performance. Data were collected from secondary source through the annual reports of the banks for the period under study and the data was analysed using panel regression techniques. The findings reveal that liquidity risk has an insignificant negative effect on the financial performance of the study banks, while the credit risk and operating risk has a significant negative effect on financial performance respectively. The bank size has a significant positive effect on financial performance of listed Deposit Money Banks in Nigeria. It is recommended among others that the banks should regulate their liquidity risk position and ensure they minimize the non-performing loan as it has been found empirically to reduce the quality of the firm's financial performance. They should also reduce their operational cost for better performance.

Keywords: Corporate Risk, Financial Performance and Listed deposit money banks

Introduction

The business environment in which organizations operate has become highly volatile and uncertain. This is owing to increased effects of globalization and internationalization of firms as reflected in highly fluctuating exchange rates, interest, inflation rates as well as stiff competition (Kambi & Ali, 2016). This may also be as a result of the global financial crisis experienced between 2007 and 2008 around the world, in which banks, stock markets, insurance firms and the governments of various nations faced financial crises ranging from inability to pay salaries, retrenchment of workers and huge downward trend of profitability of firms. Consequently, several financial measures have been put in place by the governments and chieftains of the firms to ameliorate the effects of the crises.

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For instance, the board of directors of various financial institutions set up various committees that include risk management committee to assess potential risks inherent in their activities.

Risk is an essential part of a business, because the profitability of any business is dependent largely on the level of risk taken. Hence, risk is related with opportunities and threat, which may harmfully affect an action or expected outcome (Audu, 2014). Therefore, Risk management in financial institutions has undoubtedly attracted more attention from the regulators, financial experts and academics.

Financial institutions such as Deposit Money Banks are exposed to a variety of risks among which are; interest rate risk, foreign exchange risk, political risk, market risk, liquidity risk, operational risk and credit risk (Yimka, Taofeek, Abimbola & Olusegun, 2015). Others are Solvency risk, legal/regulatory risk, counterpart risk, reputational risk, strategy risk (Audu, 2014). However, the focus of this is on liquidity, operational and credit risks which is based on the fact that the Treasury Single Account (TSA) policy of the Federal Government exposed financial institutions to wider risks.

The core operation of financial institutions especially the banks is to attract deposit and give credit to customers in form of loans. Meanwhile, the introduction of TSA policy has affected their liquidity position thereby limiting their ability to grant loans to their customers. Recent financial crises in the banks have proven that risk management practices are essential for survival of banking industry. The exposure of banking industry in Nigeria to unidentified risk has led to major bank failures. This is because the banks generally operates in volatile environments where risk change often. Many of these risks are highly improbable events such as the turmoil in global commodity markets, witnessed in the second half of 2014 brought their full weight to bear on the Nigerian economy in 2015. This reflected on high inflation rate, exchange rate, and fall in oil price by 66.8% in international market which brought about economy depression in Nigeria (NBS, 2016).

With the performance of the Deposit Money Banks in recent time and the pressure of the managers of these banks to take some level of risk in order to survive, serious understanding of corporate risk and its management has now turned to be a debate in the field of corporate finance. The review of studies conducted in Nigeria on the effect of corporate risk on financial performance shows that those studies were limited to single risk measurement on financial performance. These studies include: Iwoye (2012), Ogboi and Unuafe (2013), Olawale (2014), Olamide, Uwalowa and Ranti (2015). This study is different from previous studies in the sense that liquidity, credit, operational and the size of financial institutions were examined together unlike the previous studies that examined them separately.

In order to achieve the objectives of the study, we hypothesized the following in a null form:

- Ho₁: Liquidity risk has no significant effect on financial performance of listed Deposit Money Banks in Nigeria.
- Ho₂: There is no significant relationship between credit risk and financial Performance of listed Deposit Money Banks in Nigeria.
- Ho₃: Operational risk has no significant effect on financial performance of listed Deposit Money Banks in Nigeria.

Ho₄: The size of a bank has no significant effect on financial performance of listed Deposit Money Banks in Nigeria.

Literature Review

This section focuses on discussion of the conceptual issues, theoretical issues and review of empirical studies relevant to this study.

Concept of Financial Performance

Firms' performance is of vital importance for investors, stakeholders and the economy at large. Investors are interested in the returns for their investment. Well performing businesses can bring higher returns to their investors. Barbosa and Louri (2005) viewed firms' performance as the outcome of a firm's strategy or an assessment of how well a firm accomplished its business goals. Measuring of banks' financial performance is one of the management strategic functions aimed at satisfying the interest of shareholders and other stakeholders in a bank. In viewing operating performance, the most basic and enormously important ratio to use in evaluating company performance is Return on Assets (ROA) and Return on Equity (ROE). For this study, ROA is used in the studies to measure financial performance.

Concept of Corporate Risk

Corporate risk is the financial uncertainty faced by an investor who holds securities in a specific firm. This is also the risk inherent in a firm's operations as a result of external and internal factors that can affect a firm's profitability (Santomero, 1997). Risk Management is the identification, assessment and prioritization of risks followed by coordinated and economical application of resources to minimize, monitor, and control the probability and/or impact of unfortunate events (Njogo, 2012). For effective risk management, managers must be able to analyse corporate risk. The variables that would be used for corporate risk in this study include liquidity risk, credit risk, operational risk and firm size. The reason for the use of these variables as measurements is to have more objective result as most studies only focus on a single category of risk. For instance, in the study of Muriithi and Waweru (2017), Otieno and Nyagol (2016) used liquidity risk; Yimka *et al.*, (2015) and Iwoye (2012) used credit risk; Pakhchanyan (2016) and Luis, Moura, and Paulo (2011) used operational risk, among others. The single risk financial performance measure, may actually not give better performance measurement. This is because more wholelistic approach is needed to measure bank's overall financial health over a given period (Yahaya & Lamidi, 2015).

Liquidity Risk is a risk of insufficient liquid assets to meet payouts from policies (surrender, expenses, maturities, etc.), forcing the sale of assets at lower prices, leading to losses, despite company being solvent (Kamau & Njeru, 2016). This is a risk encounter by bank as result of inability to meet its financial obligation to various stakeholders such as their customer. According to Yousfi (2014), the potential loss arising from the bank's inability either to meet its obligations or to invest fund increases in assets as they fall due without incurring unacceptable costs or losses.

Credit risk refers to the delay of repayment on loan contract or the inability of a borrower to pay its debts, which can cause cash flow problems and affect a bank's liquidity position (Djan, Stephen, Bawuah, & Halidu, 2015). Credit risk arises whenever a lender is exposed to

loss from a borrower, counterparty, or an obligator who fails to honour their debt obligation as they have contracted (Luy, 2010). Credit risk is the biggest risk faced by banks and financial intermediaries (Gray, Cassidy & RBA., 1997). The indicators of credit risk include the level of bad loans (Non- performing loans), problem loans or provision for loan losses (Jiménez & Saurina, 2006).

Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems or from external events. This definition includes legal risk, but excludes strategic and reputational risk (Pakhchanyan, 2016). Operational risk, thus, generates operational losses and the losses generated are a cost to the bank. Hence, the pricing and the consequent measurement of the operational risk capital charge has to be adequate to cover for these losses. Operation risk is now accepted as a major risk contributor to losses in the financial institutions as seen in Baring Bank and Daiwa Bank in America that collapsed as a result of malfunctioning of their operation (Leavoy, 2015).

Firm size refers to the speed and extent of growth that is ideal for a specific company. Most companies are intent to expand the size of their business operation for them to grow either in revenue, profit, number of employees, or size of facilities Pervan and Visic (2012). Bank size matters because of the economy of scope and scale; concerning liquidity, a large bank might have better access to the interbank markets because it has a larger network of regular counterparties or a wider range of collateral (Maaka, 2013). Firm size is one of the most acknowledged determinants of a financial performance (Beard and Dess 1981). The causal relationships between size and financial performance have been widely tested with ambiguous results. Several studies suggest that a positive relationship exists between company size and financial performance.

Banks Risk Attributes and financial performance: An Empirical Review

Ail, Ahmadi and Emami (2013) examined the effect of liquidity risk on the performance of commercial banks using of panel data related to commercial banks of Iran during the years 2003 to 2010. In the estimated research model, two groups of bank-specific variables and macroeconomic variables are used. The results revealed that liquidity risk will cause to weaken the performance of bank. Also, Lasis, Mustapha, Irom and Bulus (2018) examined the corporate Board size, Risk management and financial performance of listed Deposit Money Banks in Nigeria using panel data related to this bank from 2011-2016. The study proxy financial performance with EPS and ROE and the results showed that liquidity risk has insignificant negative effect on ROE and EPS. Similarly, For Iqbal, Chaudry, Qbal and Zia ud Din (2015) who assessed the impact of liquidity on firm specific factors of the four Islamic Bank of Pakistan over the period of 2000-2013, finds that profitability is negatively co integrated with liquidity risk and also indicate a strong positive significance of liquidity risk on Return on Assets.

However, Hamza (2017) assessed the impact of credit risk management on performance of commercial banks in Pakistan. Secondary data was obtained and a pooled regression was adopted. The findings revealed that credit risk management is inversely associated with bank performance. Also, Gizaw, Kebede and Selvaraj (2015) examined the impact of credit risk on profitability of commercial banks in Ethiopia. Secondary data was collected from 8 sampled deposit money banks for a 12 year period (2003-2014) through their annual reports of the

banks. The data were analyzed using a descriptive statics and panel data regression model and the result showed that credit risk measures: non-performing loan, loan loss provisions and capital adequacy have a significant impact on the profitability of commercial banks in Ethiopia. The study suggested a need for enhancement credit risk management in banking sector of that country to maintain the prevailing profitability of commercial banks in the area. From the context of Nigeria, Olamide, Uwalomwa & Ranti (2015) studied the effect of risk management on bank's financial performance. The Ordinary least square Regression was employed and data was collected from the annual reports of banks listed on the floor of the Nigerian Stock Exchange. The study observed that there exist a negative non-significant relationship between risk management proxies of credit risk variables (Non-performing loan ratio, capital ratio and Loan to Total Deposit) and bank's financial performance as captured through return on equity. Ogboi and Unuafé (2013) studied the effect of credit risk management and capital adequacy on the financial performance of commercial banks in Nigeria for the period of 2004-2009 using a time series and cross-sectional data obtained from selected annual reports and accounts of commercial banks in Nigeria. The study found that credit risk has a positive impact on deposit money bank's financial performance under study. Similarly, Olawale (2014) conducted a study on the effect of credit risk on the performance of commercial banks in Nigeria. Secondary data were obtained from annual reports, to represent facts of the situation. The regression analysis that was used for data analysis shows a significant relationship between credit risk and the banks' financial performance.

In addition, Soyemi, (2014) Risk management practices and financial performance: evidence from the Nigerian deposit money banks (DMBs) in the 2012 financial year. The study uses secondary data gathered through content analysis of the selected banks' annual reports. The cross sectional data was analyzed using descriptive statistics to depict pattern and robust standard errors OLS regression to estimate significant influence between banks' operating risk practices and financial performance. For Abdullahi, Shalumi and Ismail (2011), cited in the work of Mary (2015), assessed the effect of operational risk on financial performance of Islamic Banks in Malaysia through the use of questionnaire for the primary data gathered, revealed that Islamic banks in the country faced operational risk that affect the profitability of the Banks. Jane and Kennedy (2017) examined the effect of operational risk on financial performance of commercial banks in Kenya. The qualitative research design ordered logistic were employed. The study revealed an inverse relationship between operational risk and financial performance. The divergences in the results of the studies reviewed might be as a result of different methodology adopted and the differences in policies adopted by each domain of the study.

Moreover, Deitiana and Habibuw, (2015) examined the factors affecting the financial performance of property real estate companies listed at Indonesia stock exchange over the period of 2007–2012. Panel data regression analysis was used. The study revealed that Firm Size had no effect on financial performance. Ferrouhi (2014) examined relationship between bank liquidity, size and financial performance of Moroccan banks over the period of 2001–2012. The financial report of the eight (8) sampled banks was selected for analysis. The study used a panel data regression with fixed effect results show that Moroccan bank's performance is determined by size of banks. It concluded that banks' performance depends positively on size of the banks.

Locally, Ofuan and Izen (2016) examined the relationship between company size and profitability. The study population consists of 202 companies listed on the Nigerian Stock Exchange Market and sample firm is 30 scientifically selected firms over the period of 2006-2012. The panel data regression analysis technique shows a positive relationship between firm size and profitability. In the same direction, the work of Oliver and Chukwuani (2014) on firm size and financial performance of Brewery Sector in Nigeria from 2000-2014, through Engle and Granger 2-step co integration approach, in a simple regression framework revealed that firm size has positive effect on financial performance. However, the study of Olawale, Ilo and Lawal (2017) on the effect of firm size on performance of 12 non-financial firms listed on the Nigeria Stock Exchange (NSE) over a period of 2005-2013 through panel data by using a pooled regression model indicated that firm size has a negative effect on performance.

Theoretical Framework

The credit market theory, Shiftability theory of liquidity and extreme value theory anchor this study. For Credit market theory, it is a model of neoclassical credit market which postulates that the term credit clears the market if collaterals and other restrictions such as interest rate remain constant. i.e. with the increasing demand for credit at a given customer supply, the interest rate increases and vice-versa. Thus, the higher the future risk of the borrowers the higher the interest premium that can lead to higher profitability (Lasisi, Mustapha, Irom & Bulus, 2018). This theory was adopted in the study of Samuel (2015) on the effect of credit risk on Performance of Banks in Nigeria.

Shiftability theory of liquidity which was developed by Herold G molton in 1915, held that banks could most effectively protect themselves against massive withdrawers by holding, as a form of liquidity reserve, credit instruments for which there existed a real secondary market. This theory thus provides for explicit understanding of how the liquidity risk affects financial performance.

Finally, extreme value theory by Leonard Tippet expands the knowledge of operational risk management as it indicates the securitization of risk and alternative risk transfer which can highlight the convergence of finance of the product level. The theory was adopted by Kamau & Njeru, (2016) who conducted study on the effect of operational risk and financial performance.

Methodology

The population of this study consists of all the fourteen (14) listed Deposit Money Banks on Nigeria Stock Exchange as at 2017 based on the availability data for the period under study. Census sampling techniques were adopted due to small number of the population. The data were obtained from secondary sources. Multiple regression techniques were used and the model encapsulates the contribution of credit risk, capital adequacy risk, operational risk and firm size on Financial Performance given below:

$$FP = f(CR) \dots\dots\dots 1$$

Where the components of CR include: LR, CRe, OR, and BS. FP is proxied by ROA. Therefore, equation 1 is re-written as:

$$ROA = f(LR, CRe, OR, BS) \dots\dots\dots 2$$

The empirical specification of the above functional relationship between ROA and components of corporate risk is given as:

$$ROA_{it} = \beta_0 + \beta_1 LR_{it} + \beta_2 CRE_{it} + \beta_3 OR_{it} + \beta_4 BS_{it} + \epsilon_{it} \dots \dots \dots 3$$

Where:

ROA= Return on asset

LR= Liquidity risk,

CRE = Credit risk,

OR= Operational risk,

BS = Bank size,

ϵ_{it} = is the error component for company i at time t.

β_0 is the intercept, while β_1 , β_2 , β_3 , and β_4 are the parameter estimates;

Variable Measurement

Liquidity risk is measured as the ratio of Loan and Advance to Deposit; that is, $\frac{\text{Loan and Advances}}{\text{Deposits}}$. Credit risk is measured as the ratio of Non-performing Loans to Total

Loans; that is, $\frac{\text{Non-performing Loans}}{\text{Total Loans}}$. Operational risk is measured as the ratio of Operating cost (expenses) to operating income; that is $\frac{\text{Operating Cost}}{\text{Operating Expenses}}$. Finally, Bank size is expressed as the measured as the natural log of Total Asset.

Apriori expectation

From the theory and past studies, inverse relationship is expected between corporate risk and financial performance such that $\beta_1, \beta_2, \beta_3 \dots \dots \beta_n > 0$

Result and Discussions

The descriptive statistics and the summary of Regression Result are presented and analysed in the study as shown in the tables below.

Table 1 indicates that the measure of return on asset (ROA) of the sampled listed Deposit Money Bank in Nigeria has an average value of 0.0142274 (1.4%) which signifies that the average financial performance of listed banks in Nigeria is low. The standard deviation of 0.0240083 signifies a wide-spread of the distribution of the listed bank performance around the average performance. The large value of standard deviation implies that the risk of obtaining the average performance reported in table 1 is high.

Table 1 also shows that on average the liquidity risk (LR) during the period of the study is 0.6602548 with a standard deviation of 0.1584148 (15.84%). This implies that the average value of liquidity risk of listed Deposit Money Bank in Nigeria is relatively high. Furthermore, the standard deviation of 15.84% implies that the values of liquidity risk are wide-spread around the average value. The minimum and maximum values of liquidity risk are 0.3157 and 1.0635 respectively. The minimum value of 0.3157 for liquidity risk shows that the proportion of the total deposit by listed Deposit Money Bank that is given out as loans and advances is low. On the hand, the maximum value of 1.0635 reveals that some of the listed Deposit Money Banks gave out loan and advances above the total deposit received from customers. This is a source of threat to the survival of banks.

The average value of credit risk as contained in Table 1 is 0.0405119 with standard deviation of 0.0375789. The implication of these values is that the ratio of Non-performing Loan to Total Loan is considerably low which is an indication of proper management of loan facility

by listed Deposit Money Bank in Nigeria. The average value of operating risk as contained in Table 1 is 0.747343 and the standard deviation is 0.2816468. this implies that the proportion of operating cost out of total operating income is very high which implies management inefficiency. For bank size, the average value is 21.00988 with a standard deviation of 0.7948831. the minimum is 19.2193 and the maximum value is 22.5568 respectively, Hence, the highly deviated size may have significant impact on the financial performance of listed deposit money banks in Nigeria as this is reflected in our regression result.

Table 1: Descriptive Statistics of the variables

Variables	Min.	Max.	Mean	Standard Deviation
ROA	-0.1068	0.0594	0.0142274	0.0240083
Liquidity risk	0.3157	1.0635	0.6602548	0.1584148
Credit risk	0.0002	0.2018	0.0405119	0.0375789
Operating risk	0.08047	2.58554	0.747343	0.2816468
Bank size	19.2193	22.5568	21.00988	0.7948831

Source: stata ₁₃ output result

Regression Results and Hypotheses Testing

The result of the Hausman test revealed a chi-square value of 6.62 with p-value of 0.1574 which means that is statistically not significant at 5% level. This implies that the test considered the random effect as being suitable for the analysis.

The regression results contained in Table 2 indicates that 64.97% variation of financial performance (ROA) is predicted by joint contribution of liquidity risk, credit risk, operating risk and bank size, (R^2 overall = 0.6497). The remaining 35.03% is explained by other risk management variables that were not included in this research model.

Liquidity Risk and Financial Performance

Hypothesis 1, Liquidity risk has no significant effect on Financial Performance of listed Money Deposit Banks in Nigeria. Using multiple regression to test the above-mentioned hypothesis, it was found that the beta coefficient (β) is -0.0128064 and $p=0.275$ at 5% level of significance. This implies that when liquidity increase by 1% will lead to a decrease in the financial performance of the firm by 1.28%. indicating that weak liquidity risk position will reduce the banks financial performance. This finding is aligned with the results of Ail, Tabari, Ahmad and Emami (2013).

Credit Risk and Financial Performance

Hypothesis 2, There is no significant effect between credit risk and Financial Performance in Nigeria (H_{02}). The credit risk has a beta coefficient of -0.1190349 at a p-value of 0.029 which is significant at 5% level of significance. This implies that for every 1% increase of credit risk (Non-performing loan), financial performance of the firm will decrease by 2.9%. The study is supported by the study of Gizaw *et al.* (2015) and Hamza, (2017). The negative association between non-performing loan and ROA indicates that the increase in nonperforming assets can cause deterioration in profitability and performance of the banks. It can create delinquencies to manage the credit quality and hence damages the reliability of the banks.

Operational Risk and Financial Performance

Hypothesis 3: Operational risk has no significant effect on the Financial Performance of listed Money Deposit Banks in Nigeria (H_{03}). The Operating risk has a beta coefficient of -0.0545649 at a p-value of 0.000 which is significant at 5% level of significance. This implies that for every 1% increase of Operating expense of banks in Nigeria, financial performance of the banks will decrease by 5.5%. This indicates that high expenses rate incurred by banks will lead to reduction in the quantum of profit of the firms. This study is supported in the finding of Sutrisno (2016) and Yousfi (2014).

Bank Size and Financial Performance

Finally, hypothesis 4: Bank size has no significant effect on the Financial Performance (Return on Assets) of listed deposit money banks in Nigeria (H_{04}). The table also revealed that bank size has a positively and significantly effect on the financial performance of listed deposit money banks in Nigeria. The beta coefficient of the variables is 0.0052874 and the p-value is 0.045 which is significant at 5% level of significance. This indicates that size has positive significant effect on the financial performance of banks. The implication of this finding is that the bigger the size of the banks the higher the quantum of profit to be reported by the banks. The finding is consistent with the findings of Alamro and Al-soub (2012).

Table 2: Regression Results using random effect.

Variables	Coefficient	T-value	P-value
Constant	-0.0428042	-0.75	0.453
Liquidity risk	-0.0128064	-1.09	0.275
Credit risk	-0.1190349	-2.18	0.029
Operating risk	-0.0545649	-8.25	0.000
Bank size	0.0052874	2.01	0.045
R ² overall	0.6497		
Hettest: Chi ²	2.80		0.045
Mean VIF			
Wald Chi2	132.67		0.0000

Source: *stata 13 output result** Significant at 5%

Conclusion and Recommendations

Based on the findings of this study, it was concluded that corporate risk has influence on financial performance of listed Deposit Money Banks in Nigeria. The study recommends the need for the management of listed Deposit Money Banks to control and monitor the Loans and Advances given to customer so as not to expose the banks to unnecessary liquidity and credit risks. Furthermore, banks should discourage unnecessary expenses especially when such expenses will not yield any returns.

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	Percentiles	Smallest		
1%	.3157	.3157		
5%	.4258	.3242		
10%	.4755	.4081	Obs	84
25%	.5387	.4231	Sum of Wgt.	84
50%	.66275		Mean	.6602548
		Largest	Std. Dev.	.1584148
75%	.7687	.9671		
90%	.8389	1.01	Variance	.0250953
95%	.9661	1.0493	Skewness	.2519073
99%	1.0635	1.0635	Kurtosis	2.878003

CR				
	Percentiles	Smallest		
1%	.0002	.0002		
5%	.002	.0012		
10%	.0098	.0016	Obs	84
25%	.0201	.0019	Sum of Wgt.	84
50%	.0315		Mean	.0405119
		Largest	Std. Dev.	.0375789
75%	.0474	.1584		
90%	.0707	.1652	Variance	.0014122
95%	.0916	.1962	Skewness	2.568324
99%	.2018	.2018	Kurtosis	10.64802
OPR				
	Percentiles	Smallest		
1%	.08047	.08047		
5%	.43526	.40764		
10%	.52087	.41095	Obs	84
25%	.6151	.42763	Sum of Wgt.	84
50%	.71578		Mean	.747343
		Largest	Std. Dev.	.2816468
75%	.83618	1.09891		
90%	.94748	1.27249	Variance	.0793249
95%	1.09225	1.42562	Skewness	3.393127
99%	2.58554	2.58554	Kurtosis	23.33414
BS				
	Percentiles	Smallest		
1%	19.2193	19.2193		
5%	19.7624	19.3196		
10%	19.8397	19.6172	Obs	84
25%	20.50205	19.7449	Sum of Wgt.	84
50%	20.9132		Mean	21.00988
		Largest	Std. Dev.	.7948831
75%	21.66235	22.2696		
90%	22.0768	22.2786	Variance	.6318392
95%	22.2277	22.2793	Skewness	-.1453902
99%	22.5568	22.5568	Kurtosis	2.211944

```
. pwcorr roa lr cr opr bs, sig star(5)
```

	roa	lr	cr	opr	bs
roa	1.0000				
lr	0.2804*	1.0000			
	0.0098				
cr	-0.5145*	-0.4371*	1.0000		
	0.0000	0.0000			
opr	-0.7781*	-0.3889*	0.5135*	1.0000	
	0.0000	0.0003	0.0000		
bs	0.3753*	0.0681	-0.2687*	-0.2593*	1.0000
	0.0004	0.5381	0.0135	0.0172	

```
. regress roa lr cr opr bs
```

Source	SS	df	MS	Number of obs =	84
Model	.03118425	4	.007796062	F(4, 79) =	36.98
Residual	.016656737	79	.000210845	Prob > F =	0.0000
				R-squared =	0.6518
				Adj R-squared =	0.6342
Total	.047840987	83	.000576837	Root MSE =	.01452

roa	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
lr	-.0091866	.011497	-0.80	0.427	-.0320707 .0136976
cr	-.0531162	.052709	-1.77	0.081	-.1580309 .0517984
opr	-.058362	.006841	-8.53	0.000	-.0719787 -.0447452
bs	.0049159	.0021133	2.33	0.023	.0007095 .0091222
_cons	-.0355959	.0474523	-0.75	0.455	-.1300512 .0588515

```
. estat hettest
```

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

H0: Constant variance

Variables: fitted values of roa

chi2(1) = 2.80

Prob > chi2 = 0.0945

```
. estat vif
```

Variable	VIF	1/VIF
cr	1.54	0.647479
opr	1.46	0.684278
lr	1.31	0.765818
bs	1.11	0.900255
Mean VIF	1.36	

```

. xtset id year
      panel variable:  id (strongly balanced)
      time variable:  year, 2011 to 2016
      delta:  1 unit

. xtreg roa lr cr opr bs, fe

Fixed-effects (within) regression               Number of obs   =       84
Group variable: id                             Number of groups =       14

R-sq:  within = 0.6009                          Obs per group: min =        6
      between = 0.6629                               avg   =       6.0
      overall  = 0.6232                               max   =        6

corr(u_i, Xb)  = -0.1292                          F(4,66)         =       24.85
                                          Prob > F        =       0.0000

```

roa	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
lr	-.0214455	.0141769	-1.51	0.135	-.0497506	.0068596
cr	-.1847341	.0621927	-2.49	0.015	-.2789059	-.0905624
opr	-.0809189	.0069037	-7.38	0.000	-.0947026	-.0671352
bs	.008974	.0058597	1.53	0.130	-.0027251	.0206732
_cons	-.1158342	.119992	-0.97	0.338	-.3554059	.1237374
sigma_u	.00924214					
sigma_e	.01318558					
rho	.32944395	(fraction of variance due to u_i)				

F test that all u_i=0: F(13, 66) = 2.29 Prob > F = 0.0143

```
. estimates store fixed
```

```

. xtset id year
      panel variable:  id (strongly balanced)
      time variable:  year, 2011 to 2016
      delta:  1 unit

```

```

. xtreg roa lr cr opr bs, re

Random-effects GLS regression               Number of obs   =       84
Group variable: id                             Number of groups =       14

R-sq:  within = 0.5953                          Obs per group: min =        6
      between = 0.7382                               avg   =       6.0
      overall  = 0.6497                               max   =        6

Wald chi2(4)         =      132.67
Prob > chi2          =       0.0000
corr(u_i, X)         = 0 (assumed)

```

roa	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
lr	-.0128064	.0117319	-1.09	0.275	-.0358006	.0101878
cr	-.1190349	.0546179	-2.18	0.029	-.2260841	-.0119858
opr	-.0845649	.0066102	-8.25	0.000	-.0975208	-.0716091
bs	.0052874	.0026346	2.01	0.045	.0001236	.0104512
_cons	-.0428042	.0570046	-0.75	0.453	-.1545312	.0689229
sigma_u	.00583604					
sigma_e	.01318558					
rho	.163811	(fraction of variance due to u_i)				

```
. estimates store random
```