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Impact of Internet Banking on Financial Performance: Empirical Evidence from Ethiopia Banks

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Abstract
The main objective of study was examined the impact of internet banking on financial performance, empirical evidence of commercial banks of Ethiopia. Specifically, the study empirically examined impact of internet banking, bank liquidity, capital adequacy, bank size, cost efficiency and deposit to asset ratio on financial performance. This study adopted correlation explanatory research design with arrangement of secondary method of data collection via document analysis, panel, quantitative approach and deductive method of inquiry. The sample of this study was 10 banks covering the period 2010-2016. Descriptive and regression analysis were performed to analyze the data. Besides, econometric model estimation procedures and specification tests plus multiple regression assumptions were tested. Accordingly, fixed effect regression model was chosen. The results of fixed effect regression analysis revealed that internet banking, capital adequacy and cost efficiency were positively associated to banks financial performance, whereas deposits to asset ratio were negatively correlated with banks financial performance. Hence, those banks with adoption of internet banking, higher capital adequacy, higher cost efficiency and lower deposit asset ratio established better banks financial performance than those with non-adoption of internet banking, lower capital adequacy, lesser cost efficiency and higher deposit to asset ratio established banks in Ethiopia. However, size of banks and banks liquidity has negative but statistically insignificant relationship with financial performance of banks in Ethiopia. Therefore, in the case of Ethiopia banks, bank size and banks liquidity have not considered as a factor that impact on financial performance of Ethiopia banks.
Keywords: Internet banking, financial performance, multiply regression and Commercial banks of Ethiopia.

1.1. Introduction

To date, the rapid spread of Internet banking all over the world its acceptance as an extremely cost effective and efficient delivery channel of banking services as compared to other existing channels (Zarei, et al.,2008). Internet banking in the world that was built in 1981 in USA, after that some famous bank introduced their internet banking one after another, such as Citibank and bank of America (Malak, 2007). Banking through internet has emerged as a strategic resource for achieving higher efficiency, control of operations and reduction of cost by replacing paper based and labour intensive methods with automated processes thus leading to higher productivity and financial performance (Malhotra, 2009). Internet banking is a new age banking concept; it uses technology and brings the bank closer to the customer. Internet banking refers to systems that enable bank customers to get access to their accounts and general information on bank products and services through the use of banks website, without the intervention or inconvenience of sending letters, faxes, original signatures and telephone confirmations (Thulani., et al, 2009).

The modern internet banking methods are new to the Ethiopian banking sector, all banks in Ethiopia are too late to move with technological advancement and they should clearly chart out the time plan for their integration and technological advancement (Gardachew, 2015). Based on the banking empirical literature different studies have been conducted in different parts of the world in order to identify the impact of internet banking on financial performance of banks, such as (England. K.L, 1998) Study in US bank result of study that show there was no evidence of difference in the financial performance of the internet and non- internet banking. In contrast to the results of (England. K.L, 1998), (Furst, et al ., (2000a, 2000b, 2002a and 2002b)) found that banks in all size categories offering Internet banking were generally better performance and tended to rely less significantly on traditional banking activities in comparison to non-Internet banks. (Deyoung, 2001 & 2005) Study conducted in US, 12 internets only banking in 1997 and 2001 the result was poor financial performance but higher assets growth of pure play internet banking. (Sathye, 2005), studies conducted in Australia during 1997-2001in credit union the result show internet banking doesn't have a significant impact on financial performance and risk profile. However, the findings in different firms revealed that mixed and contradicting results of internet banking on banks performance. In comparison with this research studies carried out in the developed countries, to the best of the researcher knowledge, no study has not yet examined on the impact of internet banking on financial performance of commercial banks in Ethiopia. Due to this background the main purpose of this study also proposes and tests the existence of financial performance gaps between internet banks and non-internet banks in Ethiopia.

2. Review of Related Literature

Internet banking: is defined as the use of internet and telecommunication networks to deliver a wide range of value added products and services to bank customers (Steven, et,al 2002).Through the use of a system that allows individuals to perform banking activities at home or from their offices or over the internet. Internet banking through traditional banks enables customers to perform all routine transactions, such as account transfers, balance inquiries, bill payments, and stop-payment requests, and some even offer online loan applications. Customers can access account information at any time, day or night, and this can be done from anywhere. Internet banking has improved banking efficiency in rendering services to customers (Karuik, 2005).

2.3. Empirical Literatures on Impacts of Financial Performance

There are different empirical studies exist in the world which are examined on impact of internet banking on banks financial performance, such as Delgado et al. (2006), Punjab et al. (2009), (England. K.L, 1998)(Furst, et al ., (2000a, 2000b, 2002a and 2002b)) and (Sathye, 2005). However, the findings revealed that mixed and contradicting results of internet banking on banks financial performance.

England, et al. (1998) was the most important study, which estimated the number of US banks offering internet banking and analyzed the structure and performance characteristics of these banks. It establish no evidence of major differences in the performance of the group of banks offering Internet banking activities compared to those that do not offer such services in terms of profitability, efficiency or credit quality. However, transactional Internet banks differed from other banks primarily by size.

In contrast to the results of England, et al. (1998), Furst et al. (2000a, 2000b, 2002a and 2002b) found that banks in all size categories offering Internet banking were generally more profitable and tended to rely less heavily on traditional banking activities in comparison to non-Internet banks. An exception to the superior performance of Internet banks was the new start-ups Internet banks, which were less profitable and less efficient than non-Internet banking. The authors concluded that Internet banking was too small factor to have affected banks profitability.

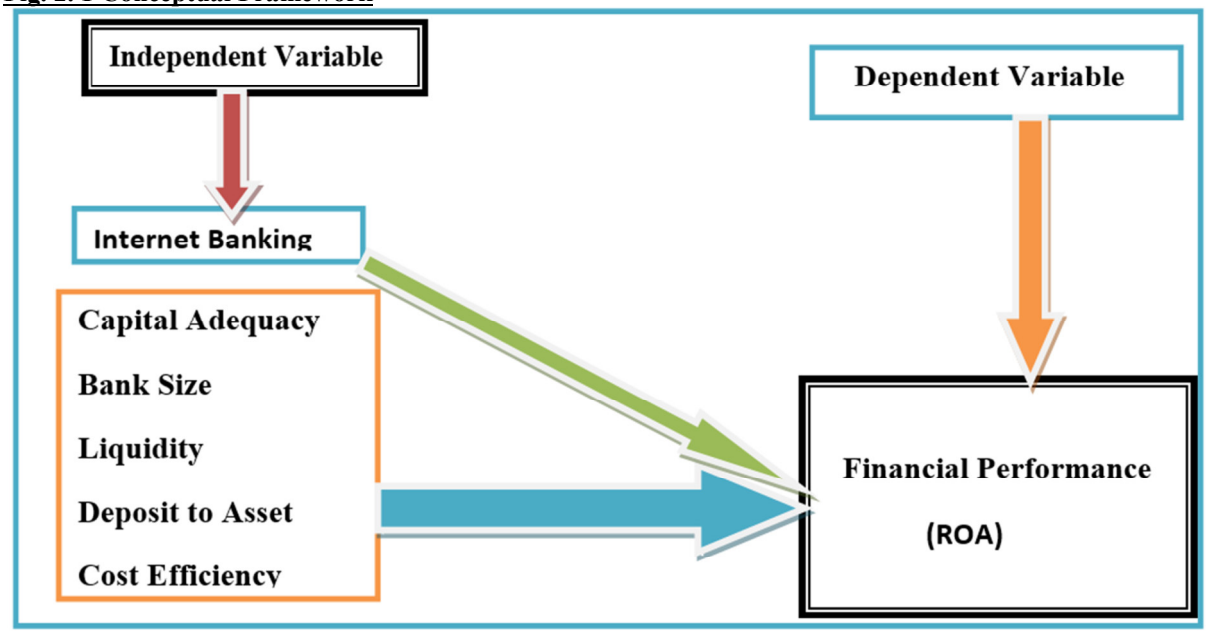
Sullivan (2000) found that click and mortar banks in the 10th Federal Reserve District incurred somewhat higher operating expenses but offset these expenses with somewhat higher fee income. On average, this study found no systematic evidence that banks were either helped or harmed by offering the Internet delivery channel. Similar to the results of Furst et al., this study also found that de novo click and mortar banks performed significantly worse than de novo brick and mortar banks.

Hassan et al. (2003) study result says that the Internet banking institutions were performing significantly better than the non-Internet groups. Additionally, the risk variables associated with the Internet group continued to be lower relative to the non-Internet group. According to Carlson, (2001) conducted study in U.S.2517 national banks on impact of internet banking on financial performance. The result is revealed that internet banking is not having an independent impact on financial performance.

2.4. Conceptual Framework for the study

The conceptual framework was the mental picture of the relationship between the independent variables, the control variables and dependent variable of the study.

Fig. 2. 1 Conceptual Framework



3. Research Methodology

This chapter's focus on the manner in which the study had been conducted to address the objectives of the study stated in the introductory chapter. It greatly concern research approach and design, type of data and data collection techniques, sampling mechanisms including sample size, method of data analysis and measurement of variables included in the regression model and model specification.

3.1. Research Design and Approach

The choice of research design depends on objectives that the researchers want to achieve (Admas, 2007). The study would be used explanatory research design. Explanatory research design it examines the cause and effect relationships between dependent and independent variable (Kothari, 2004).

3.2. Population, Sampling and Sampling Technique

The populations of this study would be including all commercial banks in Ethiopia which are 18 in number. A sample consists of a panel of ten (10) commercial banks from the total population of 18 banks operated in the Country.

3.3. Data type and source

The type of data for this study was use secondary data for the period 2010-2016. Data for this study would be obtained from the National Bank of Ethiopia (NBE).

3.4.2. Measurement of Dependent and Independent Variable.

Table 3.1: Summary of Measurement of Dependent and Independent Variables

No.	Dependent Variable	Symbols	Measurement	Expected Sign
1.	Return on Asset	ROA	Net income before tax / Total Assets	
	Independent Variable			
2.	Internet Banking	INT	Dummy variable that take (1) for the bank wh adopted internet banking and zero otherwise	+
3.	Bank Liquidity	BLD	Current asset /Total Asset	-
4.	Capital Adequacy	CAD	The ratio of Equity Capital to Total Assets.	+
5.	Bank Size	BAS	Logarithm of the value of total assets	+
6.	Deposit to Asset	DTA	The ratio of Total Deposit /Total Assets	+
7.	Cost Efficiency	CEF	Total Operating Expense / Total Income	_

Note: Symbols (+ or -) in the above table the sign used to positive (+) and negative (-) expected sign

3.6. Econometric Model specification and Data Analysis

This study used Panel data multiple regression to determine the impact of internet banking on financial

performance of selected Ethiopian banks by including the dependent and independent variables of the study. Internet banking is a dummy variable that affect bank performance and it also other control variable that affect bank performance such as capital adequacy, bank size, cost efficiency and deposit of assets (Carlson, 2001). Hence, the following regression model will be specified with some modification depending on prior studies on the issue under investigation such as (Sathye, 2005); (England. K.L, 1998), (Furst, et al ., (2000a, 2000b, 2002a and 2002b)).

$$Y_{it} = \beta_0 + \beta_1 * INT_{it} + \sum \beta_i X_{it} + \varepsilon_{it} \quad \text{..... (Equation-1)}$$

Where

Y_{it} = Dependent variable of bank i at time t,
INT_{it} = Internet banking is a dummy variable equal to 1 for Internet banks and zero otherwise
X_{it} = the control variables for bank i at time t,
ε_{it} = the disturbance term
I = indexes bank level observations
t = indexes time in years.

Equation -1 is extended to include all explanatory as follows,

$$Y_{it} = \beta_0 + \beta_1 * INT_{it} + \beta_2 CAD_{it+} + \beta_3 BAS_{it+} + \beta_4 BLD_{it} + \beta_5 DTA_{it+} + \beta_6 CEF_{it} + \varepsilon_{it}$$

Where

Y_{it} = Financial Performance of bank i at time t,
INT_{it} = Internet is a dummy variable equal to 1 for Internet banks and zero otherwise
CAD_{it} = Capital adequacy of bank i at time t,
BAS_{it} = Bank size of i at time t.
BLD_{it} = Bank Liquidity of i at time t
DTA_{it} = Deposit to Assets of bank i at time t
CEF_{it} = Cost Efficiency of bank i at time t.
ε_{it} = the disturbance term I at time t.
i = indexes bank level observations
t = indexes time in years
β_1, β_2, - β_6 are the parameters estimate/coefficient of the independent variables.

The researcher was tested whether the estimated coefficients is significantly different from zero using t-statistics

3.4. Method of Data Analysis

This study was used descriptive and inferential statistics. Mean, standard deviation, minimum, and maximum is calculate and present in tables for the purpose of descriptive analysis. For inferential statistics, the researcher used STATA software version 12 outputs determine the relationship between the dependent and independent variables. Econometric model specification tests including Chow-test, Breusch and Pagan Lagrange Multiplier test and Hausman-test was used to select the best suited model among pooled regression model, fixed effect model, and random effect model. In the same fashion, diagnostic tests for the classical linear regression model assumptions would be carried out.

Table 4.2: Descriptive Statistics of Dependent and Independent Variables over the Entire Sampled Period of Selected Banks (Seven Years for 10 Banks)

Variable	Mean	Std. Dev.	Min	Max
ROA	.0399625	.01094	.0034961	.0750155
INT	.5	.5036102	0	1
BAS	4.058856	.5517536	3.023664	5.564319
BLD	.4265273	.0631935	.1831883	.5728494
CAD	.1353815	.0321243	.0769559	.1952434
CEF	.8691217	.0397561	.798676	.954109
DTA	.7608346	.0597226	.4754842	.9049021

Source: Own Computation

The average value of return on asset is .0399625 with the standard deviation of .01094, minimum and maximum value of return on asset coefficient of .0034961 and .0750155 respectively. The average return on asset as measurement of performance of Ethiopia banks selected in the sample of this study is .0399625, the lowest return on asset is .0034961 and the highest return on asset is .0750155 with standard deviation of .01094.

The dependent variable of the study was financial performance that measured by return on asset (ROA) and the independent variable was internet banking and other are control variables such as capital adequacy, bank size, bank liquidity, cost efficiency and deposit to asset all are vary from year to year.

4.3. Econometric Model Estimation Procedures and Specification Tests

The main objective of this study was to examine the impact of internet banking on financial performance of Ethiopian banks using panel data collected from annual financial report. Panel studies begin by making comparison among three models, viz., pooled regression model, fixed effect model, and random effect model while estimating econometric models. Therefore, the choice among pooled regression model, fixed effect model and random effect model is very important as it largely influences conclusions on the individual coefficients (Gujarati, 2003). Specification tests and determination of appropriate panel data model were carried out by using F- test, Breusch and Pagan Lagrange Multiplier test, and the Hausman test to select the appropriate model.

Therefore**,** from the results of the F-test, Breusch and Pagan Lagrange Multiplier test and Hausman-test, the best model used in this study was fixed effect regression model. Hence, the regression results of the fixed effect model were used for statistical inference and further analysis of the individual coefficients.

4.4. Diagnostic Tests for Classical Linear Regression Model Assumptions

4.4.1. Normality Test

Normality assumption is required in order to conduct single or joint hypothesis tests about the model parameters (Brooks C. , 2014).

4.4.2. Zero Mean Value of Errors

The first assumption required in the classical linear regression model is that the average value of the errors is zero. In fact, if a constant term is included in the regression equation, this assumption will never be violated (Brooks, 2014) (Gujarati, 2003).

4.4.3. Multicollinearity Test

The assumption here is explanatory variables are not correlated with one another. A problem occurs when the explanatory variables are very highly correlated with each other, and this problem is known as multicollinearity (Brooks, 2014). Therefore, multicollinearity between the explanatory variables is not considered to be a problem here.

4.4.4. Model Specification Test

One of the assumptions of the classical linear regression model (CLRM) is that the regression model used in the analysis is correctly specified. Ramsey RESET test was performed for model specification with null hypothesis that the model has no omitted variables and its result was statistically insignificant supporting the null hypothesis.

4.4.5. Heteroscedasticity Test

The variance of the errors is constant which is known as the assumption of homoscedasticity. If the errors do not have a constant variance, they are said to be heteroscedasticity. If there is heteroscedasticity, the standard errors could be wrong and hence any inferences made could be misleading (Brooks, 2014). Modified Wald test was used to test heteroscedasticity with null hypothesis that variance of errors is homoscedastic. Result of this test was statistically insignificant indicating that there is no existence of heteroscedasticity.

4.4.6. Autocorrelation Test

It is assumed that the errors are uncorrelated with one another otherwise there is autocorrelation. In fact, the consequences of ignoring autocorrelation when it is present are similar to those of ignoring heteroscedasticity. There exists the possibility that the wrong inferences could be made about whether a variable is or is not an important determinant of variations in the dependent variable (Brooks, 2014). Wooldridge test was used to test autocorrelation with null hypothesis that there is no first order auto correlation. However, Wooldridge test indicated statistically significant result supporting autocorrelation.

Result of Regression Analysis

In this section the data analysis made using fixed effect regression and discussions are presented (Insert Table 4.3 here).

The result of fixed effect regression model on the impact of internet banking on financial performance presented in **Table 4.12**. The regression output reveals that the dependent variable is well explained by the explanatory variables in the model with R square and adjusted R square of 43.71% and 42.87% respectively and the rest of the variation of financial performance were not explained by the explanatory variables included in the model of this study. The F-statistic regression result was 7.38 with P- value of zero and that also statistically significant, suggesting that variations in the dependent variable are well enough explained by the repressors in the model.

The results of the model revealed that there was statistically significant positive relationship between

internet banking and banks financial performance. Based on the regression result the banks that have providing internet banking services to the customers have better financial performance than those the banks have not adopting internet banking. The result is similar to Furst et al. (2000a, 2000b, 2002a and 2002b) and Hassan. M.,(2003) found that banks in all size categories offering Internet banking were generally more profitable and tended to rely less heavily on traditional banking activities in comparison to non-Internet banks, the result of the study indicates that internet banking, capital adequacy and cost efficiency were positively associated to banks financial performance, whereas deposits to asset ratio were negatively correlated with banks financial performance.

Conclusions

The results of empirical evidence from the econometric regression analysis of fixed effect model revealed that independent variables including: internet banking, capital adequacy, cost efficiency, and deposit to asset ratio were statistically significant to explain impact of internet banking on financial performance of Ethiopian banks. Specifically, the result of the study indicates that internet banking, capital adequacy and cost efficiency were positively associated to banks financial performance, whereas deposits to asset ratio were negatively correlated with banks financial performance. Hence, those banks with adoption of internet banking, higher capital adequacy, higher cost efficiency and lower deposit asset ratio established better banks financial performance than those with non-adoption of internet banking, lower capital adequacy, lesser cost efficiency and higher deposit to asset ratio established banks in Ethiopia. However, size of banks and banks liquidity has negative but statistically insignificant relationship with financial performance of banks in Ethiopia. Therefore, in the case of Ethiopian banks, bank size and banks liquidity have not considered as a factor that impact on banks financial performance.

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Appendix

F-test of simple Pooled OLS against fixed-effects specification

H_o: Pooled Regression Model is appropriated,

H_1: Fixed Effect Regression Model is appropriated.

Based on the result Prob > F = 0.0002 it is lower than 5% and statistically significant at 1%.Therefore reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1).

H_1, Fixed Effect Model is appropriated.

Table 4.3

```
F test that all u_i=0:     F(9, 55) =     4.43                 Prob > F = 0.0002
```

Table 4.4: Breusch and Pagan Lagrangian multiplier test for random effects

H_o: Pooled Regression Model is appropriated,

H_1: Random Effect Regression Model is appropriated.

Based on the result Prob > Chi = 0.0205 it is lower than 5% and statistically significant at 5%.Therefore reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1).

H_1, Random Effect Model is appropriated.

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        ROA[Campanycode,t] = Xb + u[Campanycode] + e[Campanycode,t]

        Estimated results:
                     |       Var     sd = sqrt(Var)
             ROA     |    .0001197         .01094
               e     |    .0000487       .0069787
               u     |    7.11e-06       .0026664

        Test:   Var(u) = 0
                           chibar2(01) =     4.18
                        Prob > chibar2 =   0.0205
```


***Table 4.5 Hausman Specification Test of Random-Effects against Fixed-Effects**

H_o: Random Effect Regression Model is appropriated,

H_1: Fixed Effect Regression Model is appropriated.

Based on the result Prob > Chi = 0.0000 it is lower than 5% and statistically significant at 1%.Therefore reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1). Therefore **Fixed Effect Regression Model is appropriated.**

```
. hausman fixed_group random_group

                 ---- Coefficients ----
                 (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
            fixed_group  random_group     Difference          S.E.
-------------------------------------------------------------------------------
         BAS  -.0119874    -.0067835      -.0052038        .0028109
         BLD  -.0296821    -.0320866       .0024045        .0028409
         CAD   .0825645     .0411156       .0414489        .0331825
         CEF   .0989364     .1153389      -.0164025        .0085123
         DTA   -.111131    -.0767224      -.0344086        .0033471
-------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(5) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       39.76
                Prob>chi2 =      0.0000
                (V_b-V_B is not positive definite)
```

***Table 4.6 Normality test**

```
. swilk usquareroot

                    Shapiro-Wilk W test for normal data

    Variable |   Obs        W           V          z       Prob>z
-------------+--------------------------------------------------
 usquareroot |    70     0.97315       1.652      1.092     0.13738
```

***Graph 4.1** Test normality distribution of error term**.**

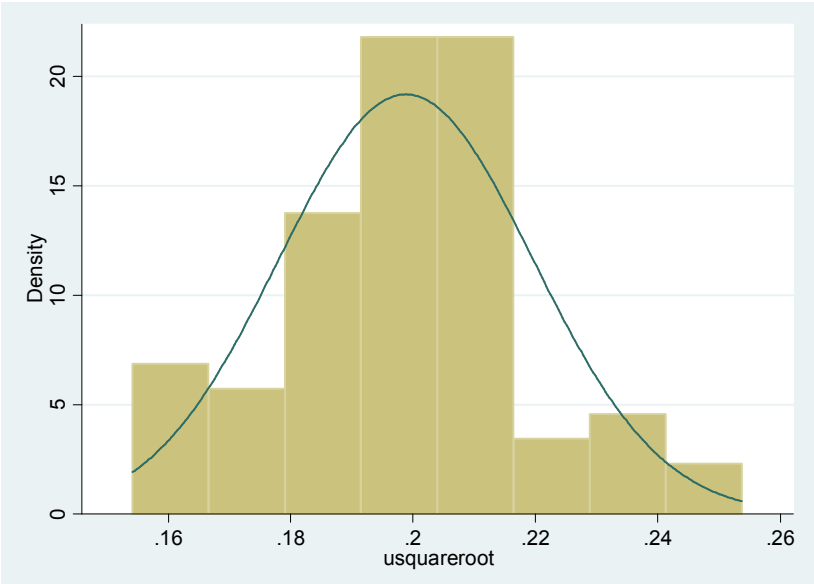

***Table 4.7 multicollinearity tests**

```
. vif

    Variable |       VIF       1/VIF
-------------+----------------------
         BAS |      1.78    0.561716
         CEF |      1.48    0.676227
         CAD |      1.41    0.709983
         DTA |      1.29    0.772221
         INT |      1.23    0.812397
         BLD |      1.12    0.889277
-------------+----------------------
    Mean VIF |      1.39
```

***Table 4.8 Model specification test for omission of variables**

Ramsey RESET test using powers of the fitted values of ROA
Ho: model has no omitted variables
F(3, 60) = 2.29
Prob > F = 0.0876

***Table 4.9 Heteroscedasticity test**

Modified Wald test for group wise heteroscedasticity in fixed effect regression model

```
Modified Wald test for groupwise heteroskedasticity
in fixed effect regression model

H0: sigma(i)^2 = sigma^2 for all i

chi2 (10)  =      12.68
Prob>chi2 =      0.2419
```

***Table 4.10 Autocorrelation test**

Wooldridge test for autocorrelation in panel data

***Table 4.11 Coloration test between dependent and independent variables**

```
. cor ROA INT BAS BLD CAD CEF DTA
(obs=70)

             |      ROA      INT      BAS      BLD      CAD      CEF      DTA
-------------+---------------------------------------------------------------
         ROA |   1.0000
         INT |   0.1962   1.0000
         BAS |  -0.2099   0.3355   1.0000
         BLD |  -0.3140  -0.1915   0.1529   1.0000
         CAD |   0.2243  -0.1232  -0.4170   0.0203   1.0000
         CEF |   0.3024   0.2693   0.5036  -0.0324  -0.2988   1.0000
         DTA |  -0.4624   0.1155   0.2885   0.0868  -0.3902  -0.0172   1.0000
```


Table 4.2: Fixed Effect Model Regression Results

ROA	Coef.	Robust Std. Err.	T	P>|t|
INT	.0045647	.0020631	2.21	0.031**
BAS	-.0036333	.0025173	-1.44	0.154
BLD	-.0042454	.0175975	-0.24	0.810
CAD	.0680913	.0366017	1.86	0.068***
CEF	.1034916	.0293984	3.52	0.001*
DTA	-.0535685	.0182004	-2.94	0.005*
Con	.0041703	.0315951	-0.13	0.895
Number of obs	70			
F(6, 57) =	7.38			
Prob > F	0.0000			
R-squared	0.4371			
Adj R-squared	0.4287			

Source: stata 12 output

*, **, and *** = significant at 1%, 5%, and 10% significance level respectively.