

The Effect of Cost of Risk and Banking Activity on the Profitability of Algerian Banks: A Panel Data Analysis for a Sample of Banks during the Period 2016 – 2023

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Date of receipt: 10-09-2025

Date of acceptance: 19-11-2025

Abstract: This study investigates the determinants of bank profitability in Algeria over the period 2016-2023, employing panel data techniques. Profitability, measured by return on assets (ROA), is found to be negatively and significantly affected by the cost of risk, while banking activity exerts a strong positive influence. Bank size has a marginal but statistically significant effect, acting mainly as a control factor rather than a core driver of performance. Based on these findings, the study highlights the importance of effective risk management and the expansion of banking activities as key levers for enhancing profitability in the Algerian banking sector.

Keywords: Profitability, Cost of risk, Banking activity, Bank size, Algeria.

Jel Classification Codes: G21, G32, C23

1. Introduction

Banks are among the most important actors in the national economy, as they play a key role in mobilizing savings and channeling them towards investment, in addition to their pivotal contribution to supporting economic growth and ensuring financial stability. Profitability is one of the most significant indicators reflecting the efficiency of banks in utilizing their resources and managing their operations.

In recent years, the Algerian banking sector has witnessed a remarkable expansion in its activities, in line with the public authorities' efforts to enhance financial inclusion and broaden the customer base, as well as to keep pace with technological transformations through the digitalization of financial services. However, this expansion has not always translated into improved profitability indicators. Several financial reports have highlighted that bank continue to face challenges related to the rising cost of risk, particularly due to the increase in loan loss provisions, which may limit their ability to generate sustainable profits.

Against this backdrop, the present study seeks to examine the relationship between cost of risk and banking activity and their impact on the profitability of Algerian banks during the period 2016–2023, while also considering the role of bank size as a control variable that may account for differences in profitability levels across banks.

1.1 Research Problem:

The idea for this study originated from the observation that the profitability of one of the largest Algerian banks had declined in recent years, despite a considerable expansion in its activity. The bank's annual report mainly attributed this decline to the rising cost of risk resulting from the increase in loan loss provisions. This contradiction between the expansion of banking activity on the one hand and the decline in profitability on the other, raises important questions about the nature of the relationship between these variables and their effect on the performance of Algerian banks.

Accordingly, the central research question can be formulated as follows: To what extent do the cost of risk and banking activity affect the profitability of Algerian banks during the period 2016–2023?

This question gives rise to the following sub-questions:

- What's the impact of the cost of risk on the profitability of Algerian banks?
- What's the impact of banking activity on the profitability of Algerian banks?
- Does bank size act as a control variable in the relationship between cost of risk and banking activity on the one hand and bank profitability on the other?

1.2 Hypotheses:

In order to address the research problem and questions, the following hypotheses are proposed:

H1: The cost of risk has a negative effect on the profitability of Algerian banks.

H2: Banking activity has a positive effect on the profitability of Algerian banks.

H3: Bank size influences the relationship between both cost of risk and banking activity, on the one hand, and the profitability of Algerian banks, on the other hand.

1.3 Objectives of the Study:

This study aims to achieve a set of scientific and practical objectives, including:

- To analyze the effect of the cost of risk on the profitability of Algerian banks during the period 2016–2023.
- To examine the relationship between banking activity and profitability, and to assess the extent to which expansion in activity contributes to improving bank performance.
- To test the role of bank size as a control variable in the relationship between cost of risk, banking activity, and profitability.
- To provide an empirical analysis of Algerian banks using panel data for a sample of banks, thereby helping to explain differences in profitability indicators.
- To derive practical implications that may assist Algerian banks in improving their policies related to risk management and the expansion of banking activity, in order to strike a balance between growth and profitability.

1.4 Study methodology and tools used:

To achieve the objectives of the study, which aims to examine the impact of banking activity and risk costs on the profitability of banks, the research adopted a descriptive-analytical approach to review relevant literature.

Empirically, the study employed a case study method, applying panel data econometric models (fixed and random effects), supported by the necessary statistical tests to determine the most appropriate specification.

The data were collected from the financial statements and annual reports of a sample of commercial Algerian banks for the period 2016-2023, and were analyzed using STATA software.

2. Literature Review

A substantial body of research has examined the relationship between credit risk, other banking risks, and profitability, with increasing attention to the moderating role of bank-specific factors and activity levels. Across different regions and methodologies, the consensus points to the centrality of risk management in shaping financial performance, albeit with nuanced variations in the strength and direction of effects.

In the MENA context, (Hakimi , Boussada, & Hamdi, 2020) employed the Seemingly Unrelated Regression (SUR) approach on conventional banks (2004–2015) and documented a significant negative association between profitability and both credit and liquidity risks. Interestingly, institutional quality, measured by law and order, mitigated these risks and enhanced profitability, highlighting the role of governance as a complementary factor. Similarly, (Saleh, Abu Afifa, & Murray, 2020), using panel GMM for 2010–2018, confirmed the detrimental effect of credit, liquidity, and capital risks on bank profitability, while emphasizing the relevance of Basel standards in enhancing resilience.

Beyond MENA, studies have reinforced the sensitivity of profitability to risk dynamics. In South Asia, (Siddique et al., 2022) found that non-performing loans (NPLs), cost efficiency, and liquidity ratio exert downward pressure on performance, while capital adequacy and lending rates support it, thus linking risk exposure with bank intermediation and activity-based measures. Likewise, in Bahrain, (Khayati, 2024) reported that excessive capital buffers and deteriorating asset quality reduce profitability, whereas

liquidity positively affects ROA. These findings suggest that the profitability-risk nexus is strongly mediated by banks funding structure and efficiency strategies.

In single-country settings, results converge around the same premise. For Vietnam, (Ngo & Trinh, 2025), adopting a Bayesian regression model, showed that credit and operational risks depress profitability, while bank size and macroeconomic conditions significantly moderate outcomes. (Shivhare, 2025), in a case study of ICICI Bank, highlighted the profitability costs of rising NPAs, while stressing the importance of early risk identification and recovery mechanisms as operational aspects of bank activity. Comparable evidence is found in the Balkans, where (Arifaj & Baruti, 2023) confirmed the inverse association between NPLs and profitability, and in Africa, where (Batekele & Maseka, 2025) reported mixed effects of NPLs and loan provisions but underscored the role of efficiency and CAR as key determinants of performance.

In Algeria, (Benchenna & Korichi, 2023) identified loan loss provisions and capital adequacy as the most decisive credit risk indicators explaining Algerian banks profitability (2009–2020). In addition to that (Imane et al., 2023) investigated the internal determinants of profitability in public banks (2011–2019) using system-GMM. Their findings revealed that liquidity, size, and efficiency positively affect profitability, while capitalization and leverage are insignificant. This underlines the importance of operational and management-related factors over capital structure, with strong implications for survival and growth strategies.

Taken together, these studies demonstrate that credit risk, most often proxied by NPL ratios or loan loss provisions, consistently undermines profitability. At the same time, indicators of bank activity such as efficiency, liquidity management, lending rates, and size shape how risks are transmitted to performance. Yet, despite this rich literature, most studies rely on conventional proxies of risk exposure, with limited integration of cost-of-risk measures relative to banking product. This gap provides an entry point for the present study, which adopts net provisions over banking product as an indicator of credit risk. By explicitly linking credit risk to bank activity, the analysis offers an operationally grounded perspective on the risk–profitability nexus that remains underexplored in prior research.

3. Methods and materials

3.1 Population and Sample of Study:

The study population consists of Algerian banks, which numbered 20, and we have selected four of it as a simple for the study, based on the availability of their financial reports during the specified study period, which included two public banks: (Algerian External Bank BEA, Algerian National Bank BNA), and also tow foreign private banks: (AL BARAKA Bank, Arab Banking Corporate ABC). The data collected from the annual reports of banks, and the study period covered eight years, from 2016 to 2023.

3.2 Study variables:

- The dependent variable: is presented by the profitability indicator, which is: the rate of return on assets (ROA).
- Independent variables: are represented by indicators of Risk Costs measured by the ration of loan loss provisions and credit risk expenses to net banking income, and Banking activity measured by the ratio of net banking income to total assets.
- Control variable: is represented by bank size and measured as the natural logarithm of total assets, in order to capture the potential scale effects.

To select these variables, table 1 summarizes the study variables.

Table 1. Study Variables

Variable	Explanation	Expected effect	Studies and research
Risk cost to net banking income (COR)	Measured by the ratio of Risk Costs to Net Banking Income. This indicator reflects the burden of credit risk on bank performance, as higher risk costs reduce the profitability of the bank.	(+)	(Elahi, 2017); (Bikker & Vervliet, 2018)
Ration of net banking income to	This ratio measures the bank's ability to generate income relative to its asset base, thus reflecting	(-)	(Petria et al., 2015); (Shin et al., 2014)

total assets (BA)	operational efficiency and income-generating capacity.		
Logarithm of total assets (SIZE)	Measured by the natural logarithm of Total Assets. This variable controls for the effect of bank size on profitability, as larger banks may benefit from economies of scale.	(+/-)	(Shin et al., 2014); (Petria et al., 2015); (Elahi, 2017)

Source: prepared by the researchers

3.4 Panel Data Model:

To empirically examine the relationship between risk costs, banking activity, and bank profitability, and to test the hypotheses developed in this study, the following panel regression model was specified:

$$ROA_{it} = \alpha + \beta_1COR_{it} + \beta_2BA_{it} + \beta_3SIZE_{it} + \varepsilon_{it}$$

ROA_{it}: profitability of bank i at time t.

COR_{it}: ration of risk, measured relative to bank income of bank i at time t.

BA_{it}: Banking activity of bank i at time t.

SIZE_{it}: Bank size, included as a control variable of bank i at time t.

ε_{it}: Error term.

4. Results and Discussion

4.1 Descriptive and Diagnostic Tests:

The empirical investigation begins with some preliminary statistical checks. First, descriptive statistics are reported to provide an overview of the variables used in the study by reporting their mean, standard deviation, minimum, and maximum values.

Table 2. Descriptive Statistics of the Variables

Variable	Obs	Mean	Std. Dev.	Min	Max
ROA	32	0.0156	0.0053	0.0055	0.0245
COR	32	0.1245	0.1377	-0.0988	0.4509
BA	32	0.0374	0.0134	0.0150	0.0614
SIZE	32	20.4196	1.6963	18.0775	22.5326

Source: Prepared by the researchers based on Stata 17

The descriptive statistics reveal that all variables exhibit values within plausible ranges, without the presence of abnormal deviations or outliers. This

indicates that the dataset is well-structured and reliable for subsequent econometric analysis.

To examine possible linear association between the variables, a correlation matrix is presented. This step also allows us to check for potential multicollinearity problems.

Table 3. Correlation Matrix

Variable	ROA	COR	BA	SIZE
ROA	1.000			
COR	-0.4765 (0.0058)	1.000		
BA	0.8138 (0.0000)	-0.2715 (0.1328)	1.000	
SIZE	-0.5756 (0.0006)	0.6135 (0.0002)	-0.8016 (0.0000)	1.000

Source: Prepared by the researchers based on Stata 17

The correlation matrix shows that most independent variables are weakly correlated, except for bank size (SIZE) and banking activity (BA), which display a strong negative correlation (-0.8016 , $p < 0.05$). This suggests the potential presence of multicollinearity. However, further diagnostic tests such as the Variance Inflation Factor (VIF) are required to confirm whether multicollinearity poses a serious issue in the regression model.

Table 4. Multicollinearity (VIF)

Variable	VIF	1/VIF
SIZE	5.31	0.1882
BA	3.58	0.2796
COR	2.05	0.4878
Mean VIF	3.65	

Source: Prepared by the researchers based on Stata 17

As shown in Table (4) all VIF values are below the critical value of 10, indicating that multicollinearity is not a major concern.

4.2 Regression Results:

The regression analysis was then carried out using three panel data specifications. The baseline estimation relies on the Pooled OLS model, followed by the Fixed Effects model, which controls for unobserved

heterogeneity across banks, and the Random Effects model, which assumes bank-specific effects are random and uncorrelated with the regressors.

The estimation results of these models are presented in Table below.

Table 5. Results of estimating panel models

Variable	Pooled OLS Coefficient (Std. Err.)	Fixed Effects Coefficient (Std. Err.)	Random Effects Coefficient (Std. Err.)
COR	-0.0266 (0.00298) ***	-0.0211 (0.00234) ***	-0.0266 (0.00298) ***
BA	0.5537 (0.0403) ***	0.5928 (0.0371) ***	0.5537 (0.0403) ***
SIZE	0.0031 (0.00039) ***	0.0052 (0.00146) **	0.0031 (0.00039) ***
_cons	-0.0643 (0.00901) ***	-0.1103 (0.0309) ***	-0.0643 (0.00901) ***
R ²	0.9166	0.9284 (within)	0.9166 (overall)
Obs.	32	32	32

Notes: *** p<0.01, ** p<0.05, * p<0.1.

Source: Prepared by the researchers based on Stata 17

The results across the three models (OLS, FE, RE) are consistent in both the direction and statistical significance of the estimated coefficients. Specifically, the cost of risk (COR) exerts a negative and highly significant effect on bank profitability, while banking activity (BA) and bank size (SIZE) display positive and significant contributions. This consistency across alternative specifications strengthens the robustness of the findings and underscores the reliability of the established relationships.

Following the analysis of the estimated models, we now turn to the diagnostic tests that guide the final model selection. In particular, the first step consists of comparing the pooled OLS with the Fixed Effects Model (FEM) in order to assess whether unobserved individual heterogeneity plays a significant role. The results of this test are reported in the following table.

Table 6. F-test Comparing Fixed Effects and Pooled OLS Models

Test	Statistic	df	Prob > F
F test that all $u_i = 0$ (Fixed Effects)	13.41	(3, 25)	0.0000

Source: Prepared by the researchers based on Stata 17

Table (6) show an F-statistic of 13.41 with degrees of freedom (3, 25) and a p-value < 0.01, leading to the rejection of the null hypothesis (H_0) stating that all bank-specific intercepts are equal (i.e., no differences between banks). This indicates that significant differences exist between banks, justifying the use of a Fixed Effects model to obtain more accurate estimates of the impact of the independent variables (COR, BA, SIZE) on Return on Assets (ROA), compared to a standard Pooled OLS model which ignores these differences.

The Breusch-Pagan LM test (Table 7) was then applied to determine whether a random effects model is preferred over pooled OLS.

Table 7. Breusch-Pagan Lagrangian Multiplier

Test	Statistic	P-value
Var(u) = 0	chibar ² = 0.00	1.0000

Source: Prepared by the researchers based on Stata 17

The Breusch–Pagan Lagrange Multiplier test was performed to compare the random effects specification with the pooled OLS model. The test yielded a chi-bar² statistic of 0.00 with a p-value of 1.000, indicating that the null hypothesis of no significant random effects cannot be rejected. This result suggests that the pooled OLS model is preferred over the random effects model for the current dataset.

Finally, and to confirm the previous result the Hausman specification test was used to decide between FEM and REM.

Table 8. Hausman Test

Test	Chi ²	df	P-value
H0: Differences in coefficients not systematic	17.27	3	0.0006

Source: Prepared by the researchers based on Stata 17

Table (8) shows a chi² of 17.27 with a p-value of 0.0006, indicating that the differences are statistically significant. Therefore, the Random Effects estimator is inconsistent, and the Fixed Effects model is preferred for estimating the impact of COR, BA, and SIZE on ROA.

5. Discussion

• Model Selection:

Based on the results of the diagnostic tests, and in particular the Hausman test ($\chi^2 = 17.27$, $p = 0.006$), the Fixed Effects Model (FEM) was selected as the most appropriate specification for the panel data. This choice reflects the ability of the FEM to control for unobserved, time-invariant characteristics across Algerian banks that may systematically influence profitability. Accordingly, the following discussion is grounded exclusively in the FEM estimates, while the alternative models (OLS, REM) were used only for comparison and methodological validation.

- **Hypothesis (H1): "The cost of risk has a negative effect on the profitability of Algerian banks."**

The estimation results indicate that the coefficient of cost of risk (COR) is -0.0210 ($p < 0.01$), confirming a negative and statistically significant relationship with bank profitability. Although the magnitude of the coefficient is relatively small, its significance demonstrates that higher risk-related costs erode profitability. The limited size of the effect can be explained by the specificities of the Algerian banking sector, where lending policies are highly conservative and credit is granted under stringent conditions. These practices substantially reduce the likelihood of loan defaults, thereby mitigating the direct impact of credit risk on profitability. This finding provides strong support for H1, while also highlighting the institutional and regulatory context that shapes the risk–profitability nexus in Algeria. And it is consistent with the result of (Benchenna & Korichi, 2023), who found loan loss provisions to be key drivers of Algerian banks profitability. Similar evidence was reported in the MENA region by (Hakimi , Boussada, & Hamdi, 2020) and in South Asia by (Siddique et al., 2022), where non-performing loans and provisioning reduced profitability. In Vietnam, (Ngo & Trinh, 2025) also showed that credit and operational risks weaken financial performance.

- **Hypothesis (H2): "Banking activity has a positive effect on the profitability of Algerian banks."**

The results reveal that the coefficient of banking activity (BA) is 0.5927 ($p < 0.01$), which is both positive and comparatively large. This indicates that the expansion of banking activities is the most important driver of profitability among the variables considered. The strength of this effect can be attributed to the ongoing transformation of the Algerian banking sector,

characterized by efforts toward digitalization, such as the introduction of automated teller machines (ATMs), the expansion of branch networks, and the development of Islamic financial products. In addition, banks are increasingly engaged in strategies aimed at financial inclusion, extending services to previously underserved segments of the population. These initiatives diversify income sources, increase transaction volumes, and enhance customer reach, thereby boosting profitability. The results thus provide robust support for H2. This aligns with (Siddique et al., 2022), who showed that lending activity boosts profitability in South Asian banks, and with (Khayati, 2024) in Bahrain, where liquidity and operational ratios improved ROA. By focusing on income relative to assets, this study confirms that profitability is not only a function of risk control but also of revenue generation strategies.

- **Hypothesis (H3): "Bank size influences the relationship between both cost of risk and banking activity, on the one hand, and the profitability of Algerian banks, on the other hand."**

Bank size (SIZE) was included as a control variable to account for differences in scale across banks. The coefficient of SIZE is positive and statistically significant (0.0052, $p < 0.01$), suggesting that larger banks tend to enjoy marginally higher profitability. However, the effect remains quantitatively limited, indicating that size does not play a decisive role in determining performance. Instead, its main function is to isolate the impact of risk costs and banking activity on profitability. Consequently, H3 is partially supported, as size contributes to stabilizing the estimated relationships but does not represent a primary determinant of profitability in the Algerian context. This finding is in line with (Benchenna & Korichi, 2023), who also reported that the profitability of Algerian banks is mainly driven by credit risk indicators rather than scale effects.

6. Conclusion and Recommendations

This study analyzed the impact of risk's cost and banking activity on the profitability in Algerian banks over the period 2016-2023 using panel data models, with the Fixed Effects Model (FEM) identified as the most appropriate specification. The key findings and recommendations are summarized as follows:

6.1 Main Findings:

- Cost of risk (COR): Exhibits a negative and statistically significant impact on profitability, confirming the sensitivity of bank performance to credit risk.
- Banking activity (BA): Shows a strong and positive effect, emerging as the most important driver of profitability, largely due to diversification, digitalization, and financial inclusion initiatives.
- Bank size (SIZE): Has a positive but limited influence, suggesting that scale economies exist but do not decisively shape profitability.

6.2 Recommendations:

For banks:

- Strengthen credit appraisal systems and adopt forward-looking provisioning policies to minimize cost of risk and protect earnings.
- Diversify income sources through the expansion of non-traditional services (such as digital banking, fee-based services, and Islamic finance), which can enhance net banking income and reinforce the positive impact of banking activity on profitability.

For policymakers:

- Develop balanced prudential frameworks that ensure adequate provisioning while avoiding excessive pressure on bank profitability.
- Encourage competition and financial innovation to increase the effectiveness of banking activity and strengthen the resilience of the sector.

In summary, profitability in Algerian banks is primarily determined by effective risk management and the expansion of banking activity, while size plays only a secondary role. Future research could extend this work by incorporating regulatory reforms, fintech adoption, and cross-country comparative analysis.

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6. Appendices:

6.1 Descriptive Statistics Test:

`. summarize ROA COR BA SIZE`

Variable	Obs	Mean	Std. dev.	Min	Max
ROA	32	.0156352	.0052553	.0054594	.024462
COR	32	.1244829	.137715	-.0988112	.4509277
BA	32	.03736	.0134433	.0150048	.0613947
SIZE	32	20.41959	1.696262	18.07746	22.53259

6.2 Correlation Matrix Test:

`. pwcorr ROA COR BA SIZE, sig`

	ROA	COR	BA	SIZE
ROA	1.0000			
COR	-.04765 0.0058	1.0000		
BA	0.8138 0.0000	-.02715 0.1328	1.0000	
SIZE	-.05756 0.0006	0.6135 0.0002	-.08016 0.0000	1.0000

6.3 Multicollinearity Test (Variance Inflation Factor – VIF)

. vif

Variable	VIF	1/VIF
SIZE	5.31	0.188221
BA	3.58	0.279600
COR	2.05	0.487758
Mean VIF	3.65	

6.4 Pooled OLS Model Results:

. reg ROA COR BA SIZE

Source	SS	df	MS	Number of obs	=	32
Model	.000784797	3	.000261599	F(3, 28)	=	102.64
Residual	.000071363	28	2.5487e-06	Prob > F	=	0.0000
				R-squared	=	0.9166
				Adj R-squared	=	0.9077
Total	.00085616	31	.000027618	Root MSE	=	.0016

ROA	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
COR	-.026648	.0029812	-8.94	0.000	-.0327547	-.0205412
BA	.5537238	.0403367	13.73	0.000	.4710979	.6363498
SIZE	.003062	.0003896	7.86	0.000	.0022638	.0038601
_cons	-.0642588	.0090132	-7.13	0.000	-.0827214	-.0457961

6.5 Fixed Effects Model (FE) Results:

Fixed-effects (within) regression	Number of obs	=	32
Group variable: BANK	Number of groups	=	4
R-squared:	Obs per group:		
Within = 0.9284	min =		8
Between = 0.0978	avg =		8.0
Overall = 0.4250	max =		8
corr(u_i, Xb) = -0.2122	F(3,25)	=	108.00
	Prob > F	=	0.0000

ROA	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
COR	-.0210758	.0023394	-9.01	0.000	-.025894	-.0162577
BA	.5927881	.0371317	15.96	0.000	.516314	.6692623
SIZE	.0052101	.0014648	3.56	0.002	.0021933	.0082268
_cons	-.110275	.0308556	-3.57	0.001	-.1738233	-.0467267
sigma_u	.00450403					
sigma_e	.00104605					
rho	.94882119	(fraction of variance due to u_i)				

F test that all u_i=0: F(3, 25) = 13.41 Prob > F = 0.0000

6.6 Random Effects Model (RE) Results:

Random-effects GLS regression	Number of obs	=	32
Group variable: BANK	Number of groups	=	4
R-squared:	Obs per group:		
Within = 0.9041	min =		8
Between = 0.9270	avg =		8.0
Overall = 0.9166	max =		8
corr(u_i, X) = 0 (assumed)	Wald chi2(3)	=	307.92
	Prob > chi2	=	0.0000

ROA	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
COR	-.026648	.0029812	-8.94	0.000	-.032491	-.0208049
BA	.5537238	.0403367	13.73	0.000	.4746654	.6327823
SIZE	.003062	.0003896	7.86	0.000	.0022983	.0038256
_cons	-.0642588	.0090132	-7.13	0.000	-.0819243	-.0465932
sigma_u	0					
sigma_e	.00104605					
rho	0	(fraction of variance due to u_i)				

6.7 F-test for Fixed Effects vs. Pooled OLS:

Fixed-effects (within) regression		Number of obs	=	32
Group variable: BANK		Number of groups	=	4
R-squared:		Obs per group:		
Within = 0.9284		min =		8
Between = 0.0978		avg =		8.0
Overall = 0.4250		max =		8
corr(u_i, Xb) = -0.2122		F(3,25)	=	108.00
		Prob > F	=	0.0000

ROA	Coefficient	Std. err.	t	P> t	[95% conf. interval]	
COR	-.0210758	.0023394	-9.01	0.000	-.025894	-.0162577
BA	.5927881	.0371317	15.96	0.000	.516314	.6692623
SIZE	.0052101	.0014648	3.56	0.002	.0021933	.0082268
_cons	-.110275	.0308556	-3.57	0.001	-.1738233	-.0467267
sigma_u	.00450403					
sigma_e	.00104605					
rho	.94882119	(fraction of variance due to u_i)				

F test that all u_i=0: F(3, 25) = 13.41	Prob > F = 0.0000
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6.8 Breusch–Pagan Lagrange Multiplier (LM) Test for Random Effects vs. Pooled OLS:

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

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

Estimated results:

	Var	SD = sqrt(Var)
ROA	.0000276	.0052553
e	1.09e-06	.0010461
u	0	0

Test: Var(u) = 0

chibar2(01) = 0.00
Prob > chibar2 = 1.0000

6.9 Hausman Test for Fixed Effects vs. Random Effects:

. hausman fe re, sigmamore

	Coefficients		(b-B) Difference	sqrt(diag(V_b-V_B)) Std. err.
	(b) fe	(B) re		
COR	-.0210758	-.026648	.0055721	.0019647
BA	.5927881	.5537238	.0390643	.0398041
SIZE	.0052101	.003062	.0021481	.0022013

b = Consistent under H0 and Ha; obtained from xtreg.
B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

Test of H0: Difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 17.27
Prob > chi2 = 0.0006