The impact of the Real Time Gross Settlement System (RTGS) on the financial performance of Bahraini banks (2012-2021) - Standard Study –

<div dir="rtl">

أثر النظام الآلي للتسويات الإجمالية (RTGS) على الأداء المالي للبنوك البحرينية خلال الفترة (2012–2021)

— دراسة قياسية —

</div>

Sofia Zemmit [1]
University algers3 - Algeria
zemmit.sofia@univ-alger3.dz

Pr. Ismail Dahmani
University algers3 - Algeria
dahmani.smail@univ-alger3.dz

Abstract:

This study aimed to highlight the impact of the Real Time Gross Settlement System (RTGS) on the financial performance indicators of Bahraini banks.

In order to achieve the objective of the study and test its hypotheses, a simple linear model was used as a standard statistical tool for applying statistical tests and selecting the most appropriate ones statistically.

The results of the standard study showed that the (RTGS) system has a positive impact on the financial performance indicators (NPLS, ROE) of Bahraini banks. The Real Time Gross Settlement System affects directly the Return on Equity (ROE) index, and affects indirectly the Non-Performing Loans (NPLS) index, i.e. reducing provisions for Non-Performing Loan risks and raising shareholder profits. As for its effect on the Liquidity Ratio (LR), it was indirectly negative compared to the fixed ratio (LR).

Key words: *Automated (Real Time) System - Electronic Settlements - Financial Performance - Bahraini Banks.*

<div dir="rtl">

ملخص:

هدفت هذه الدراسة إلى إبراز تأثير النظام الآلي للتسويات الإجمالية (RTGS) على مؤشرات الأداء المالي للبنوك البحرينية، ولتحقيق هدف الدراسة واختبار فرضياتها تم استخدام نموذج خطي بسيط كأداة إحصائية قياسية لتطبيق الاختبارات الإحصائية واختيار الأنسب منها إحصائيا، حيث أظهرت نتائج الدراسة القياسية أن نظام (RTGS) له الأثر الإيجابي على مؤشرات الأداء المالي (NPLS، ROE) للبنوك البحرينية، فالنظام الآلي للتسويات الإجمالية يؤثر بشكل مباشر على مؤشر (ROE)، وبشكل غير مباشر على مؤشر (NPLS) أي تخفيض مخصصات مخاطر القروض المتعثرة ورفع نسبة أرباح المساهمين، أما تأثيره على مؤشر نسبة السيولة القانونية (LR) فكان سلبي غير مباشر مقارنة بنسبة (LR) الثابتة.

الكلمات المفتاحية: النظام الآلي — التسويات الالكترونية — الأداء المالي — البنوك البحرينية.

</div>

---

[1] *- Corresponding author: SOFIA ZEMMIT, zemmit.sofia@univ-alger3.dz.*

1. INTRODUCTION:

The technological progress witnessed by the banking sector in recent years has enhanced banking comprehensiveness through the adoption of digital banking services, which contributed to modernizing and changing the nature of the work of banks as a whole (Public), as it has become a modern field that includes technological skills, techniques and financial tools, which led to the settlement of services provided in a very fast and accurate way.

Technological development has become the focus of attention of banks as one of the important modern production factors that would achieve the best banking performance in coordination with other factors, as there is a shift in the directions of local and international banks to acquire the best technological techniques in settling their transactions as quickly as possible in order to achieve the largest possible return.

The management of banks performs several functions, starting with planning, organizing, implementing, directing, and controlling, so that the evaluation and follow-up function comes as a very important administrative function that works to monitor the positive and negative deviations resulting from the banks' policies in light of the various circumstances and factors. Periodically with the aim of determining its financial position, knowing its financial position and working to improve it in parallel with the use of technological mechanisms or what is known as Electronic Settlements by taking appropriate decisions.

Importance of the research:

Our research is of great importance in identifying the most important effects of the Real Time Gross Settlement System (RTGS) on the financial performance achieved by Bahraini banks in light of the economic theories (the theory of commercial loans [short term], the theory of switching [the possibility of conversion and diversification of banking operations and components of the stock portfolio], the theory of expected and certain income through a credit feasibility study, the theory of liability management [strengthening financial resources and expanding lending to achieve profits and sector specialization], the theory of asset and liability management [diversifying services and investments and adopting creativity and innovation in all fields], theory of concluding and distributing loans model [securitization technology and developing the financial market]). These theories entirety make the work of banks keep pace with emergency conditions in order to achieve efficient financial performance and ensure the continuity and expansion of their activity in the future.

Objectives of the study:

This study aims to find out how electronic settlements of Bahraini banks' payments affect their financial performance during the period (2012-2021), by using the rate of the Real Time Gross Settlement System (RTGS) for the banking system and financial performance evaluation indicators (NPLS, ROE, LR).

Research problematic:

Through the foregoing, it is clear that the bank's primary objective is to achieve the largest profit, taking into account all of the liquidity available to it, in addition to the security and indebtedness on which its activity is based, especially with its reliance on electronic settlements that are characterized by simultaneity. On this basis, the main question is:

How does the adoption of the Real Time Gross Settlement System (RTGS) affects the financial performance indicators of banks in Bahrain?

Research hypotheses: The hypotheses of the study are as follows:

- ➢ **Hypothesis (01):** The rate of the **Real Time Gross Settlement System (RTGS)** positively affects the financial performance indicators of Bahraini banks (NPLS, ROE, LR) on the financial performance of Bahraini banks.
- ➢ **Hypothesis (02):** The rate of the **Real Time Gross Settlement System (RTGS)** negatively affects the financial performance indicators of Bahraini banks (NPLS, ROE, LR) on the financial performance of Bahraini banks.
- ➢ **Hypothesis (03):** The rate of the **Real Time Gross Settlement System (RTGS)** on the financial performance indicators of Bahraini banks (NPLS, ROE, LR) does not affect the financial performance of Bahraini banks.

Research methodology and used tools:

The study relied on the descriptive approach and the analytical approach, using the rate of the automated system for electronic settlements adopted in the Bahraini banking system. The study is trying to highlight its impact on a set of financial performance indicators for banks such as asset quality indicators, profitability indicators and liquidity. The study is using the standard statistical method by adopting simple linear models in interpreting the effect of the independent variable (RTGS) on the dependent variables (NPLS, ROE, LR), and using **E-Views 10** software as a statistical tool that translates the relationship between variables.

Study model:
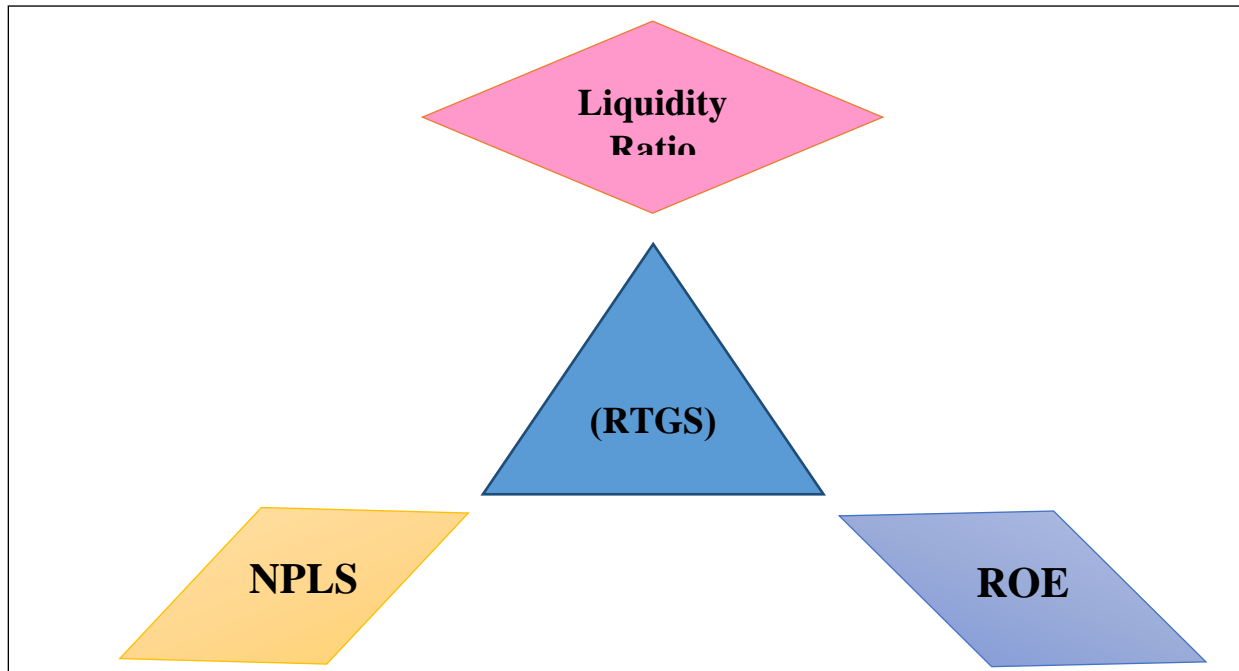
2. Previous studies:

-          **Study (01):** Tahtan Mourad, Chorouki Zinedine, **Factors affecting the profitability of commercial banks - an applied study on a sample of commercial banks operating in Algeria during the period (2005-2011)**, Algerian Journal of Economics and Finance, Issue 01, April 15, 2014. The study analyzed the impact of internal factors (liquidity, loans, property rights, bank size, general exploitation expenses) on the profitability of commercial banks operating in Algeria, measured by the rate of return on total assets (ROA), and to achieve this, (Panel Data) models were applied to a sample of five commercial banks operating in Algeria during the period (2005-2011). The study concluded that: private commercial banks are more efficient in achieving profits compared to public banks, and there is no statistically significant correlation between the ratio of equity to total assets, the volume of Bank (total assets) and the rate of return on total assets (ROA).

-          **Study (02):** Shrooq Hadi Abd Ali, Aradn Hatem Khudair, **The digital transformation of banking operations as a tool for developing the strategic financial performance of the Bank of Baghdad as a model**, Journal of Management and Economics, Issue 126, 2020. This study aimed to determine the impact of the digital transformation dimensions of settlement systems on Strategic Financial Performance according to four indicators (profitability, liquidity, capital adequacy, employment), by analyzing the relationship of correlation and regression through the use of simple linear regression. Strategic financial. Therefore, modern methods of banking work must be promoted to meet digital challenges and reach high and distinguished levels of financial performance.

-          **Study (03):** Mansour Nasser Al-Raji, Suad Nuri Al-Obaidi, **The Impact of Using Electronic Payment Systems on the Performance of Jordanian Banks - A Field Study of Banks Listed in the Amman Stock Exchange**, Economic Studies Journal, Issue 23, July 2017. The study focused on highlighting the impact of the use of electronic payment systems on the financial

performance and efficiency of the internal operations of Jordanian banks based on the SPSS program, on the performance of banks as a whole.

3. Theoretical part (Framework):

3.1. Electronic banking:

3.1.1. Motives for switching to electronic banking:

Electronic settlement: The settlement process facilitates the transfer of funds according to the agreed terms. The settlement allows the final transfer of funds to the receiving service provider, and the settlement agent undertakes the task of settlement. It is often a central bank, but banks may also play this role, particularly where there are indirect participants in the payment system. (Cook, Dylan, & Soraya, 2021)

This service has also evolved to include the real-time total settlement system, as the electronic settlement of payments between different banks is carried out through the electronic payment clearing system. (Mohamed & Hamo, 2017)

Among the motives for switching to electronic banking, we find:

It is summarized in what was imposed by scientific and technical progress and the continuous demand to raise the quality of banking services and ensure the safety of operations provided by Algerian banks from: (Gharibi & Renouba, 2016)

- Reducing expenses incurred by banks in performing services and establishing branches in new areas. (Mohamed & Hamo, 2017)

- Enhancing transparency by establishing electronic management as an information window to introduce banks, promote their services, and inform them of financial indicators to place them at the disposal of customers and all other concerned parties.

- Encouraging and developing the money market by increasing the turnout of savers to deal and own shares and bonds of various companies, as well as carrying out promotional campaigns and activating the services and activities provided to facilitate the performance of the buying and selling process of securities. (Majzoub, 2017), which affects the activation of the role of the Stock Exchange in the context of establishing an electronic financial market and the establishment of electronic payment systems that contribute to the development and promotion of its performance. (Drees, 2013)

- Improving the performance of banking services and providing the opportunity to invest in the technology sector to facilitate life and take advantage of the technical advantages available at the international level.

- The need of bank employees for qualitative support through solid information and an advanced work system. - Improving the services of banks to rise to higher levels, to obtain the international quality certificate for their services on the one hand, and to satisfy their customers on the other hand. (Gharibi & Renouba, 2016)

3.1.2. Electronic banking outlets: Electronic banking adopts several channels, the most important of which are: automatic teller machines, banking via the Internet, electronic banking service over the phone, mobile banking, bank payment orders and electronic clearing services.

Figure No. (01): Electronic banking outlets:
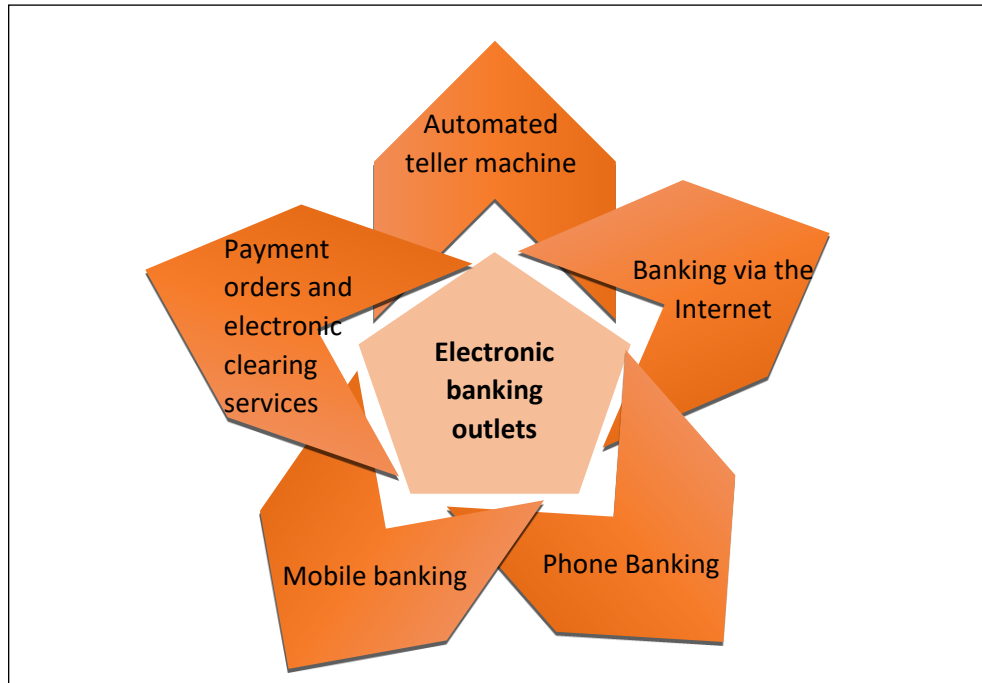
Source: Prepared by the researchers based on: Belayish Mayada, Zaidi Hassiba, ***The reality of electronic banking in developed countries - The French experience as a model for the experiences of pioneering countries in the use of modern payment methods****, Economic Researcher Magazine, Issue 08, December 2017, pp. 305-308.*

3.2. Banks' financial performance:

3.2.1. Financial performance: There are many definitions of financial performance according to the researchers' viewpoints. We mention the most important of them:

"The extent of the institution's ability to make optimal use of its resources and sources in the long and short term uses in order to create wealth." (Maida & Ahmed Al-Saleh, 2017)

"It is a diagnosis of the financial position of the institution in order to determine its ability to create value through its optimal use of available resources, and to compare the achieved goals with the set goals in order to discover errors and deviations and work to correct them". (Noman & Siraj, 2019)

As for the **financial performance of banks**, it was defined as follows:

Evaluation of the bank's financial performance is a process through which the bank's financial statements are relied upon in order to determine its efficiency and effectiveness in managing its resources in order to achieve profits, using financial ratios. (Amina & Mihoub, 2021)

"In order to judge the soundness of the bank's financial position, compared with other banks and through various periods of activity." (Fawzi & El Tijani, 2015)

3.2.2. Stages of bank performance appraisal:

The performance appraisal process in commercial banks goes through several successive stages, as follows:

a) **The stage of data and statistics collection:** which is required by the performance evaluation process in commercial banks to calculate the ratios or indicators used in the evaluation, and it includes several years and for the various activities of the bank.

b) **The stage of analyzing statistical data and information:** studying them and indicating their accuracy and validity for calculating ratios and indicators necessary for the bank's performance appraisal process.

c) **The stage of conducting the evaluation process:** using ratios and indicators based on the available data.

d) **The stage of analyzing the results of the assessment:** indicating the extent of success or failure that accompanied the bank's performance, with an inventory and identification of the deviations that occurred in the bank's activity, and then explaining their causes, and developing solutions to address these deviations to ensure an optimal performance of the bank.

e) **The stage of following up the corrective operations for the deviations** that occurred in the bank's activity, providing the necessary conditions that encourage the achievement of the required performance, and benefiting from the results of the evaluation in order not to repeat mistakes in the future. (Saliha & Zidan, 2021)

4. Practical part:

4.1. Study indicators:

4.1.1. Electronic (real-time) settlement systems:

On May 11, 2010, the Central Bank management issued a circular to all retail banks operating in the Kingdom of Bahrain regarding withdrawals and deposits of amounts that will be made through the real-time settlement system (RTGS) starting from June 1, 2010, which requires all retail banks to provide sufficient amounts in Their accounts with the Central Bank while making withdrawals, as the amounts will be deducted directly from their accounts. On the first of June, withdrawals and deposits of amounts were implemented through the real-time settlement system (RTGS).

The Central Bank management supervises the payment and settlement systems and ensures their integrity, which are classified as follows: (Central Bank of Bahrain)

A) Important Regular payment systems such as (RTGS) and (SSS):

• **Inter-Bank Payments and Settlement System (RTGS):** through which all bank transfers between retail banks are made instantly, and the Real Time Gross Settlement System also allows

transfer and settlement of customer operations, and the real-time system is capable of settling in multiple currencies through direct electronic operations Straight Through Processing (STP).

B) Bahrain Electronic Check Clearing System (BCTS): It came into operation in cooperation with The Benefit Company on May 13, 2012. Where checks submitted for payment to the bank are scanned, the customer deposits the check, and then the electronic images and information of the check are transferred through the system instead of From sending the check manually to the BCTS Clearing House, then the clearing and settlement process is done based on the electronic images and information of the checks sent.

C) Electronic Transfer System (EFTS): It is one of the low-value payment systems that includes displaying electronic invoices and payment under the names of Fawri, Fawri+, and Fawateer.

4.1.2. Indicators of financial performance of Bahraini banks:

Below we will present the most important indicators used in evaluating bank performance and approved in our study:

a) Measuring profitability: The profitability of banking-type institutions, similar to the rest of the institutions, is measured using a set of rates that highlight the efficiency of the bank in terms of achieving profits from the invested funds.

One of the most important is the rate of Return on Assets (ROA), which is the ratio between net income to total assets. In our study we focus on:

• **The Ratio of Return on Equity (ROE):** It is the ratio between net income to equity, and it measures the productivity of equity only from capital, reserves and undistributed profits, where: The ratio of return on deposits is net profit after tax to total deposits.· Therefore, it is preferable to take the rate of return on resources. (Fawzi & El Tijani, 2015)

b) Measuring liquidity: Liquidity indicators measure the bank's ability to convert its assets into cash without exposure to large losses, which proves its ability to meet its short-term obligations. In addition to the **ratio of loans to deposits**: which refers to the percentage of bank loans financed through deposits, (Aissa, Fadili , & Ezzedine , 2021) We will focus on:

• **The Legal Liquidity Ratio (LR)**: It represents a measure of the ability of primary reserves and secondary reserves to fulfill the financial obligations owed by the bank in various circumstances, as the higher the legal liquidity ratio, the greater the bank's liquidity, which is:

Liquidity Ratio = (Cash and gold in the bank + balances with the central bank + commercial or financial papers and investments + treasury bills Statutory / Total deposits + amounts borrowed from the central bank + bank dues + checks, letters and remittances due) X 100
(Al-Karwi, 2018)

c) Measurement of Capital Adequacy (solvency): This ratio measures the extent of the bank's ability to absorb losses resulting from lending and investment operations based on the ownership

right available to the owners of the bank. The **Capital Adequacy Ratio** is included in this indicator, as the capital is subject to the following minimum requirements:

- Ordinary shares must constitute at least 4.5% of the risk weighted assets.

- Capital must constitute at least 6% of the risk weighted assets.

- Capital tier 1+ capital tier 2 (i.e. total regulatory capital) must constitute at least 8% of risk weighted assets, excluding capital reserves according to Basel III. (Central Bank of Saudi Arabia, 2022)

- **The basic regulatory capital ratio**: It consists of the book capital and some provisions, reserves and other financial instruments, which banks must maintain to face the risks they are exposed to, which is determined legally by the supervisory or control authorities. (Mahmoud Ismail & Mansour Hamed , 2021)

d) Asset quality indicators: A group of ratios can be used to predict the state of financial hardship, which measures the bank's ability to fulfill its obligations towards creditors. It is called leverage ratios, which contribute to estimating the possibility of financial hardship. It represents the **non-performing debt coverage ratio:** that is, loans that are no longer realized. The bank has interest income as a result of the possible inability of the bank to collect loans, which makes the bank allocate funds to face this default. (Chikou, 2017)

In our research, we will rely on:

• **The Non-performing Debt/Partners Ratio (NPLS)**: It is the percentage that each shareholder bears from the risks resulting from non-performing loans or non-performing debts that the bank could not cover with its provisions.

4.2. The practical study: The relationship between the study indicators

4.2.1. Study variables and model:

The aim of this standard study is to test the effect of the rate of the Real Time Gross Settlement System (RTGS/ASTS) on the financial performance of Bahraini banks (asset quality, profitability, liquidity) by taking one indicator that expresses the mentioned financial performance indicators during the years (2012-2021), depending on Annual data covering 10 observations obtained from the Bahrain Statistical Bulletin, in addition to the reports of the Central Bank of Bahrain and by estimating the relationship between the study variables that were classified according to their nature to:

a) The independent variable:

• Rate of the Real Time Gross Settlement System (RTGS): It represents the percentage of transactions that are carried out through the Automated Gross Settlement System to the total number of total electronic settlement systems operations in the State of Bahrain.·

b) The dependent variables:

• **Asset quality:** This is expressed by the index of the un-hedged portion of Non-performing Loans to shareholder ratio (NPLS).·

• **Profitability:** It is expressed as Return on Equity (ROE).·

• **Liquidity:** It is expressed by the indicator of the Legal Liquidity Ratio (Liquidity Ratio: LR).·

4.2.2. Estimating statistical models using EViews10 software:

Independent variable:

$X = X1,$ Rate of the Real Time Gross Settlement System : $RTGS$

Dependent variables: indicators of financial performance of banks.

$$Y = \begin{cases} Y1, & \text{Un} - \text{hedged portion of Non} - \text{performing Loans to shareholders ratio:} NPLS \\ Y2, & \text{Return on Equity} \quad : ROE \\ Y3, & \text{Legal Liquidity Ratio} : LR \end{cases}$$

In the process of estimating the model, we use the method of least squares to estimate the relationship between the variables in the long run according to the following model:

$$y = \alpha + \beta.X + \varepsilon t$$

a) The first model: estimating the relationship between the Rate of the Real Time Gross Settlement System (RTGS/ASTS) and the indicator of the un-hedged portion of Non-performing Loans to shareholders ratio (NPLS).

b) The second model: estimating the relationship between the Rate of the Real Time Gross Settlement System (RTGS/ASTS) and the Return on Equity (ROE) indicator.

c) The third model: estimating the relationship between the Rate of the Real Time Gross Settlement System (RTGS/ASTS) and the Legal Liquidity Ratio (LR) indicator.

$$NPLS = \alpha + \beta1.RTGS + \varepsilon t$$
$$ROE = \alpha + \beta2.RTGS + \varepsilon t$$
$$LR = \alpha + \beta3.RTGS + \varepsilon t$$

5. RESULTS AND DISCUSSION:

The first model: $NPLS = -13.0625 + 0.2256\, RTGS$

BRosh test: Prob Chi-Squar > 5 % The model is statistically acceptable

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.057160	Prob. F(1,7)	0.8179
Obs*R-squared	0.080996	Prob. Chi-Square(1)	0.7760

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/13/23   Time: 14:35
Sample: 2012 2021
Included observations: 10
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.094244	4.867300	-0.019363	0.9851
RTGS	0.001034	0.059551	0.017356	0.9866
RESID(-1)	0.105722	0.442201	0.239081	0.8179

R-squared	0.008100	Mean dependent var	-1.02E-15
Adjusted R-squared	-0.275301	S.D. dependent var	0.629013
S.E. of regression	0.710340	Akaike info criterion	2.397179
Sum squared resid	3.532080	Schwarz criterion	2.487954
Log likelihood	-8.985894	Hannan-Quinn criter.	2.297598
F-statistic	0.028580	Durbin-Watson stat	1.599381
Prob(F-statistic)	0.971937		

Student's test: t-Statistic >2.306   The model is statistically acceptable

Dependent Variable: NPLS
Method: Least Squares
Date: 05/13/23   Time: 14:32
Sample: 2012 2021
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-13.06256	4.556476	-2.866812	0.0209
RTGS	0.225663	0.055784	4.045303	0.0037

R-squared	0.671653	Mean dependent var	5.350000
Adjusted R-squared	0.630610	S.D. dependent var	1.097725
S.E. of regression	0.667170	Akaike info criterion	2.205311
Sum squared resid	3.560921	Schwarz criterion	2.265828
Log likelihood	-9.026557	Hannan-Quinn criter.	2.138924
F-statistic	16.36448	Durbin-Watson stat	1.488549
Prob(F-statistic)	0.003708		

Variation of variance test: using ARCH autoregressive conditional stability-of-variance test:

Heteroskedasticity Test: ARCH

F-statistic	0.045881	Prob. F(1,7)	0.8365
Obs*R-squared	0.058605	Prob. Chi-Square(1)	0.8087

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/13/23   Time: 14:36
Sample (adjusted): 2013 2021
Included observations: 9 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.321757	0.181642	1.771383	0.1198
RESID^2(-1)	0.100079	0.467229	0.214198	0.8365

R-squared	0.006512	Mean dependent var	0.351581
Adjusted R-squared	-0.135415	S.D. dependent var	0.328424
S.E. of regression	0.349955	Akaike info criterion	0.931103
Sum squared resid	0.857277	Schwarz criterion	0.974931
Log likelihood	-2.189965	Hannan-Quinn criter.	0.836523
F-statistic	0.045881	Durbin-Watson stat	1.390071
Prob(F-statistic)	0.836499		

We note that the statistic: **Prob.Chi-Square(1) >10%** means that: The computed value is **Obs*R-squared < the tabular value**, and from it we accept the null hypothesis, that is, the stability of the variance of the limit of random error in the estimated model. That is to say, **the model is statistically valid**.

Fisher's test: **Pro (F-statistic) < 5%**.   The model is statistically valid

Durbin-Watson test: The model is acceptable because:
 Durbin-Watson stat €[0.70- 1.64]

Source: *Prepared by the researchers, based on the outputs of the **E-Views 10** program.*

The second model:	$ROE = 0.0764.RTGS$

BRosh test: Prob Chi-Squar > 5% The model is statistically acceptable

```
Breusch-Godfrey Serial Correlation LM Test:

F-statistic          2.968438   Prob. F(1,8)           0.1232
Obs*R-squared        2.706345   Prob. Chi-Square(1)    0.0999

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/13/23   Time: 09:18
Sample: 2012 2021
Included observations: 10
Presample missing value lagged residuals set to zero.

   Variable      Coefficient   Std. Error   t-Statistic   Prob.

   RTGS          -0.001264     0.006062     -0.208514     0.8400
   RESID(-1)     -0.567402     0.329327     -1.722916     0.1232

R-squared            0.270594   Mean dependent var     0.012089
Adjusted R-squared   0.179419   S.D. dependent var     1.715848
S.E. of regression   1.554317   Akaike info criterion  3.896806
Sum squared resid    19.32721   Schwarz criterion      3.957323
Log likelihood       -17.48403  Hannan-Quinn criter.   3.830419
Durbin-Watson stat   2.070964
```

Student's test: t-Statistic test >2.306 The model is statistically acceptable.

```
Dependent Variable: ROE
Method: Least Squares
Date: 05/13/23   Time: 09:07
Sample: 2012 2021
Included observations: 10

   Variable      Coefficient   Std. Error   t-Statistic   Prob.

   RTGS          0.076452      0.006643     11.50839      0.0000

R-squared            -0.026086  Mean dependent var     6.250000
Adjusted R-squared   -0.026086  S.D. dependent var     1.693943
S.E. of regression   1.715895   Akaike info criterion  4.012386
Sum squared resid    26.49866   Schwarz criterion      4.042645
Log likelihood       -19.06193  Hannan-Quinn criter.   3.979193
Durbin-Watson stat   2.716244
```

Variance-of-variance test: using ARCH autoregressive conditional stability-of-variance test:

```
Heteroskedasticity Test: ARCH

F-statistic          0.432114   Prob. F(1,7)           0.5320
Obs*R-squared        0.523273   Prob. Chi-Square(1)    0.4694

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/13/23   Time: 09:30
Sample (adjusted): 2013 2021
Included observations: 9 after adjustments

   Variable      Coefficient   Std. Error   t-Statistic   Prob.

   C             2.065081      1.447923     1.426237      0.1968
   RESID^2(-1)   0.243578      0.370544     0.657354      0.5320

R-squared            0.058141   Mean dependent var     2.676909
Adjusted R-squared   -0.076410  S.D. dependent var     3.207154
S.E. of regression   3.327428   Akaike info criterion  5.435406
Sum squared resid    77.50243   Schwarz criterion      5.479234
Log likelihood       -22.45933  Hannan-Quinn criter.   5.340826
F-statistic          0.432114   Durbin-Watson stat     1.909139
Prob(F-statistic)    0.531965
```

We note that the statistic: **Prob.Chi-Square(1) >10%** means that:
The computed value is **Obs*R-squared < the tabular value**, and from it we accept the null hypothesis, that is, the stability of the variance of the limit of random error in the estimated model. That is to say, **the model is statistically valid**.

Since the constant α = 0, we pass the Fisher test to the Durbin-Watson test.

Durbin-Watson test: The model is acceptable because:
Durbin-Watson stat €[2.68–3.12]

***Source**: Prepared by the researchers, based on the outputs of the **E-Views 10** program.*

The third model: $LR = 54.4124 - 0.3808\, RTGS$	
BRosh test: Prob Chi-Squar(1) > 5% The model is statistically acceptable	**Student's test: t-Statistic >2.306** The model is statistically acceptable

BRosh test: Prob Chi-Squar(1) > 5% The model is statistically acceptable

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.027806	Prob. F(1,7)	0.1975
Obs*R-squared	2.246178	Prob. Chi-Square(1)	0.1339

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/13/23   Time: 15:37
Sample: 2012 2021
Included observations: 10
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.384592	7.729156	0.179139	0.8629
RTGS	-0.017462	0.094672	-0.184450	0.8589
RESID(-1)	-0.494042	0.346937	-1.424011	0.1975

R-squared	0.224618	Mean dependent var	8.88E-15
Adjusted R-squared	0.003080	S.D. dependent var	1.124463
S.E. of regression	1.122730	Akaike info criterion	3.312728
Sum squared resid	8.823654	Schwarz criterion	3.403504
Log likelihood	-13.56364	Hannan-Quinn criter.	3.213148
F-statistic	1.013903	Durbin-Watson stat	1.901606
Prob(F-statistic)	0.410493		

Student's test: t-Statistic >2.306 The model is statistically acceptable

Dependent Variable: LR
Method: Least Squares
Date: 05/13/23   Time: 15:34
Sample: 2012 2021
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	54.41247	8.145435	6.680118	0.0002
RTGS	-0.380823	0.099723	-3.818806	0.0051

R-squared	0.645756	Mean dependent var	23.34000
Adjusted R-squared	0.601475	S.D. dependent var	1.889268
S.E. of regression	1.192673	Akaike info criterion	3.367127
Sum squared resid	11.37975	Schwarz criterion	3.427644
Log likelihood	-14.83564	Hannan-Quinn criter.	3.300740
F-statistic	14.58328	Durbin-Watson stat	2.658390
Prob(F-statistic)	0.005098		

Variation of variance test: using ARCH autoregressive conditional stability-of-variance test:

Heteroskedasticity Test: ARCH

F-statistic	0.379300	Prob. F(1,7)	0.5575
Obs*R-squared	0.462605	Prob. Chi-Square(1)	0.4964

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/13/23   Time: 15:38
Sample (adjusted): 2013 2021
Included observations: 9 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.279767	0.590432	2.167511	0.0669
RESID^2(-1)	-0.217514	0.353180	-0.615874	0.5575

R-squared	0.051401	Mean dependent var	1.020745
Adjusted R-squared	-0.084114	S.D. dependent var	1.193993
S.E. of regression	1.243195	Akaike info criterion	3.466377
Sum squared resid	10.81874	Schwarz criterion	3.510204
Log likelihood	-13.59869	Hannan-Quinn criter.	3.371797
F-statistic	0.379300	Durbin-Watson stat	2.248036
Prob(F-statistic)	0.557465		

We note that the statistic: **Prob.Chi-Square(1) >10%** means that:
The computed value is **Obs*R-squared < the tabular value**, and from it we accept the null hypothesis, that is, the stability of the variance of the limit of random error in the estimated model. That is to say, **the model is statistically valid**.

Fisher's test: Pro (F-statistic) < 5%. The model is statistically valid

Durbin-Watson test: The model is acceptable because:
Durbin-Watson stat €[2.36- 3.3]

Source: *Prepared by the researchers, based on the outputs of the* **E-Views 10** *program.*

5.1. Results:

From the conclusions of our standard study, we find: The positive effect of the rate of the Real Time Gross Settlement System (RTGS) on the financial performance indicators of Bahraini banks in general, as:

- The (RTGS) rate enhances the Profitability of Bahraini banks, and this is evident in the positive relationship between it and the Return on Equity (ROE) index.

- Bahraini banks' use of the Real Time Gross Settlement System (RTGS) increases lending operations, and this in turn reduces banks' Liquidity and limits investment operations in deposits. This is what our study showed, as the (RTGS) rate causes a decrease in the Legal Liquidity Ratio (LR) by 0.3808%. It is a small percentage that does not significantly affect the fixed Legal Liquidity Ratio of 54.4124%.

- Bahraini banks allocate part of the funds to face the risks of Non-performing Loans (Debts) out of the shareholder profit rate (NPLS), which is 13.0625%. But the adoption of the Real Time Gross Settlement system (RTGS) contributes to reducing this part of the provisions by 0.2256%, which raises shareholder profits by the same ratio.

- As a general result of our standard study, the use of the Real Time Gross Settlement System (RTGS) in the Bahraini banking sector falls within the framework of its activity, which is based on three main characteristics: Profitability, Liquidity, and Safety, according to the mentioned economic theories that explain banking work.

All these results support the first hypothesis of the study, as the study proved that the rate of the Real Time Gross Settlement System (RTGS) affects the financial performance indicators of Bahraini banks positively.

5.2. Economic analysis of statistically acceptable models in the study of the impact of the Real Time Gross Settlement System (RTGS):

• **The first model:**· According to the first model, the rate of the Real Time Gross Settlement System (RTGS) positively affects the ratio of the un-hedged portion of Non-performing Loans to the shareholder ratio (NPLS). If the rate of (RTGS) increases by 1%, it results in an increase in the ratio (NPLS) of 0.225. This means that each contributor bears 0.225% of the risk of Non-performing Loans (non-performing debts), but in the event that the (RTGS) rate is absent, the average ratio of (NPLS) is -13.06%, meaning that each contributor avoids bearing the risk of Non-performing Loans at a rate of 13.06%, which represents the provisions of banks to face any emergency default, and this is evident from the activity of banks in general, which depends on lending operations as a basic activity. As these operations increase, the risk of non-payment, that the shareholders bear and which the banks cannot face with their provisions, also increases. The contrary is also correct.

• **The second model:**· According to the second model, the rate of the Real Time Gross Settlement System (RTGS) has a direct positive impact on the rate of Return on Equity (ROE), as if the rate of (RTGS) increases by 1%, it results in an increase in the rate (ROE) estimated at 0.076%. The Real Time Gross Settlement System (RTGS) contributes positively to the profitability of Bahraini banks from capital, reserves and undistributed profits. This is consistent with the economic

theory and the results of previous studies, as the operations of the Real Time Gross Settlement System (RTGS) have a positive impact on enhancing the profitability of banks.

• **The third model:**· According to the third model, the rate of the Real Time Gross Settlement System (RTGS) adversely affects the Legal Liquidity Ratio (LR) by 0.38%. An increase in the rate of the Real Time Gross Settlement System (RTGS) by 1% is reflected in the Legal Liquidity Ratio (LR), with an estimated decrease of 0.38%. However, if the rate of the Real Time Gross Settlement System (RTGS) equals zero, then the average Legal Liquidity Ratio (LR) remains constant at 54.412%. This is the percentage that the local and international control and supervision authorities were keen to maintain, as it represents the ability of primary reserves and secondary reserves to fulfill the financial obligations owed by banks, in various circumstances. This is the Evidence that the statistical model proves the internationally existing economic theory.

6. CONCLUSION and Recommendations:

6.1. CONCLUSION:

Banks seek to provide distinguished services of quality commensurate with the technological requirements of their customers, which contributes to the innovation of modern banking financial techniques that help in the settlement of bank transactions in real time.

The Bahraini banking sector is one of the most prominent international and Arab experiences in the field of banking financial innovation. The Bahraini automated electronic Real Time Gross Settlement System (RTGS) is one of the innovative systems that are successful in completing various transactions, whether between customers or between banks, as it saves effort and saves time.

Through our standard study, we tried to determine the impact of the rate of the Real Time Gross Settlement System (RTGS) on the financial performance of Bahraini banks. We found the efficiency of the system (RTGS) in achieving good financial achievement by achieving the main objectives of Bahraini banks (profitability, liquidity, safety). It is fulfilled through its positive impact in enhancing Profitability (ROE) and supporting banks' security towards the risks of Non-payment (NPLS). This will often not be achieved if banks focus on preserving their Liquidity. Therefore, we found the negative effect of the (RTGS) system on the Legal Liquidity Ratio (LR), but it is a very small negative effect commensurate with requirements for the continuity of the activity of Bahraini banks.

6.2. Recommendations:

- The Real Time Gross Settlement System (RTGS) is one of the most important systems used in the Bahraini banking system, which has proven effective in achieving the sector's goals with a small percentage of Profitability, Liquidity and maintaining bank Security, but it has a positive impact on that, and this counts in favor of Bahraini banks, especially since the system helps to clear financial liabilities among financial clients in a record period.

- The Real Time Gross Settlement System (RTGS) is an experience that must be exploited to develop similar systems in other Arab countries to take advantage of its many advantages over various parties to financial transactions, especially Algeria, and why not be more innovative, developed and easy by urging qualified youth to financial innovation.

- The Real Time Gross Settlement System (RTGS) includes securities clearing, and therefore it can be considered an integrated system that works in coordination between two fields: bank cash and the financial market. This stimulates countries that are somewhat behind in the financial field to take a brave step in activating stock exchanges that are unable to keep pace with financial, monetary and economic developments.

7. Bibliographie List :

1. Journal article :

Aissa, K., Fadili , S., & Ezzedine , A. (2021, 08 06). *Evaluating the financial performance of commercial banks using financial ratios - a study of a group of Algerian commercial banks during the period 2015-2019. Journal of Economic, Management and Commercial Sciences, 14(01), 36.*

Al-Karwi, B. N. (2018, 12 20). *Assessing the profitability of banks using liquidity indicators - a comparative study between Al-Rafidain and Al-Rasheed Banks. Iraqi Journal of Administrative Sciences(24), 08.*

Amina, B. J., & Mihoub, M. (2021). *Building a structural model for evaluating financial performance in commercial banks - a study of a sample of Algerian banks for the period between 2005-2019. Journal of Research in Financial Sciences and Accounting, 06(01), 324.*

Central Bank of Saudi Arabia. (2022). *Financial Stability Report, p 26.*

Chikou, A. (2017). *Causes of Non-performing Loans and Methods of Addressing them. Journal of Law and Human Sciences - Economic Studies, 20(01), 52.*

Cook, W., Dylan, L., & Soraya, S. (2021). *Technical Handbook: A Guide to Inclusive Instant Payment Systems for Faster and Better Payments. World Bank, 11.*

Drees, R. (2013). *Electronic banking as a strategy to establish a modern banking system in Algeria. Journal of Economics, Management and Trade Sciences(27), 187.*

Fawzi, S. M., & El Tijani, E. (2015, June). *Evaluating the financial performance of commercial banks, "A case study of the National Bank of Algeria and the Algerian People's Loan" for the period 2005-2011. Shaoubi Mahmoud Fawzi, El Tijani Elham, Evaluating the financial performance of commercial banks, "A case stEconomic and administrative research(17), 33-36.*

Gharibi, A., & Renouba, A.-A. (2016). *The reform of public service through electronic management and prospects for its rationalization. Journal of Islamic Sciences and Civilization(03), 417.*

Mahmoud Ismail , M., & Mansour Hamed , M. (2021, 12). *The Impact of Economic Capital on Regulatory Capital According to Basel III Agreement on Banks' Performance and Risks. 01, p. 04.*

Maida, M. F., & Ahmed Al-Saleh, S. (2017). *Muhammad FaisaThe Role of Internal Audit in Improving Financial Performance and Maximizing the Value of Economic Institutions - Case Study of Souf Flour Corporation. Muhammad Faisal Maida, Ahmed Al-Saleh Saba', The Role of Internal Audit in Improving Financial Performance andJournal of Advanced Economic Research, Martyr Hama Lakhdar(03), 249.*

Majzoub, O. (2017). *The Algerian Banking System in the Context of Globalization. Dafater Economic Magazine(14), 81.*

Mohamed, H., & Hamo, A. (2017). *The Position of Electronic Banking in Algeria. Journal of Studies in Economics and Financial Trade(02), 306.*

Noman, M., & Siraj, M. (2019). *Evaluating the financial performance of banks - a case study of the Bank of the Arab Banking Corporation during the period 2013-2018. Mahssol Noman, Siraj Mouso, Evaluating the financial performance of banks - a case study of the Bank Namaa Journal of Economics and Trade, 03(02), 123.*

Saliha, A. S., & Zidan, M. (2021). *Evaluation of the performance of the National Bank of Algeria using the PATROL model during the period 2015-2019. North African Economics Journal, 17(25), 166,167.*

William Cook, D. L. (January 2021). *Technical Handbook: A Guide to Inclusive Instant Payment Systems for Faster and Better Payments*. World Bank, 11.

William Cook, D. L. (January 2021). *Technical Handbook: A Guide to Inclusive Instant Payment Systems for Faster and Better Payments*. World Bank, 11.

2. **Internet websites:**

Central Bank of Bahrain. (s.d.). *Payment and Settlement Systems*, 20:10: heur. Consulté le 02 09, 2023, sur https://www.cbb.gov.bh/ar/payment-settlement/.

6. Appendices:

➢ **The first model:** $NPLS = -13.0625 + 0.2256\,RTGS$

Dependent Variable: NPLS
Method: Least Squares
Date: 05/13/23   Time: 14:32
Sample: 2012 2021
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-13.06256	4.556476	-2.866812	0.0209
RTGS	0.225663	0.055784	4.045303	0.0037

R-squared	0.671653	Mean dependent var	5.350000
Adjusted R-squared	0.630610	S.D. dependent var	1.097725
S.E. of regression	0.667170	Akaike info criterion	2.205311
Sum squared resid	3.560921	Schwarz criterion	2.265828
Log likelihood	-9.026557	Hannan-Quinn criter.	2.138924
F-statistic	16.36448	Durbin-Watson stat	1.488549
Prob(F-statistic)	0.003708		

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.057160	Prob. F(1,7)	0.8179
Obs*R-squared	0.080996	Prob. Chi-Square(1)	0.7760

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/13/23   Time: 14:35
Sample: 2012 2021
Included observations: 10
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.094244	4.867300	-0.019363	0.9851
RTGS	0.001034	0.059551	0.017356	0.9866
RESID(-1)	0.105722	0.442201	0.239081	0.8179

R-squared	0.008100	Mean dependent var	-1.02E-15
Adjusted R-squared	-0.275301	S.D. dependent var	0.629013
S.E. of regression	0.710340	Akaike info criterion	2.397179
Sum squared resid	3.532080	Schwarz criterion	2.487954
Log likelihood	-8.985894	Hannan-Quinn criter.	2.297598
F-statistic	0.028580	Durbin-Watson stat	1.599381
Prob(F-statistic)	0.971937		

Heteroskedasticity Test: ARCH

F-statistic	0.045881	Prob. F(1,7)	0.8365
Obs*R-squared	0.058605	Prob. Chi-Square(1)	0.8087

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/13/23   Time: 14:36
Sample (adjusted): 2013 2021
Included observations: 9 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.321757	0.181642	1.771383	0.1198
RESID^2(-1)	0.100079	0.467229	0.214198	0.8365

R-squared	0.006512	Mean dependent var	0.351581
Adjusted R-squared	-0.135415	S.D. dependent var	0.328424
S.E. of regression	0.349955	Akaike info criterion	0.931103
Sum squared resid	0.857277	Schwarz criterion	0.974931
Log likelihood	-2.189965	Hannan-Quinn criter.	0.836523
F-statistic	0.045881	Durbin-Watson stat	1.390071
Prob(F-statistic)	0.836499		

➢ **The second model:** $ROE = 0.0764.RTGS$

Dependent Variable: ROE
Method: Least Squares
Date: 05/13/23   Time: 09:07
Sample: 2012 2021
Included observations: 10

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RTGS	0.076452	0.006643	11.50839	0.0000

R-squared	-0.026086	Mean dependent var	6.250000
Adjusted R-squared	-0.026086	S.D. dependent var	1.693943
S.E. of regression	1.715895	Akaike info criterion	4.012386
Sum squared resid	26.49866	Schwarz criterion	4.042645
Log likelihood	-19.06193	Hannan-Quinn criter.	3.979193
Durbin-Watson stat	2.716244		

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.968438	Prob. F(1,8)	0.1232
Obs*R-squared	2.706345	Prob. Chi-Square(1)	0.0999

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/13/23   Time: 09:18
Sample: 2012 2021
Included observations: 10
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RTGS	-0.001264	0.006062	-0.208514	0.8400
RESID(-1)	-0.567402	0.329327	-1.722916	0.1232

R-squared	0.270594	Mean dependent var	0.012089
Adjusted R-squared	0.179419	S.D. dependent var	1.715848
S.E. of regression	1.554317	Akaike info criterion	3.896806
Sum squared resid	19.32721	Schwarz criterion	3.957323
Log likelihood	-17.48403	Hannan-Quinn criter.	3.830419
Durbin-Watson stat	2.070964		

Heteroskedasticity Test: ARCH

F-statistic	0.432114	Prob. F(1,7)	0.5320
Obs*R-squared	0.523273	Prob. Chi-Square(1)	0.4694

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/13/23   Time: 09:30
Sample (adjusted): 2013 2021
Included observations: 9 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.065081	1.447923	1.426237	0.1968
RESID^2(-1)	0.243578	0.370544	0.657354	0.5320

R-squared	0.058141	Mean dependent var	2.676909
Adjusted R-squared	-0.076410	S.D. dependent var	3.207154
S.E. of regression	3.327428	Akaike info criterion	5.435406
Sum squared resid	77.50243	Schwarz criterion	5.479234
Log likelihood	-22.45933	Hannan-Quinn criter.	5.340826
F-statistic	0.432114	Durbin-Watson stat	1.909139
Prob(F-statistic)	0.531965		

➢ **The third model:** $LR = 54.4124 - 0.3808\ RTGS$

Dependent Variable: LR				
Method: Least Squares				
Date: 05/13/23 Time: 15:34				
Sample: 2012 2021				
Included observations: 10				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	54.41247	8.145435	6.680118	0.0002
RTGS	-0.380823	0.099723	-3.818806	0.0051
R-squared	0.645756	Mean dependent var		23.34000
Adjusted R-squared	0.601475	S.D. dependent var		1.889268
S.E. of regression	1.192673	Akaike info criterion		3.367127
Sum squared resid	11.37975	Schwarz criterion		3.427644
Log likelihood	-14.83564	Hannan-Quinn criter.		3.300740
F-statistic	14.58328	Durbin-Watson stat		2.658390
Prob(F-statistic)	0.005098			

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.027806	Prob. F(1,7)	0.1975
Obs*R-squared	2.246178	Prob. Chi-Square(1)	0.1339

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 05/13/23 Time: 15:37
Sample: 2012 2021
Included observations: 10
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.384592	7.729156	0.179139	0.8629
RTGS	-0.017462	0.094672	-0.184450	0.8589
RESID(-1)	-0.494042	0.346937	-1.424011	0.1975
R-squared	0.224618	Mean dependent var		8.88E-15
Adjusted R-squared	0.003080	S.D. dependent var		1.124463
S.E. of regression	1.122730	Akaike info criterion		3.312728
Sum squared resid	8.823654	Schwarz criterion		3.403504
Log likelihood	-13.56364	Hannan-Quinn criter.		3.213148
F-statistic	1.013903	Durbin-Watson stat		1.901606
Prob(F-statistic)	0.410493			

Heteroskedasticity Test: ARCH

F-statistic	0.379300	Prob. F(1,7)	0.5575
Obs*R-squared	0.462605	Prob. Chi-Square(1)	0.4964

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 05/13/23 Time: 15:38
Sample (adjusted): 2013 2021
Included observations: 9 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.279767	0.590432	2.167511	0.0669
RESID^2(-1)	-0.217514	0.353180	-0.615874	0.5575
R-squared	0.051401	Mean dependent var		1.020745
Adjusted R-squared	-0.084114	S.D. dependent var		1.193993
S.E. of regression	1.243195	Akaike info criterion		3.510204
Sum squared resid	10.81874	Schwarz criterion		3.466377
Log likelihood	-13.59869	Hannan-Quinn criter.		3.371797
F-statistic	0.379300	Durbin-Watson stat		2.248036
Prob(F-statistic)	0.557465			

7. Citations[1]:

---

[1]- Should be at the end of the document (Endnotes)