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Research Article

Determining the relationship between financial inclusion and financial stability: An application for Iraq[1]

Finansal içerme ile finansal istikrar arasındaki ilişkinin belirlenmesi: Irak için bir uygulama

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Abstract

This study aims to determine the relationship between financial inclusion and financial stability in Iraq by applying the ARDL bounds test. The dependent variable of the study is the financial stability index (FIE), and the independent variables are the number of ATMs (ATM), banking diffusion (BYA), banking density (BYO), credit depth (KD) and deposit depth (MD). However, since there is a high correlation between BYA and BYO, two different models were established in the study. According to the analysis results of both models, a negative relationship was found between FIE and ATM in the short and long run. Again, as a result of the analysis of both models, it was determined that there is a negative relationship between FIE and KD in the short run. On the other hand, in the first model, it is understood that there is a long-run positive relationship between FIE and KD. Finally, in the second model, it was observed that there was a long-run positive relationship between FIE and MD.

Keywords: Financial Inclusion, Financial Stability, ARDL Bounds Test

Jel Codes: C22, G20, G21

Öz

Bu çalışmanın amacı finansal içerme ile finansal istikrar arasındaki ilişkinin ARDL sınır testi uygulanarak Irak özelinde tespit edilmesidir. Çalışmanın bağımlı değişkeni finansal istikrar endeksi (FIE) ve bağımsız değişkenleri ise ATM sayısı (ATM), bankacılık yayılımı (BYA), bankacılık yoğunluğu (BYO), kredi derinliği (KD) ve mevduat derinliği (MD)'dir. Ancak BYA ile BYO arasında yüksek korelasyon olduğundan çalışmada iki ayrı model kurulmuştur. Her iki modelin analiz sonucuna göre FIE ile ATM arasında kısa ve uzun dönemde negatif ilişki bulunmuştur. Yine her iki modelin analiz sonucunda FIE ile KD arasında kısa dönemde negatif yönlü ilişki olduğu tespit edilmiştir. Öte yandan birinci modelde FIE ile KD arasında uzun dönemde pozitif yönlü ilişki olduğu anlaşılmıştır. Son olarak ikinci modelde ise FIE ile MD arasında uzun dönemde pozitif yönlü ilişki olduğu görülmüştür.

Anahtar Kelimeler: Finansal İçerme, Finansal İstikrar, ARDL Sınır Testi

JEL Kodları: C22, G20, G21

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Introduction

Financial inclusion is defined as the process of providing the products and services they need to all segments of society, especially the disadvantaged and low-income segments, at acceptable costs, transparently and fairly (Rangarajan Committee, 2008, p.1); the fact that the population without access to banks has the opportunity to access many financial services such as savings, payments, money transfers, loans and insurance, and to be included in the financial system (Hannig and Jansen, 2010, p.1); having a bank account but using this account regularly and people benefiting (Demirgüç-Kunt, Klapper, Singer & Van Oudheusden, 2015, p.2). The low level of financial inclusion is related to the exclusion of the segment in society who are disadvantaged in terms of income and disability from the financial system. Financial Inclusion is an intervention tactic that aims to overcome the market friction that hinders the markets from operating in favour of people with limited income and fundamental social rights. Based on these definitions, it can be stated that researchers focus on the possibility of accessing financial products and services for financial inclusion. In addition, the definitions emphasize that financial consumers should not experience difficulties in terms of time, distance and cost in the access process, and disadvantaged groups such as the poor, the elderly and the disabled are prioritized among all individuals the society.

Financial inclusion is a topical issue of high importance for the welfare of financial consumers and the entire financial system and economy, which is at the centre of policymakers, financial institutions, and scientists. In that, when financial consumers can reach official financial institutions easily, quickly, and at low costs, they can benefit from the products and services of these institutions that provide income. In addition, financial consumers gain ease of payment and flexibility in spending, thanks to products such as credit cards, debit cards, virtual cards, and digital banking services. On the other hand, financial inclusion will provide individuals with many opportunities to safely perform financial services such as custody, escrow and transfer, plan for family members' future, and eliminate future anxiety, thus increasing individual welfare. Of course, this increase in the individual welfare of financial consumers will also establish social welfare. Essentially, the personal benefits of financial inclusion will also increase the efficiency, depth and development of the financial system. The reason for this is the increase in the participation rate in the financial system or, from another point of view, the expansion of the inclusiveness of the financial system. Thus, the stability of the banking sector and the financial system will be supported, as banks can be more flexible when placing the deposits, they collect into loans (Neaime and Gaysset, 2018, p.236). The presence of economic units in the financial system reduces banks' marginal cost, makes them stronger in pricing, and supports their stability. In addition, financial inclusion promotes stabilized socio-political environments. Therefore, their stability increases due to the efficient operation of banks in countries with an inclusive financial sector and high institutional quality (Ahamed and Mallick, 2019, p.35). Considering the banking intermediation function and market share in the financial system, it is strongly predicated that the improvement in the stability indicators of the banking sector reflects upon the entire financial sector. However, to make a definite judgment, theoretical explanations should be handled empirically and evaluated in light of the findings obtained from data analysis. Accordingly, the study aims to determine the relationship between financial inclusion and financial stability in Iraq.

Literature review

Many studies in the literature have examined financial inclusion from different perspectives. Despite this, it has continued to be an up-to-date topic whose importance is increasing with each passing period. However, especially in recent years, the relationship between financial inclusion and financial stability has started to take its place among the topics examined, with empirical studies explicitly conducted on countries or a few selected countries. However, it is still so few that it can be called limited. Some of these studies on financial inclusion and stability are summarized below. (Table 1).

Table 1: Literature Review

Author	Dataset	Method	Conclusion
Morgan and Pontines (2014)	• Financial inclusion indicators • Bank non-performing loans • Some financial stability indicators such as the bank Z-score	Dynamic Panel Data Analysis	In the study, it has been determined that the increasing share of loans given to small and medium-sized enterprises (SMEs) mainly reduces the probability of non-performing loans and the default of financial institutions and helps financial stability.
Amatus and Alireza (2015)	• Bank Z-score • outstanding deposits • outstanding loan • GDP per capita • Inflation domestic credit provided to the private sector by banks • Financial crisis	Generalized Moments Method	In the study, it has been revealed that deposits in commercial banks hurt financial stability, and unpaid loans from commercial banks positively affect financial stability. On the other hand, while the increase in GDP per capita supports financial stability, inflation, loans to the private sector and the financial crisis affect financial stability negatively.
Iqbal and Sami (2017)	• Number of bank branches in the country • ATM growth rate • Credit deposit rate • GDP	Multiple Regression	The study determined that the increase in the number of branches and the loan deposit ratio contributed positively to economic growth.
Neaime and Gaysset (2018)	• Number of ATMs and banks per 100 thousand adults, • Female workforce ratio, • Inflation • Trade openness • GDP per capita growth • The growth rate of poverty, • Gross enrollment ratio • The ratio of working age population to dependent population	Generalized Moments Method Generalized Least Squares	Findings showed that financial inclusion decreases income inequality but does not affect poverty.
Siddik and Kabiraj (2018)	• Bank Z-score • The ratio of the number of SME borrowers to total borrowers • Outstanding SME loans to total loans • GDP per capita • Liquidity position • The proportion of domestic credit to GDP • Size of the financial sector • Real interest rate	Generalized Moments Method	According to the analysis results, there is a positive relationship between financial stability and financial inclusion variables measured using the ratio of SME debtors to total debtors and the ratio of unpaid SME loans to total loans. In addition, as a result of the analysis, the ratio of GDP per capita, liquidity, and private loans to GDP is positive with financial stability; It has been determined that domestic loans provided to the private sector and financial crises are negatively related to financial stability.
Al-Humairi , DubaiAbdulmahdiAl-Jubouri and Mahmood (2020)	• The data used in the study examines the effect of financial inclusion on increasing financial stability for the period of 2004-2018 in Iraq; • Financial inclusion indicators • Banking sector, macroeconomic and capital market indicators representing financial stability	Ridge, LASSO and Elastic net regularization method	Increasing financial inclusion supports financial stability, financial security and consumer protection. The lack of depth in the banking sector due to the disproportionateness of the services provided to various segments of society and the service provision gap negatively affects banks' financial intermediation role.
Pham and Doan (2020)	• Access to and use of financial services for financial inclusion; • Bank Z score represents financial stability	Generalized Least Squares Method	Empirical findings show that financial inclusion has a weak positive effect on financial stability.
Feghali, Mora and Nassif (2021)	• Financial inclusion indicators • Bank Z score • Bank profitability • The ratio of non-performing loans to gross loans	Panel Data Analysis	In the study, it was concluded that access to credit negatively affects bank soundness. In addition, according to the findings, a more competitive structure increases the negative impact of credit access on stability.

	• The ratio of regulatory capital to risk-weighted assets • Some variables, such as the ratio of liquid assets to deposits and short-term funding		
Barik and Pradhan (2021)	• Bank Z score • Number of ATMs and branches per 1000 km², • Number of ATMs and branches per 100 thousand adults • The ratio of outstanding loans and deposits to GDP	Generalized Moments Method	The empirical findings of this study show that financial inclusion has a negative and significant effect on financial stability.
Saha and Dutta (2021)	• Financial inclusion • Competition • Concentration data	Generalized Moments Method Two Stage Least Square Method	As a result of the analysis, it was stated that there is a U-shaped curvature between financial inclusion and financial stability, and the concentration in the banking sector contributed to the fragility.
Vo, Nguyen and Van (2021)	• Bank Z score • Non-performing loan to gross loan ratio • Provision for non-performing loans • Inflation volatility • Production increase • Consumer price index • Producer price index	Generalized Moments Method	The findings showed that the increase in financial inclusion contributed positively and significantly to the stability of the banking sector, which increased banks' flexibility.
Malik, bin Md Isa, bin Jais, Rehman and Khan (2022)	• Bank Z-score • Bank credit to bank deposit • Liquid assets to deposits and short-term funding • Number of commercial bank branches per 100,000 adults • Number of ATMs per 100,000 adults • Institutions of Commercial Banks • Outstanding deposits with commercial banks (% of GDP) • Outstanding loans from commercial banks (% of GDP)	Generalized Moments Method	According to the study conducted specifically for Asian countries, the effect of financial inclusion on financial stability is positive.

As a result of the literature review, it has been understood that conducting research on Iraq, which has been in many wars and conflicts resulting in the loss of trust and the stability of the economy, financial system, and social welfare, would make significant contributions to the literature. For this reason, this study aims to analyse the impact of Iraq's financial inclusion indicators from 2004-2020 on financial stability. This study differs from other studies conducted for similar purposes in terms of method, period and country. Also, this study is different in terms of period and method from the study carried out for a similar purpose in Iraq.

The findings to be obtained as a result of the analysis will consist of up-to-date and objective information that can guide the actions of policymakers and authorities in the banking sector, insurance sector and capital markets on financial inclusion and financial stability. In addition, it is hoped that this study will provide a new perspective and knowledge to all researchers and readers interested in the subject.

Dataset and methodology

In this study, which examines the cointegration relationship between financial inclusion and financial stability in Iraq with the ARDL bounds test approach, the variables representing financial inclusion are; Number of ATMs, banking density, banking spread, credit depth and deposit depth. The data of these variables for the period 2004-2020 (annual) were compiled from the Financial Stability Reports of the Central Bank of Iraq. Variables representing financial stability are gathered under three leading indicators (macroeconomic, banking sector and capital markets). Accordingly, GDP growth, core

inflation and current account balance in macroeconomic indicators; capital adequacy, asset quality, profitability and liquidity in banking sector indicators; market value and circulation volume variables are used in capital market indicators. Macroeconomic indicators were collected from the Central Bank of Iraq Annual Reports and Statistical Bulletin. Banking sector indicators are taken from the Central Bank of Iraq Financial Stability Report. Iraq Stock Exchange Reports are used for capital market indicators. However, the market value data of the capital market indicators for the years 2004 and 2005 were obtained from El-Obaidi (2021), and the circulation volume was obtained from Hamza and Abdulhamid (2012). Iraq's financial stability index (FIE) was calculated with these variables representing financial stability.

While creating the data set of the study, it was restructured by taking the variables used in Al-Humairi et al. (2020)'s study, which examined the effect of financial inclusion on increasing financial stability, as a reference. Since secondary data were used in the study and there was no particular situation requiring ethical permission, no application was made to the ethics committee, and the relevant data were used within the ethical framework by referring. The variables used in the study are listed in the table below with their symbols and explanations (Table 2).

Table 2: Variables Used in the Study

	Variables	Symbol	Description	Source
Independent	Financial Inclusion Variables	ATM	Number of ATMs	Central Bank of Iraq
		BYA	Banking Diffusion	
		BYO	Banking Density	
		KD	Credit Depth	
		MD	Deposit Depth	
Dependent	Financial Stability Index	FIE	FIE is calculated by the author using macroeconomic, banking sector and capital markets indicators.	Central Bank of Iraq Iraq Stock Exchange El-Obaidi (2021) Hamza and Abdulhamid (2012)

The study determined the relationship between financial inclusion and financial stability using the ARDL bounds test in the Eviews 10 program. However, for the ARDL test to be applied, the variables must be stationary at the level or the first difference. For this reason, PP (Phillips-Perron) and Augmented Dickey-Fuller (ADF) unit root tests were tested using Akaike Information Criteria (AIC). After these tests, the ARDL bounds test was applied. At this stage, the correlation between the independent variables was tested first. The analysis was made for two different models since there was a high correlation ($r>0.90$) between BYA and BYO. In the first model, the dependent variable is FIE, and the independent variables are ATM, BYA, KD and MD. In the second model, the dependent variable is FIE, and the independent variables are ATM, BYO, KD and MD. Appropriate lag lengths of the variables were determined, and AIC selected the appropriate ARDL model. Then, whether there is a cointegration relationship between the dependent variable FIE and the independent variables was determined by the F-bounds test. After determining the cointegration relationship, the long-run relationship coefficients were estimated. Next, the assumptions of autocorrelation, heteroscedasticity, normality and stability (structural breaks) were tested and whether there were any errors in the modelling process. Finally, the short-run correlation coefficients were estimated by calculating the error correction coefficient of the model.

Findings

The findings obtained in the study that investigated the relationship between financial inclusion and financial stability in Iraq are shared under this title.

Findings related to PP and ADF unit root test

Before the ARDL bounds test, whether the variables are stationary or not, and if they are stationary, to what level they are stationary was determined by PP and ADF unit root tests. The hypotheses of the unit root test are as follows:

H0: $\delta = 0$ There is a unit root; the series is not stationary.

H1: $\delta < 0$ There is no unit root; the series is stationary.

According to the PP unit root test result of the FIE dependent variable, when the first difference is taken, it was found to be stationary at the 1% significance level in the constant model and the 5% significance

level in the constant and trend model. Again, looking at the ADF unit root test result of the dependent variable of FIE, it was determined that it became stationary at the 1% significance level when it took the first difference in the constant model.

When the PP and ADF unit root test results for the ATM independent variable are examined together, it is determined that both are not stationary at the level. Still, when the first difference is taken, it is stationary in both the constant model and the constant and trend model at the 1% significance level.

According to the PP and ADF unit root test results for the BYA independent variable, the variable is not stationary at the level. However, it was determined that the variable in question became stationary when it took the first difference in the constant model at the 10% significance level.

When the PP and ADF unit root test results for the BYO independent variable are examined, it is seen that the variable is not stationary at the level in both tests. However, when the first difference of the variable was taken, it was determined that it was stationary at the 5% significance level in the constant model and 10% in the constant and trend model in both tests.

According to the PP unit root test result for the KD independent variable, it is not stationary at the level and the first difference. However, according to the ADF unit root test, it was determined that the level was stationary in the constant and trended model at the 5% significance level. On the other hand, when the first difference of the variable was taken, it was determined that it became stationary at the 1% level of significance in the constant model and 10% in the model with constant and trend.

Finally, according to the PP unit root test, the MD independent variable was not stationary at the level, so the first difference of the said variable was taken, and it was determined that it became stationary at the 10% significance level in the constant model. On the other hand, when the ADF unit root test is examined, it is seen that the variable is not stationary at the level and the first difference.

Decision: PP and ADF, which are frequently used unit root tests within the scope of the study, were applied, and the null hypothesis was not rejected, and it was accepted that the variables were stationary at the level or the first difference, that is, there was no unit root in the variables. According to the ARDL method, all variables are suitable for entering the model, as there is no need for all studied variables to be stationary at the same level.

Table 3: PP Unit Root Test Result of Variables

PP Unit Root Test	At Level		At First Difference	
Variables	**Constant**	**Constant Trend**	**Constant**	**Constant Trend**
FIE	-1.7648	-1.7840	-4.4099***	-4.5243**
	(0.3827)	(0.6644)	(0.0044)	(0.0141)
ATM	1.7137	-1.7302	-4.5683***	-5.5702***
	(0.9990)	(0.6896)	(0.0033)	(0.0025)
BYA	-1.5126	-1.2526	-2.8676*	-2.9443
	(0.5017)	(0.8621)	(0.0727)	(0.1776)
BYO	-1.5241	-1.4028	-3.4278**	-3.4377*
	(0.4962)	(0.8192)	(0.0267)	(0.0839)
KD	1.4428	-1.7022	0.7705	-0.4486
	(0.9981)	(0.7024)	(0.9894)	(0.9734)
MD	1.3358	-1.8079	-2.8253*	-2.8961
	(0.9974)	(0.6530)	(0.0782)	(0.1904)

Note: (*) 10%; (**) 5%; (***) 1%; at the level of significance.

Table 4: ADF Unit Root Test Result of Variables

ADF Unit Root Test	At Level		At First Difference	
Variables	Constant	Constant Trend	Constant	Constant Trend
FIE	-2.4270	-1.4362	-4.4132***	-1.2316
	(0.1524)	(0.8018)	(0.0043)	(0.8615)
ATM	1.3939	-1.7302	-4.5683***	-5.2427***
	(0.9977)	(0.6896)	(0.0033)	(0.0043)
BYA	-1.8191	-1.0918	-2.8676*	-2.9550
	(0.3577)	(0.8981)	(0.0727)	(0.1749)
BYO	-1.5241	-1.3055	-3.4278**	-3.4550*
	(0.4962)	(0.8482)	(0.0267)	(0.0817)
KD	0.4136	-4.4949**	-4.3258***	-3.3818*
	(0.9748)	(0.0163)	(0.0072)	(0.0972)
MD	0.2310	-2.5393	-2.4511	-3.0822
	(0.9657)	(0.3077)	(0.1481)	(0.1450)

Note: (*) 10%; (**) 5%; (***) 1%; at the level of significance.

Findings related to ARDL bounds test

The findings obtained from the analysis made with the ARDL bounds test approach are given under this title.

ARDL bounds test findings for the first model

Using these variables, first of all, the optimal lag lengths of the variables were determined, and AIC selected the appropriate ARDL model. The model's maximum lag length is 1, and the trend specification is constant. Accordingly, the most appropriate model was ARDL (1,1,1,0,1). The optimal lag length for the first model is given in Figure 1.

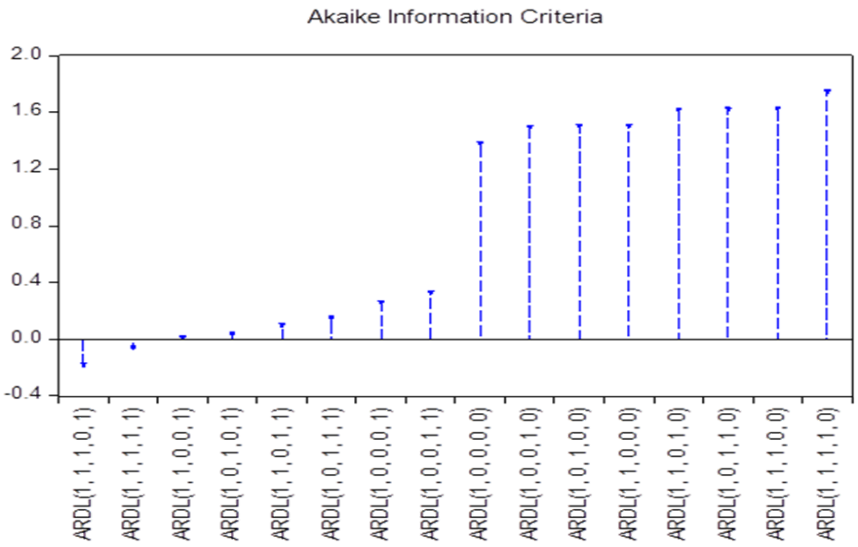

Figure 1: First Model Optimal Lag Length

F bounds test and determination of cointegration relationship

After choosing the optimal lag length and the appropriate ARDL model, the F-bounds test was performed to determine the cointegration relationship for the first model. The used hypotheses are listed below.

H_0: $\beta 1 = \beta 2 = \beta 3 = \beta 4 = \beta k+1 = 0$ (There is no cointegration)

H_1: $\beta 1 \neq \beta 2 \neq \beta 3 \neq \beta 4 \neq \beta k+1 \neq 0$ (There is cointegration)

If the F statistic is lower than the lower bound critical value, I(0), the null hypothesis is not rejected, and it is decided that there is no cointegration. However, if the F statistic is higher than the upper bound critical value, I(1), the null hypothesis is rejected, and cointegration is accepted. It should also be noted that if the calculated F statistic stays at a point between I(0) and I(1), a definite opinion about the existence of cointegration cannot be declared. For example, as seen in Table 5, the calculated F statistic

is 14.40442. Since this calculated value exceeds the upper bound critical value, I(1), at all significance levels, concluded that there is a cointegration relationship between the variables.

Table 5: F Limit Test Result and Critical Values

ARDL (1,1,1,0,1)		Critical Values at 1% Significance		Critical Values at 5% Significance		Critical Values at 10% Significance	
F statistic	**K**	**I(0)**	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
14.40442	4	4.768	6.67	3.354	4.774	2.752	3.994

Estimating the long-run coefficients of the ARDL (1,1,1,0,1) model

After determining the existence of a cointegration relationship with the F-bounds test, long-run coefficients were estimated for the ARDL (1,1,1,0,1) model using a maximum delay of 1 and AIC.

Table 6: Estimation Results of Long-run Coefficients for The ARDL (1,1,1,0,1) Model

Dependent Variable: FIE			
Variables	**Coefficients**	**t Statistics**	**P Value**
ATM	-0.000935	-2.615271	0.0346**
BYA	-0.297394	-1.877598	0.1025
MD	-0.041777	-0.899771	0.3981
KD	0.275554	6.572033	0.0003***

Note: (**) 5%; (***) 1%; at the level of significance.

Considering the long-run coefficients estimation results in Table 6, the number of ATMs variable is statistically significant at the 5% significance level. In addition, the effect of the number of ATMs on the financial stability index, which is the dependent variable, is harmful. This result shows that an increase of 100.000 in the number of ATMs causes a 93-point decrease in the financial stability index in the long run.

The credit depth variable is statistically significant at the 1% significance level and positively affects the financial stability index. Accordingly, a 1-point increase in credit depth causes an increase of 0.27 points on the financial stability index in the long run.

Testing the model's assumptions

The model assumes no autocorrelation problem; the series is normally distributed, heteroscedasticity, specification error and structural breaks are absent. Accordingly, the Breusch-Godfrey autocorrelation LM test was used to check whether there was an autocorrelation problem between the series in the established model. It was determined that there was no autocorrelation problem between the series (0.0122>0.01). The normality test of the series was done with the Jarque-Bera test and observed that the series were usually distributed (0.627591>0.01). Whether there is heteroscedasticity in the model was checked with the Breush-Pagan-Godfrey Test. Accordingly, the probability values greater than 0.01 indicate no heteroscedasticity in the model. That is, the model has a constant variance. Finally, whether there was any specification error in the establishment of the model was tested with the Ramsey Reset Test, and it was accepted that there was no specification error in the model since the probability value of the F statistic was greater than 0.01 (Table 7).

Table 7: Autocorrelation, Normal Distribution, Heteroscedasticity, Model Specification Result

Breusch-Godfrey Autocorrelation LM Test			
F Statistics Value	3.884785	**Chi² Probability Value**	0.0122
R² Observation Value	6.288104		
Jarque-Bera Normality Test			
Jarque-Bera	0.931732	**p Value**	0.627591
Heteroskedasticity Test: Breush-Pagan-Godfrey Test			
F Statistics Value		**R² Observation Value**	
Calculated	**Probability**	**Calculated**	**Probability**
1.017820	0.4973	8.603627	0.3768
Ramsey Reset Test F Statistics			
F Statistics Value		**t Statistics Value**	
Calculated	**Probability**	**Calculated**	**Probability**
0.174245	0.6909	0.417427	0.6909

Finally, the stability of the parameters estimated from the CUSUM and CUSUM-Q graphs was checked. The parameters estimated according to Figure 2 and Figure 3 are stable at the 5% significance level. In other words, there are no structural breaks.

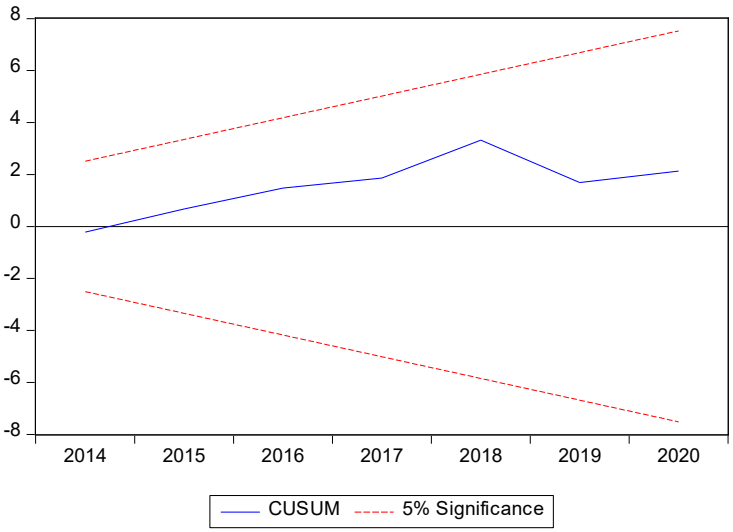

Figure 2: CUSUM Test Result

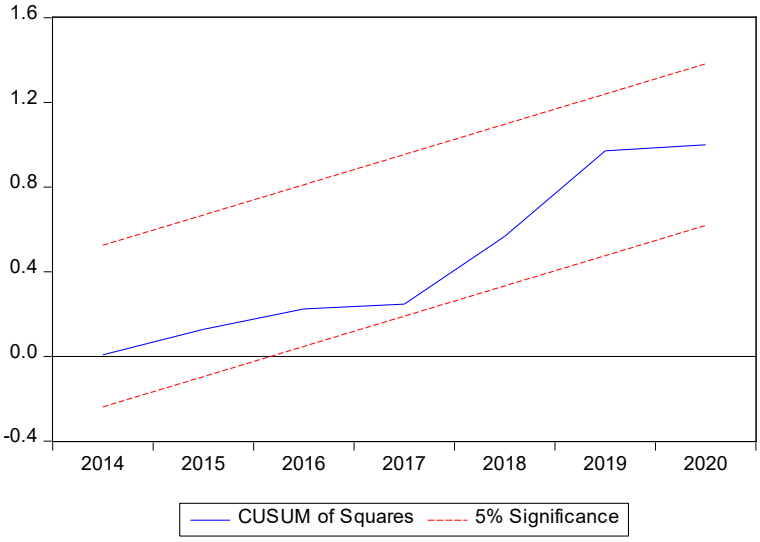

Figure 3: CUSUM-Q Test Result

Estimating short-run coefficients for the ARDL (1,1,1,0,1) model

The short-run coefficients of the model were estimated after the results were obtained by checking the validity of the assumptions. Accordingly, the error correction coefficient, CointEg (-1), was calculated as -1.668111 (Table 8). In addition, the error correction coefficient, which is statistically significant and negative, shows the suitability of the analysis.

The error correction coefficient is more significant than one indicating that the error correction process fluctuates around the long-run value in the form of damping instead of approaching the equilibrium path monotonously. However, at the end of the process, the convergence towards the equilibrium path accelerates (Narayan and Smyth, 2006, p.339). Accordingly, the financial stability index fluctuates around its long-run value in the form of a damping-off. However, its convergence to the equilibrium path accelerates when the process is completed. As a result, the return time is 0.59 years from the formula 1/|-1.668111|. In this case, the financial stability index comes to its long-run equilibrium during the year.

Table 8: Estimation Results of Short-run Coefficients for The ARDL (1,1,1,0,1) Model

Variables	Coefficient	Standard Deviation	t-Statistics	Probability
C	-0.629992	0.075413	-8.353880	0.0001
D(ATM)	-0.000737	0.000310	-2.372605	0.0494**
D(BYA)	0.044998	0.170070	0.264582	0.7990
D(KD)	-0.079361	0.034549	-2.297044	0.0552*
CointEq (-1)	-1.668111	0.156800	-10.63849	0.0000

Note: (**) 5%; (***) 1%; at the level of significance.

According to the short-run coefficients, the number of ATMs is significant at the 5% significance level. An increase of 100.000 in the number of ATMs causes a 73-point decrease in the financial stability index in the short run. A 10-point increase in credit depth leads to a 0.79-point decrease in the financial stability index in the short run.

According to the ARDL bounds test results, there is a cointegration relationship between the number of ATMs, credit depth and financial stability index in the short and long run. This relationship is negative for both independent variables in the short run. However, in the long run, the relationship between the number of ATMs and the financial stability index is negative, and the relationship between credit depth and financial stability is positive.

ARDL bounds test findings for the second model

In the next part of the study, the dependent variable is FIE, and the independent variables are ATM, BYO, MD, KD. The optimal lag length of the variables was determined according to the AIC, and the most suitable model was selected for the analysis.

The model's maximum lag length is 1, and the trend specification is constant. Accordingly, the most appropriate model was found to be ARDL (1,1,1,1,0). The optimal lag length for the second model is given in Figure 4.

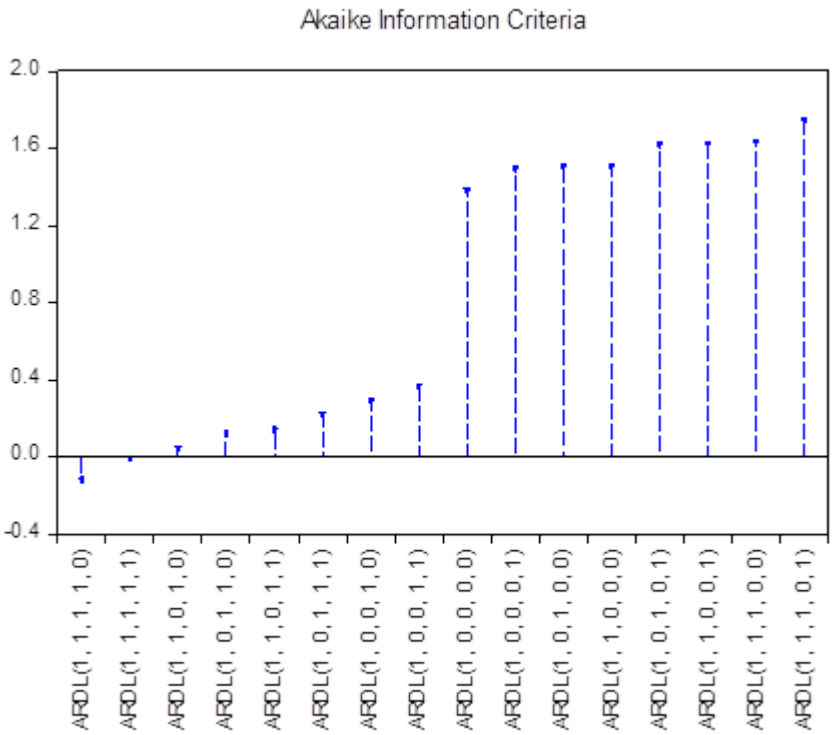

Figure 4: Second Model Optimal Lag Length

F bounds test and determination of cointegration relationship

At this stage, the F-bounds test was conducted to determine the cointegration relationship regarding the second model. In other words, to test the null hypothesis (H0), which states that all parameters of the variables are equal to zero, it is determined whether there is a cointegration by calculating the F statistic. The used hypotheses are listed below.

H_0: $\beta1 = \beta2 = \beta3 = \beta4 = \beta k+1 = 0$ (There is no cointegration)

H_1: $\beta1 \neq \beta2 \neq \beta3 \neq \beta4 \neq \beta k+1 \neq 0$ (There is cointegration)

As seen in Table 9, the calculated F statistic was found to be 13.51280. Since this calculated value exceeds the upper bound critical value, I(1), at all significance levels, concluded that there is a cointegration relationship between the variables.

Table 9: F Bounds Test Result and Critical Values

ARDL (1,1,1,1,0)		Critical Values at 1% Significance		Critical Values at 5% Significance		Critical Values at 10% Significance	
F Statistic	**K**	**I(0)**	**I(1)**	**I(0)**	**I(1)**	**I(0)**	**I(1)**
13.51280	4	4.768	6.67	3.354	4.774	2.752	3.994

Estimating long-run coefficients for the ARDL (1,1,1,1,0) model

After determining the existence of a cointegration relationship with the F bounds test, long-run coefficients were estimated for the ARDL (1,1,1,1,0) model using a maximum delay of 1 and AIC.

Table 10: Estimation Results of Long-run Coefficients for The ARDL (1,1,1,1,0) Model

Dependent Variable: FIE			
Variables	**Coefficients**	**t Statistics**	**P Value**
ATM	-0.000905	-2.374982	0.0492**
BY0	0.016970	1.768216	0.1203
MD	0.280574	6.258927	0.0004***
KD	-0.047083	-0.891109	0.4025

Note: (**) 5%; (***) 1%; at the level of significance.

According to the long-run coefficient estimation results in Table 10, the number of ATMs variable is statistically significant at the 5% significance level. In addition, the effect of the number of ATMs on the financial stability index, which is the dependent variable, is negative. This result shows that an increase of 100,000 in the number of ATMs causes a 90-point decrease in the financial stability index in the long run. On the other hand, the deposit depth variable is statistically significant at the 1% significance level and positively affects the financial stability index. Accordingly, a 1-point increase in deposit depth causes an increase of 0.28 points on the financial stability index in the long run.

Testing the model's assumptions

The model assumes no autocorrelation problem. The series is normally distributed; heteroscedasticity, specification error and structural breaks are absent. Accordingly, the Breusch-Godfrey autocorrelation LM test was used to check whether there was an autocorrelation problem between the series in the established model, and it was determined that there was no autocorrelation problem between the series (0.0230>0,01). In addition, the normality test of the series was performed using the Jarque-Bera test, and it was seen that the series were normally distributed. (0.681158>0.01). Whether there is heteroscedasticity in the model was checked with the Breush-Pagan-Godfrey Test. Accordingly, the probability values greater than 0.01 indicate no heteroscedasticity in the model. That is, the model has a constant variance. Whether there was any specification error in the establishment of the model was tested with the Ramsey Reset Test, and it was accepted that there was no specification error in the model since the probability value of the F statistic was greater than 0.01 (Table 11).

Table 11: Autocorrelation, Normal Distribution, Heteroscedasticity, Model Specification Result

Breusch-Godfrey Autocorrelation LM Test			
F Statistics Value	2.863034	**Chi² Probability Value**	0.0230
R² Observation Value	5.168495		
Jarque-Bera Normality Test			
Jarque-Bera	0.767921	**p Value**	0.681158
Heteroskedasticity Test: Breush-Pagan-Godfrey Test			
F Statistics Value		**R² Observation Value**	
Calculated	**Probability**	**Calculated**	**Probability**
0.911105	0.5555	8.161713	0.4178
Ramsey Reset Test F Statistics			
F Statistics Value		**t Statistics Value**	
Calculated	**Probability**	**Calculated**	**Probability**
0.009604	0.9251	0.098001	0.9251

Finally, the stability of the parameters estimated from the CUSUM and CUSUM-Q graphs was checked. The parameters estimated according to Figure 5 and Figure 6 are stable at the 5% significance level. In other words, there are no structural breaks.

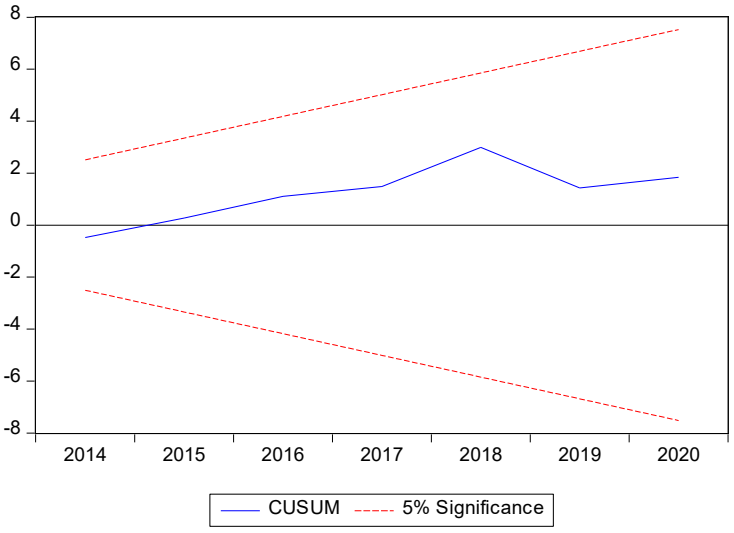

Figure 5: CUSUM Test Result

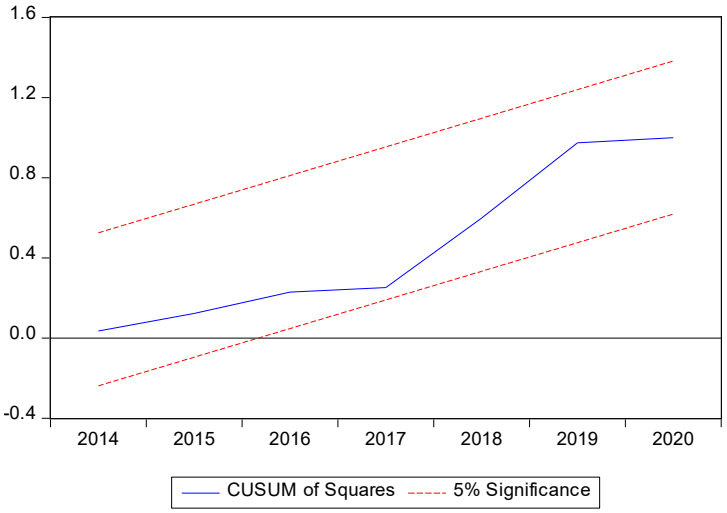

Figure 6: CUSUM-Q Test Result

Estimating short-run coefficients for the ARDL (1,1,1,1,0) model

The short-run coefficients of the model were estimated after the results were obtained by checking the validity of the assumptions. Accordingly, the error correction coefficient, CointEg (-1), was calculated as -1.673385 (Table 12). In addition, the error correction coefficient, which is statistically significant and negative, shows the suitability of the analysis.

Similar to the result in the first model, the error correction coefficient is greater than 1 in the second model, indicating that the financial stability index fluctuates around the long-run value in the form of damping and its convergence to the equilibrium path accelerates when the process is completed. The return time is 0.59 years from the formula 1/|-1.673385|. In this case, the financial stability index comes to its long-run equilibrium during the year.

Table 12: Estimation Results of Short-run Coefficients for The ARDL (1,1,1,1,0) Model

Variables	Coefficient	Standard Deviation	t-Statistics	Probability
C	-3.034514	0.299493	-10.13217	0.0000
D(ATM)	-0.000637	0.000318	-2.006448	0.0848*
D(BYO)	0.000171	0.008362	0.020454	0.9843
D(KD)	-0.073275	0.035297	-2.075938	0.0765*
CointEq(-1)	-1.673385	0.162402	-10.30398	0.0000

Note: (*)10%; at the level of significance.

According to the short-run coefficients in Table 12, the number of ATMs is significant at the 10% significance level, and an increase of 100.000 in the number of ATMs causes a 63-point decrease in the financial stability index in the short-run. In addition, the credit depth variable is also significant at the 10% significance level. Accordingly, a 10-point increase in credit depth leads to a 0.73-point decrease in the financial stability index in the short run.

Conclusion and discussion

The increase in the variety of financial products and services due to developments in information technologies has contributed to the emergence of preferable products and services for each forming the society. This has led to an increase in the number of consumers in the financial system. Another change has been experienced in the type of financial institution in line with the expectations and needs of consumers. The change in the number and type of banks operating in the banking system has eliminated one or more reasons consumers do not participate in the financial system. The best example of this is participation banks. Because the establishment of these banks has increased the participation of consumers who have financial exclusion problems due to interest rate sensitivity to the financial system, it can be stated that participation banks make positive contributions to the level of financial inclusion, especially in countries with a high Muslim population. What has been explained so far indicates the contribution of the developments to the financial system. However, one of the issues that should be emphasized here is financial stability, which has become one of the essential goals of central banks. In this direction, the study aims to determine the relationship between financial inclusion and financial

stability in Iraq. In this study, which tries to present evidence for Iraq for the period 2004-2020, the existence of the relationship above has been demonstrated by the ARDL bounds test.

In this study, which differs from other studies in the literature in terms of method and period and uses the variables of financial inclusion and financial stability for the period 2004-2020 in Iraq, the cointegration relationship was determined by the ARDL bounds test. The study's dependent variable is FIE, and the independent variables are ATM, BYA, BYO, KD and MD, representing financial inclusion. However, since there is a very high correlation between BYA and BYO, two different models were created in the study. First of all, whether the variables are stationary or not, and if they are stationary, to what level they are stationary are tested with PP and ADF unit root tests. It is decided that the variables are stationary. After the unit root test, the ARDL bounds test was applied for both models. In the first step of the ARDL bounds test, the optimal lag length for the model and the appropriate ARDL model were determined according to the AIC. In the second step, the F-bounds test tested whether there was a cointegration relationship between FIE and independent variables. The calculated F statistic values showed a cointegration relationship in both models. In the third step, the long-run coefficients of the models are estimated.

According to the long-run coefficients estimation results of the first model, the effect of the number of ATMs on the dependent variable, the financial stability index, is harmful. On the other hand, in the long-run coefficient estimation results of the second model, it was seen that the relationship between the number of ATMs and the financial stability index was negative. This result, which is reached by estimating the long-term coefficients of both models, can be explained by the fact that ATMs located in various places impose a severe cost on branches and the bank's profitability decreases due to this technology investment. In addition, periodic maintenance, repair and software updates of ATMs increase the costs of banks. On the other hand, cards (debit cards and credit cards) are distributed to each customer for the active use of ATM devices, and the cost of printed cards can be a severe burden for banks. Furthermore, due to the distribution of printed cards by couriers, the distribution costs of the banks also increased. In addition, for ATMs located at different points outside the branch building, banks pay rent for the place where these devices are located. If all these costs become income, many customers should use ATMs and not be inactive. Therefore, the process of determining the location of ATMs requires severe preliminary research and the creation of a customer data warehouse. All these hurt the profitability of banks. Therefore, the increase in ATMs decreases financial stability and the bank's profitability.

According to the first model's long-run coefficient estimation result, credit depth positively affects the financial stability index. Indeed, the credit extended to the private sector finance the commercial activities of the real sector or the initiatives such as renovating and constructing buildings and facilities; therefore, the increase in credit depth increases financial stability. Moreover, the credits are used to turn into investments and return to the bank as funds. This increases the ability of banks to create bank money. Thus, banks can increase their interest income significantly by extending more loans. The second model's long-run coefficient estimation showed a positive relationship between deposit depth and financial stability index. Interest income is important among the income items of banks, whose primary function is to collect deposits and give loans. Because banks provide loans in direct proportion to the deposits they collect. This shows that increasing deposit volume can provide more financing support and increase interest income. On the other hand, the increase in deposit volume may be due to newly opened accounts or new customers joining the portfolio. Furthermore, because banks can make all deposits, customers use different products and services and increase their income through cross-selling. However, the size of the deposits collected by the banks and the size of the loans given is a sign of trust in the system and the banking sector's reputation. Considering all these, it is clear that this optimistic atmosphere in the banking sector will also feed financial stability.

Finally, the short-run coefficient of both models was estimated, and a typical result was reached. In both models, there is a negative relationship between the number of ATMs and financial stability in the short run. This result may be due to miscellaneous costs associated with ATMs, similar to the long-run relationship. Furthermore, both models found a negative relationship between credit depth and financial stability in the short run. It is possible to explain this because banks are exposed to the risk of non-repayment in loans due to personnel carelessness, financial intelligence errors, and asymmetric information. Therefore, the increasing amount of non-performing loans in the banking sector and the provisions set aside for these loans will adversely affect the banks' financial structure and damage the sector's solidity. In this case, it can be stated that the increasing credit depth in the short run has a repulsive effect on financial stability.

Confidence in the financial system has also decreased in Iraq, which has been exposed to events that led to economic and social deformations such as war and conflict for many years. Therefore, it is important to re-establish financial confidence in Iraq and to focus on financial inclusion elements to stabilize its financial system. For this reason, it will contribute to Iraq's financial system, mainly if it receives support from neighbouring countries with a robust banking system and learns the policies or strategies implemented in these countries. In future studies, the relationship between financial inclusion and financial stability can be analysed by comparing Iraq and Turkey. Alternatively, it can be suggested to compare Iraq and other countries exposed to events that cause economic and social deformations such as war and conflict.

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