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Effects of Macroeconomic Variables on Bank Credit in Saudi Arabia: An ARDL Bounds Testing Approach to Cointegration

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Authors' contributions

This work was carried out in collaboration between both authors. Author MSB designed the study, wrote the protocol and wrote the first draft of the manuscript. Author AAI performed the statistical analysis and rechecked the flow of the study. Both authors read and approved the final manuscript.

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ABSTRACT

The main objective of the paper is to examine the relationship between bank credit and the major macroeconomic variables of Saudi Arabia during the period from 1993 to 2019. An autoregressive distributed lag (ARDL) method was employed to estimate the short-run and long-run effects of the major macroeconomic variables on bank credit. The study revealed that the real exchange rate and money supply have positive long-run effects on bank credit compared to the negative effects of inflation on bank credit. Gross domestic product (GDP) has a negative effect on total bank credit, which is in conflict with the Keynesian view. In the short run, the effect of GDP on bank credit is negative, whereas inflation has a positive influence on bank credit. Based on the findings, the study suggests some expansionary monetary and fiscal policies, such as raising asset prices and lowering the costs of borrowing, increasing spending and cutting taxes to produce budget deficits for stabilizing the financial system and increasing national income to promote sustainable and stable growth in bank credit.

Keywords: ARDL; cointegration; bank credit; macroeconomic variables; Saudi Arabia.

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1. INTRODUCTION

The banking sector is one of the largest segments of the Saudi financial system. It has been playing a key role in the development of Saudi Arabia since the last three decades. It is contributing to the development of the country in several areas such as domestic trade, infrastructure and manufacturing. The banks usually increase the consumers' purchasing ability through consumer loans, and they finance both corporates and individuals [1,2]. The credit provided by the banks is influenced by various internal and external factors. The external factors are the key economic factors such as gross domestic product (GDP), inflation rate, interest rate and money supply [3]. As shown in Fig. (1), overall bank credit in Saudi Arabia has increased considerably over time, from SAR 183 billion in 1993 to SAR 1465 billion in 2019. According to the Saudi Monetary Authority (SAMA), the total value of loans granted from 1993 to 2019 by the banking system in Saudi Arabia, contributed on a sectoral basis, increased on average in the trade sector by 22.1 percent, followed by the manufacturing sector and construction and building sector at 11.3 percent and 8 percent, respectively. Bank credit continued to show steady growth, driven by robust economic activity and strong domestic demand. It has risen by 56.3 percent to reach SAR 1.25 trillion, currently [4].

Despite the growth in credit as shown in Fig. (2), the credit to GDP ratio has been stable over the years, indicating a healthy growth rate that ensures sufficient credit for economic growth, yet with no excessive leveraging. The ratios of bank credit to GDP and non-oil GDP posted annual increases of more than 10.0 percent and 3.0 percent respectively, in 2014. The credit to GDP curve has been flat, indicating no excessive leveraging in the sector. Since 2014, the ratio has settled at around 45 percent, lower than for most G20 nations and other regional economies [5]. Bank credit to the private sector constituted the bulk of the lending activity, with claims of the private sector continuing to serve as the main driver of asset growth in the banking sector. Bank credit to the private sector, which includes both consumers and corporates, accounted for SAR 1.5 trillion in 2019, representing 96.3 percent of the total because of these supportive fundamentals coupled with strong government policy responses, so that the Saudi banking sector has remained largely insulated from the global financial market volatility in recent years. The sector, however, remains connected to macroeconomic developments. Credit growth has largely been driven by retail lending, while corporate credit remains sluggish. The share of private claims on banks' asset portfolio has been growing consistently, and now constitutes some 60 percent, compared to less than 40 percent 27 years ago [6].

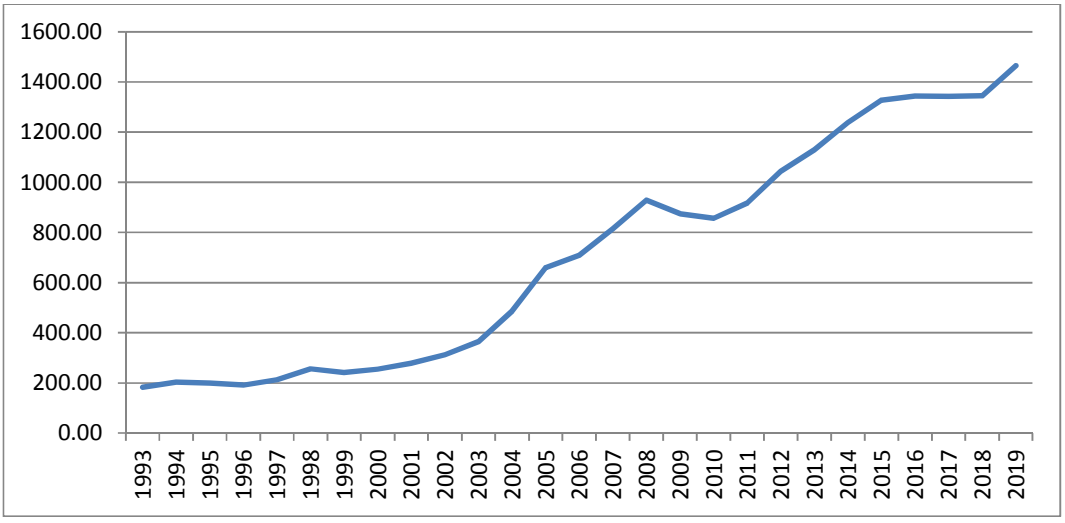

Fig. 1. Saudi's bank credit, 1993–2019 (in billion SAR)
Source: Saudi Monetary Authority. Financial stability report: 2019

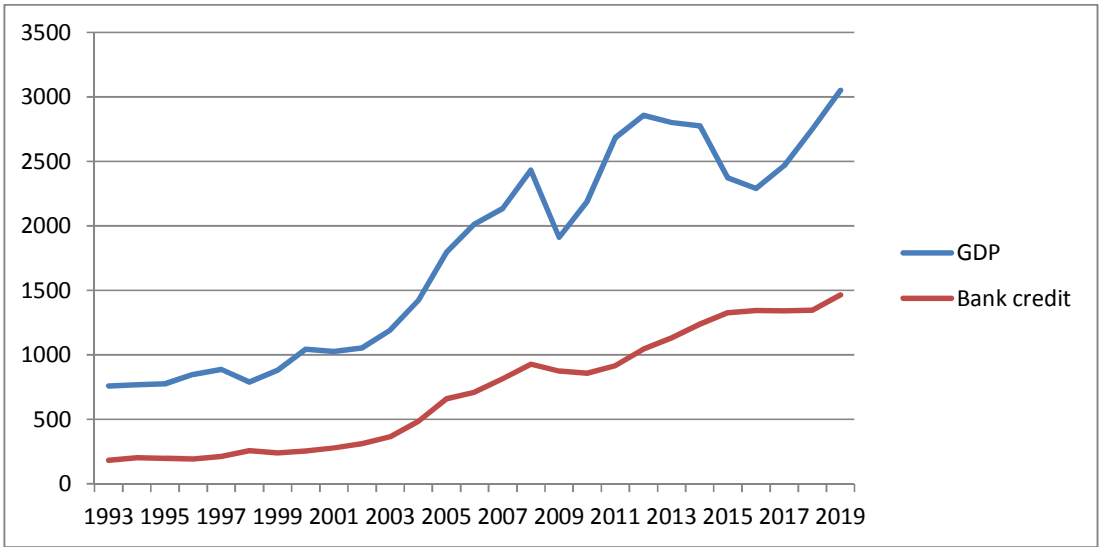

Fig. 2. Bank credit and GDP, 1993–2019 (In billion SAR)
Source: Saudi Monetary Authority. Financial stability report: 2019

As shown in Fig. (3), price pressures in Saudi Arabia have remained low over the past ten years, with the average rate of inflation at 2.6 percent. As a result, GDP growth has remained strong, with an average growth of 3 percent over the last ten years. The ratio of bank credit to GDP has increased over time, reaching a maximum of 59 percent in 2015 and a minimum of 22 percent in 1996. The exchange rate is stable; the interest rate has declined compared to fluctuation in inflation over time. There is a strong negative correlation between the ratio of credit/GDP and exchange rate (-0.8502), and a negative moderate correlation exists between credit/GDP and interest rate (-0.6158) while there is a very weak correlation between credit/GDP and inflation (0.1435). Inflation is strongly correlated to the exchange rate, which influences the bank credit. A lower interest rate tends to encourage consumers to spend more, which is likely to increase bank credit. Saudi banks have continued to rely on a business model that is largely oriented towards domestic savers and investors. For instance,

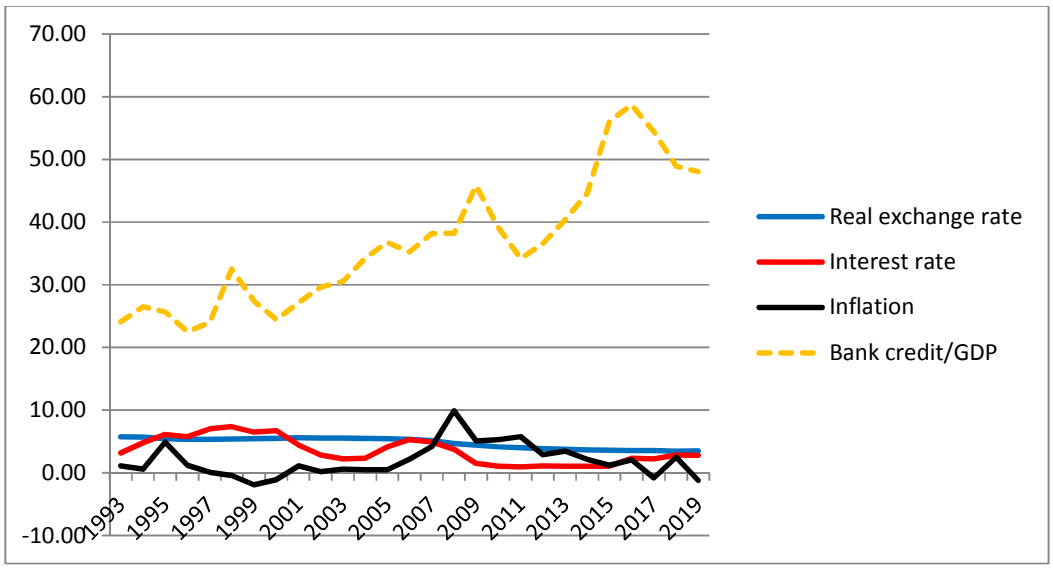

Fig. 3. Prices and bank credit, 1993–2019 (%)
Source: Saudi Monetary Authority: 2020, General Statistics Department: 2020

the predominant source of their assets has been domestic deposits from households, businesses and government entities. Similarly, most of their lending is directed to domestic households, corporate and semi-government entities. In other words, Saudi banks' exposure to foreign banks and other entities in terms of lending or borrowing is fairly limited. Moreover, the fixed exchange rate system that has been in place for decades has contributed to the stability of the riyal and has largely reduced Saudi banks' foreign exchange transaction risk. It is because of these historical realities that the Saudi banking sector has considerable built-in protection against adverse external developments.

2. REVIEW OF THE RELATED LITERATURE

Several studies have examined the relationship between bank credit and macroeconomic variables in developed and developing countries, by considering credit demand and supply effects either separately or jointly. Some of these studies examined the role of bank credit in cash transfer mechanisms, and others focused on the relationships between bank credit and macroeconomic and financial variables. There is no standard model for estimating the effects of macroeconomic variables on bank credit. While some models relate bank lending to major macroeconomic and financial variables such as real GDP, exchange rate, inflation, interest rate, deposit growth and non-performing loans by including supply and demand variables or indicators in a single model, others consider them in two separate models.

Ibrahim and Shah [7] investigated the relationship between bank lending, macroeconomic conditions and financial uncertainty in Malaysia. They used a cointegration, causality and vector autoregression (VARs) model. The authors found a positive long-run relationship between real income, real bank credit and real stock prices. Their findings suggest that intensified market uncertainty is negatively related to income in the long run. They found significant dynamic effects of interest rate shocks on other macroeconomic variables.

Ivanović [8] estimated the determinants of bank credit growth in Montenegro from the demand and supply side with special attention to supply factors. The researcher applied a fixed effects linear model to identify the determinants of bank credit, finding that positive economic developments and an increase in banks' deposit potential lead to higher credit growth. The study results confirm that a banking system's soundness is decisive for promoting banks` further lending activities. In conclusion, the researcher provides evidence that the weakening of banks` balance sheets, in terms of high non-performing loans and low solvency ratio, has a negative effect on credit supply.

Hasanov et al. [9] examined the bank-specific and macroeconomic determinants of bank profitability in Azerbaijan. They used a panel generalized method of moments in a dynamic framework model of bank profitability. The study revealed that bank size, capital, loans, economic cycle, inflation expectation and oil prices had positive effects on bank profitability. The results also showed that exchange rate devaluation, liquidity risk and deposits negatively affected bank profitability.

Adeleke and Awodumi [10] examined the relationship between bank credit and some macroeconomic variables in Nigeria during the period 1970–2015. They focused on the short-run and long-run effects of bank credit supply by using autoregressive distribution lag estimation. The authors found that the exchange rate, money supply, net foreign liabilities and real GDP have a positive long-run impact on bank credit to the private sector in Nigeria, whereas the effect of the general price level is negative. In the short run, the effect of money supply, net foreign liabilities and reserve requirements on bank credit to the private sector is positive, with only inflation exerting a negative influence.

Ahmed et al. [11] investigated the impact of some main economic indicators, including consumer price index, government expenditure & support to the private sector, money supply and interest rates on the total credit offered by banks in the Sultanate of Oman. They used annual time series data during the study period by using the ARDL bounds testing approach to cointegration and the associated error correction model (ECM). The result indicated that the macroeconomic indicators have a positive effect on the total bank credit in Oman. The outcome of the long-run analysis reveals that all variables show a positive effect and they are statistically significant, which were expected signs as this is consistent with economic theory, except for

interest rate, which may be due to the component of interest on personal loans.

There is no evidence found of any previous research investigating the effects of major economic variables by using the ARDL approach to cointegration in Saudi Arabia, although this approach has been adequately addressed in the current literature. To fill this literature gap, this paper identifies the effects of major economic variables on bank credit by using an up-to-date time series set of data covering the period 1993–2019. The findings of this paper will help shed light on the key tenets of the relationship between macroeconomic variables and bank credit in Saudi Arabia and will be robust to different considerations, which is a very important component of making appropriate policy recommendations.

3. ESTIMATED MODEL AND METHODOLOGY

This paper employs the autoregressive distributed lag model (ARDL). Although ARDL models have been used in economics for decades, they have gained popularity in recent years as a method of testing cointegrating relationships between economic variables, such as by Pesaran and Shin [12] and Pesaran et al. [13]. The ARDL model is a linear time series model, in which both the dependent and independent variables are related not only contemporaneously, but across lagged values as well. The advantage of adopting the ARDL model is that it provides more reliable results than other models when applied on a small sample data set [14,15], and also allows explanatory variables to be stationary at different levels [16].

3.1 Model Specification

In line with Vodova [17] and Adeleke and Awodumi [10], several possible determinants of demand and supply of bank credit have been previously utilized in the literature. The relationship between bank credit and major macroeconomic variables can be expressed as follows:

$$lnFI_t^d = \beta_0 + \beta_1 lnYD_t + \beta_2 ln(IR)_t + \beta_3 \ln RE_t + \beta_4 lnMS_t + \beta_5 lnRF_t + \mu_t \quad (1)$$

where FI = bank credit; YD = real GDP; IR = interest rate; RE = exchange rate; MS = money supply; RF = inflation rate.

Theoretically, it is expected that the lending capacity of financial institutions is positively associated with bank credit (FI). The interest rate (IR) and money supply (MS) are expected to positively impact credit to the private sector because of increase in loans from financial institutions and money supply to domestic banks which improve banks' assets as well as their liquidity, and as a result, they can lend more at the domestic level, while general price level (RF) and exchange rate (RE) are expected to increase bank credit. However, while GDP is expected to have a positive influence on the real volume of bank credit, the effect of total income (GDP) is likely to be negative. Moreover, the positive sign for GDP is because banks may form expectations about output. If the output is expected to decline in the future, it can lower the credit supply in the present. Also, higher reserve requirements tend to reduce the ability of commercial banks to create credit.

The equation where the null hypothesis of no cointegration is rejected is estimated with an error-correction term [18,19]. The vector error correction model is specified as follows:

$$\Delta FI_t = \beta_0 + \sum_{i=1}^{n}\beta_1 \Delta YD_{t-i} + \sum_{i=1}^{n}\beta_2 \Delta(IR)_{t-i} + \sum_{i=1}^{n}\beta_3 \Delta RE_t + \sum_{i=1}^{n}\beta_4 \Delta MS_t + \sum_{i=1}^{n}\beta_5 \Delta RF_t + \beta_6 EC_{t-1} + \varepsilon_t \quad (2)$$

where EC_{t-1}= error correction term lagged one period, and the parameter β_6 is the error correction coefficient that measures the speeds of adjustment to obtain equilibrium in the event of shocks to the system, or measures the response of the regression in each period to departures from equilibrium. Lagged explanatory variables represent short-run impact, and the long-run impact is given by the error correction term.

3.1.1 Data sources and description

Annual time series data have been used on bank credit, GDP, inflation rate, interest rate, exchange rate and money supply for the period from 1993 to 2019. The data have been obtained from two different sources, namely, the Saudi Monetary Authority (SAMA) and the General Authority for Statistics [20]. The income variable, which is measured by real GDP, is noted by YD. Bank credit (FI) is the value of total loans provided by the commercial banks to the public and private sectors, exchange rate is the index of real riyal exchange rates, inflation is measured by consumer price index (CPI), interest rate (IR) is measured as the interest rate on Saudi deposits (interbank offer rate) and money supply (MS) is

measured by M2, which includes money in circulation plus deposits in banks, plus savings deposits and money market funds. The data on bank credit does not include the banks' investments in private securities but includes loans extended to government agencies. All nominal values of variables are converted to real values using CPI for 2013 as a base year [5,20].

4. RESULTS AND DISCUSSION

4.1 Empirical Analysis

As shown in Table 1, the mean of the total credit over the period of the study is reckoned at SAR 710.3 billion, indicating the significant contribution of the banks in Saudi Arabia. The high standard deviation of GDP and money supply followed by bank credit, at 810070.91, 505937.54 and 452820.92 respectively, explains the obvious differences among these variables, which need consideration in terms of effective and fiscal policies. The standard deviation of the exchange rate, interest rate and inflation were lower at 0.8561, 2.0953 and 2.6365 respectively, indicating no substantial differences over the period covered by the study, emphasizing the stability of prices. The average interest rate is at 4.7535 with the lowest standard deviation of 0.8561, which indicates the adoption of a fixed exchange rate regime between the Saudi Riyal and the US dollar.

Money supply accounted for the highest average of 848818.04, as well as the second-highest standard deviation of 505937.54, indicating a significant difference in money supply over time, which can be attributed to the practices of the Saudi Monetary Agency (SAMA), which preferred to maintain a lower liquidity ratio. This means that banks are willing to lend a larger proportion of their funds, as there is a demand for credit from investors and consumers. Regarding the variations and fluctuation, the coefficient of variation shows that inflation is the most volatile variable, being estimated at the high value of 1.2610, while interest rate and money supply are the least volatile variables. All the variables are skewed to the right, except for (RE), which is skewed to the left.

4.1.1 Unit root tests

The study carries out a unit root test for each variable to avoid spurious regression results in a time series data set. In the presence of integrated variables of order two, it cannot interpret the values of F-statistics provided by Pesaran et al. [13,21]. The ARDL bounds test is based on the assumption that the variables are I(0) or I(1). In the unit root test, when the critical value of 5% (absolute value) exceeds tau-statistic it cannot reject the null hypothesis of the unit root for all variables.

As shown in Table 2, all variables are non-stationary at the level, but they are stationary at the first difference. It is, therefore, worth concluding that all the variables are integrated for order one 1(1). The lag length in the ARDL model is selected based on Schwarz Bayesian criterion (SBC) and Akaike information criterion. For our annual data, Pesaran and Shin [12] suggest a maximum of 2 lags.

Phillips–Perron (PP) test is an alternative model to test the presence of unit root in a time series. Table 3 reports the results of the PP tests for the unit root on both the level and the first difference of the variables. This means the PP test rejects the null hypothesis of non-stationarity for all the variables. Therefore, the results lead to testing the presence of cointegration among variables in the model. In general, the tests indicate that all variables are stationary in first differences, a result that is confirmed by other researchers. Based on these tests, the study concludes that all variables are non-stationary in the level and stationary in the first difference.

Table 1. Summary of descriptive statistics for the variables

	FI	RE	GDP	RF	IR	M2
Mean	710368.34	4.7535	1776436.77	1.9370	3.5411	848818.04
Median	709430.34	5.3521	1909989.65	1.2000	2.8400	768947.93
Maximum	1464602.7	5.7202	3050943.40	9.9000	7.3700	1688714.41
Minimum	183113.01	3.4949	759586.74	-1.9000	0.9700	258392.30
Std. Dev.	452820.92	0.8561	810070.91	2.6365	2.0953	505937.54
Skewness	0.2322663	-0.3859	0.0333	1.0737	0.3762	0.2980
Kurtosis	1.5512598	1.3759	1.4266	4.2187	1.8312	1.5611
Coefficients of variance	0.63745	0.18011	0.45601	1.36108	0.59170	0.59605

Source: Authors' calculations based on EViews (10) outputs

Table 2. Results of the Augmented Dickey-Fuller (ADF) test

Variable series	Level		First Difference			
	Intercept	Trend intercept	Lag	Intercept	Trend intercept	Integrated order
lnGDP	-0.74	-1.60	1	-4.22	-4.15	I(1)
lnIR	-1.99	-2.59	1	-3.36	-3.31	I(1)
lnRE	-0.74	-1.81	1	-2.31	-2.15	I(1)
lnRF	-1.49	-1.95	1	-4.06	-3.90	I(1)
lnFI	-1.37	-2.02	1	-4.37	-4.27	I(1)
lnMS	-0.74	-1.38	1	-3.35	-3.38	I(1)

Source: Authors' calculations based on EViews (10) outputs

Table 3. Results of the Phillips–Perron test

Variable Series	Level		First Difference		
	Intercept	Trend intercept	Intercept	Trend intercept	Integrated order
lnGDP	-0.74	-1.60	-4.17	-4.09	I(1)
lnIR	-1.54	-2.18	-3.36	-3.31	I(1)
lnRE	-0.09	-1.57	-2.32	-2.17	I(1)
lnRF	-1.51	-1.95	-4.05	-3.89	I(1)
lnFI	-1.60	-2.30	-4.37	-4.27	I(1)
lnMS	-0.68	-1.17	-3.31	-3.38	I(1)

Source: Authors' calculations based on EViews (10) outputs

4.1.2 Cointegration analysis

Cointegration is a test of the existence of an equilibrium relationship. As shown in Table 4 below, since the computed F statistics value of (14.07) is greater than the upper bounds of the critical value band at 5% level, given by 2.39 and 3.38, the lower and upper bonds, respectively; therefore, the null hypothesis of no long-term relationship between variables, irrespective of the order of their integration, is rejected. This study implies that explained and explanatory variables have a long-term relationship at 1%, 5% and 10% significance levels. Therefore, the error correction model (ECM) is estimated.

The selected ARDL model (1,1,0,1,1,1) reveals the results of the long- and short-run coefficients for Saudi's bank credit, as reported in Table 4. The results from the model show the expected sign for all the independent variables. Relative price and exchange rate have a statistically negative effect on the bank credit at 5% significance level for the long run and 1% significance level for the short run. These results imply that a relative price increase by 1 percent leads to a decrease in the bank credit by 0.25 percent. When the interest rate increases by 1 percent, this will decrease bank credit by 1.11 percent. This indicates a higher negative impact on bank credit. The result indicates that bank credit is not determined by GDP or money supply, which are insignificant.

4.1.3 Short-run dynamic equation

Following the identification of a long-run equilibrium relationship, the short-run import demand function is estimated. The long-run equation is inserted in the equation as an error correction term (ECM). The error correction term is not only significant but also has the correct negative sign. This study's result implies that when there is a deviation from the long-run equilibrium in the short run at time t-1, it is corrected by the amount of its coefficient at time t. The selected maximum lag length that minimized the SBC was 2.

The coefficient of the error correction term, ecm_{t-1}, which represents the speed of adjustment, is significant and carries the correct negative sign, which is a feature necessary for the model's stability. Therefore, the long-run equilibrium is achievable. As shown in Table 6, the estimated coefficient of the error correction term (-0.642092) is statistically significant at the 5% level and with the appropriate (negative) sign. The study results suggest the validity of a long-run equilibrium relationship among the variables. In Saudi Arabia, the adjustment from the short-run to the long-run equilibrium is very

fast. The estimated coefficient value of -0.642092 implies that the system corrects its previous period's disequilibrium by 64 percent a year, "the larger the error correction coefficient (in absolute value) the faster is the economy's return to its equilibrium, once shocked" [22].

As shown in Table 6, the total goodness of fit (coefficient of determination) of the assessed equation is high (R^2 =0.97). The estimated equation is high; the F statistics which estimate the combined significance of all regressions are highly statistically significant. This indicates that all independent variables together influence total bank credit (FI) positively in the long run.

As predicted, the interest rate has a positive sign but without a statistically significant effect on total credit in the long run, while (RF) has a positive and statistically significant relationship with bank credit, which indicates that if (RF) increases by 1percent, bank credit increases by 0.13 percent. Siregar et al. [23] stated that the inflation rate is capable of positively or negatively influencing the performance of the banks; it should be noted that an increase in inflation will result in the growth of the economy and will have a positive effect on the revenue side rather than on the cost side for the banks. Money supply (MS) has a positive sign and does not have a statistically significant effect on bank credit in the long run. It was revealed that GDP also has the anticipated negative sign and a statistically significant effect on total bank credit in the long run. The elasticity of the link between bank credit and GDP seems to be strong, with a 1 percent increase in GDP leading to a decrease in total bank credit of 1.33 percent. This result contradicts the economic theory where the GDP growth rate has a positive influence on bank credit, whereas the unemployment rate negatively impacts bank lending behavior [24].

4.1.4 Lagrange multiplier test for serial correlation

An alternative test for general serial correlation is the Lagrange multiplier (LM) test. It uses the Breusch-Godfrey large sample test for autocorrelation disturbances. It is applicable whether the disturbances follow an $AR_{(\rho)}$ or an $MA_{(\rho)}$ process, where ρ can be specified as any positive order. It is also applicable whether or not lagged values of the dependent variable appear among the regressors, i.e., when there is a lagged dependent variable on the right-hand side of the equation. Thus, it is advisable to compute the Breusch-Godfrey statistic and respond to any indication of autocorrelation disturbances, since it is almost certainly more dangerous to incorrectly suppose that autocorrelation is not present than to incorrectly suppose that it is [25]. "if R^2 exceeds the critical chi-square value at the chosen level of significance, the study rejects the null hypothesis, in which case at least one ρ is significantly different from zero" [26]. As evident from Table 7, the result indicates no autocorrelation, because the p-value is less than 5%.

4.1.5 Stability tests

The well-known cumulative sum recursive residuals (CUSUM) and cumulative of the square of recursive residuals (CUSUMSQ) tests of the residuals of the optimum model have been used to test for stability of coefficient estimates. These tests were introduced by Brown et al. [27] and require that the sample be broken with enough observations before and after the break point. In the plot produced with this test, the cumulative sum is plotted against time. Two critical lines are also shown. The test finds parameter instability if the cumulative sum goes outside the area between the two critical lines [25]. The two CUSUM and CUSUMSQ statistics are then plotted against the break points or break dates. When the plots of these statistics stay within a 5% significance level, coefficients are said to be stable. Since the blue lines lie inside the red lines, this means that the model is stable. We also test for stability of the coefficient estimates using CUSUM and CUSUMSQ tests. The regression model is found stable within the 5% bounds level of significance. The plots statistics are inside the critical bounds at 5% significance for both tests, denoting that all coefficients in the error correction model are stable over time. Therefore, the model implemented in the paper appears to be appropriate and powerful in assessing the short- and long-run links between the independent variables used and total bank credit. The CUSUM test of parameter stability in Fig. (4) indicates that the estimated parameters of the model have remained stable over the sample period. As shown in Fig. (5), CUSUMSQ statistics marginally exceed the 5% critical bounds of parameter stability, thus indicating slight instability of the coefficient.

Table 4. Results of the ARDL cointegration test

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	**Value**	**Sign.**	**I(0)**	**I(1)**
F-statistic	14.07224	10%	2.08	3
K	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15

Source: Authors' calculations based on EViews (10) outputs

Table 5. ARDL long-run form and bounds test*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.719873	0.227515	3.164073	0.0195
LONFI (-1) **	-0.642092	0.254546	-2.522502	0.0451
LONIR (-1)	-1.110474	0.247897	-4.479573	0.0042
LONRE***	18.36180	2.986564	6.148135	0.0008
LONGDP (-1)	0.453632	0.831444	0.545595	0.6050
LONMS (-1)	-2.832450	2.560858	-1.106055	0.3111
LONRF (-1)	0.424952	0.130110	3.266093	0.0171
D (LONIR)	0.010927	0.285715	0.038244	0.9707
D(LONGDP)	-1.332225	0.717065	-1.857886	0.1126
D(LONMS)	0.393715	1.748036	0.225233	0.8293
D(LONRF)	0.130842	0.060312	2.169428	0.0731

*Notes: * Dependent variable: D(LONFI), ARDL (1, 1, 0, 1, 1, 1), Conditional Error Correction Regression; ** p-value incompatible with t-Bounds distribution; *** Variable interpreted as Z = Z (-1) + D(Z).*
Source: Authors' calculations based on EViews (10) outputs.

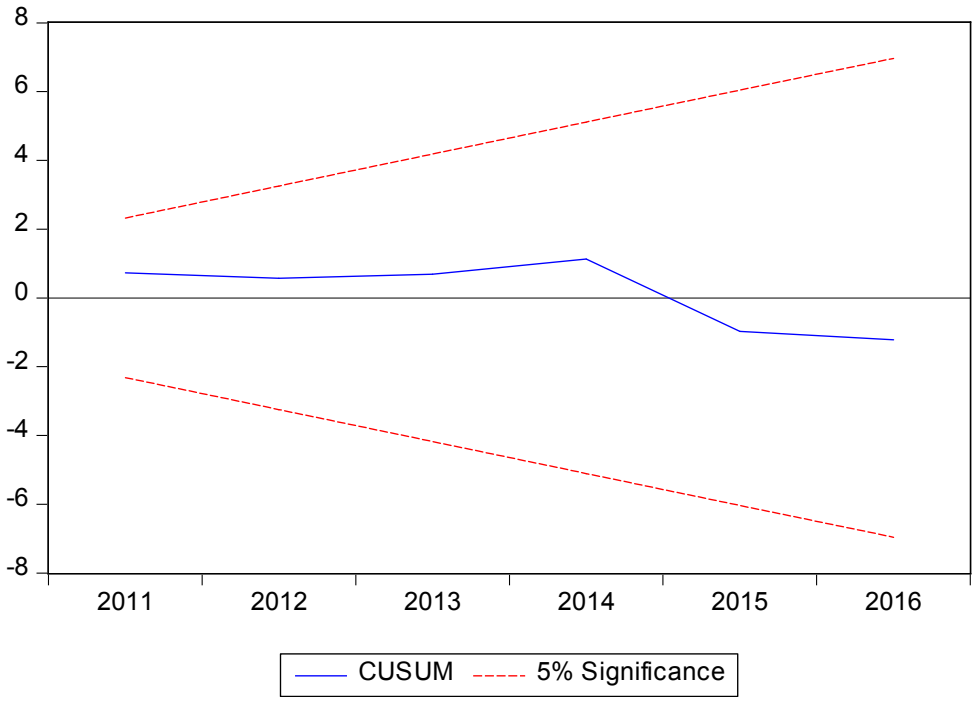

Fig. 4. Plot of CUSUM

Table 6. ARDL error correction regression*

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LONIR)	0.010927	0.121137	0.090202	0.9311
D(LONGDP)	-1.332225	0.305961	-4.354228	0.0048
D(LONMS)	0.393715	0.623797	0.631159	0.5512
D(LONRF)	0.130842	0.031647	4.134467	0.0061
CointEq(-1)**	-0.642092	0.045746	-14.03607	0.0000
R-squared	0.971123	Mean dependent var		-0.003670
Adjusted R-squared	0.961498	S.D. dependent var		0.692405
S.E. of regression	0.135864	Akaike info criterion		-0.914401
Sum squared resid.	0.221507	Schwarz criterion		-0.669338
Log likelihood	12.77241	Hannan-Quinn criterion		-0.890041
Durbin-Watson stat	2.619343			

*Note: * Dependent variable: D(LONFI), Selected model: ARDL (1, 1, 0, 1, 1, 1), Case 2: Restricted constant and no trend; ** p-value incompatible with t-Bounds distribution.*
Source: Authors' calculations based on EViews (10) outputs

Table 7. Breusch-godfrey serial correlation LM test

F-statistic	1.584195	Prob. F (2,4)	0.3114
Obs*R-squared	7.513908	Prob. Chi-Square (2)	0.0234

Source: Authors' calculations based on EViews (10) outcomes

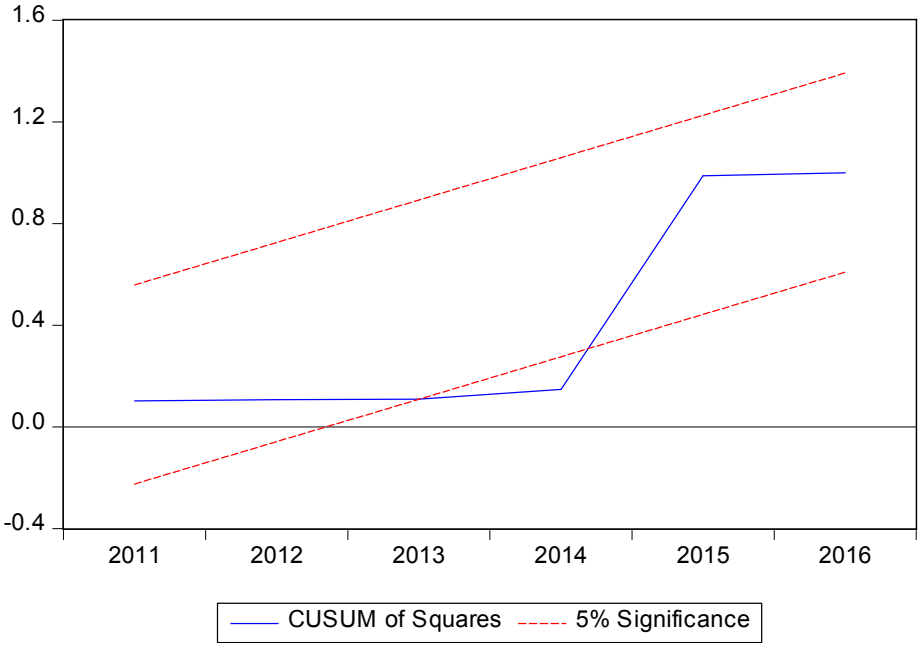

Fig. 5. Plot of CUSUMSQ

5. CONCLUSION AND POLICY IMPLICATIONS

The main objective of this paper is to examine the short- and long-run linkages between total bank credit and some major macroeconomic indicators, namely GDP, interest rate, inflation rate, exchange rate and money. It employs annual time series data covering the study period 1993–2019 by using the ARDL bounds testing approach to cointegration and the associated model ECM.

The empirical investigation suggests that there exists a long-run relationship between total bank credit and some major macroeconomic indicators, namely GDP, interest rate, inflation rate, exchange rate and money supply. The

interest rate is found to be the most important determinant of total bank credit. The coefficient of the error correction term, ecm_{t-1} , which represents the speed of adjustment is significant and carries the correct negative sign, which is a feature necessary for the model's stability, and suggests a high speed of convergence to equilibrium.

Specifically, the findings reveal that GDP and rate of inflation have a positive long-run impact on bank credit in Saudi Arabia, whereas the effects of money supply and interest rate are negative. In the short run, the effects of interest rate and exchange rate on bank credit are positive, with only inflation exerting a negative influence. Therefore, policymakers are required to implement policies that stabilize the financial system and boost per capita income to promote sustained and stable growth of bank credit to the private sector in Saudi Arabia. Commercial banks should monitor the interest rate at which they create credit, which has implications for the overall money supply. The evidence shows that the exchange rate, money supply and real GDP have a positive long-run impact on bank credit to both public and private sectors in Saudi Arabia, while the effect of the general price level is negative. In the short run, the effects of money supply and the interest rate on bank credit are positive, with only inflation exerting a negative influence. The effect of interest rate spread is insignificant. Thus, the strength of the financial system is based on bank liquidity, which is important for bank credit determination.

This paper is limited by its focus being only on the supply-side analysis. Future research should focus on both the demand and supply sides, employing longer time series data and other economic variables, so that the results can provide a comprehensive picture of the relationship between bank credit and macroeconomic variables on both supply and demand sides. Thus, it is important to identify alternative monetary and financial policies to increase bank credit and its impact on economic development, given the significant role of the banking and financial system for promoting economic growth and in increasing its development benefits. Some financial and monetary measures are required in light of the development policies to diversify the production base and not rely on oil as the sole source of income, taking into account the major economic transformations at the local and international levels, in order to achieve the goals of the development vision 2030 for Saudi Arabia.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Almalki AM, Batayneh KI. The relationship between inflation and financial development in Saudi Arabia. The Journal of Developing Areas. 2015;49(6):321-332.
2. Belloumi M, Alshehry A. The impacts of domestic and foreign direct investments on economic growth in Saudi Arabia. Economies. 2018;6(1):18.
3. Alshehry AS, Belloumi M. Study of the environmental Kuznets curve for transport carbon dioxide emissions in Saudi Arabia. Renewable and Sustainable Energy Reviews. 2017;75:1339-1347.
4. Saudi Monetary Authority. Financial stability report 2020 [Internet]. Riyadh: SAMA; 2020.
   [cited 2020 Aug 15].
   Available:http://www.sama.gov.sa/en-US/EconomicReports/Financial%20Stability%20Report/FSR_EN_V8_U.pdf
5. Saudi Monetary Authority. Annual statistics 2019 [Internet]. Riyadh: SAMA; 2020.
   [cited 2020 Jul 5].
   Available:http://www.sama.gov.sa/en-US/EconomicReports/Pages/YearlyStatistics.aspx
6. Saudi Monetary Authority. Monetary and banking development; first quarter 2020 [Internet]. Riyadh: SAMA; 2020.
   [cited 2020 Jul 5].
   Available:http://www.sama.gov.sa/en-US/EconomicReports/DevelopmentReports/Monetary%20and%20Banking%20Development%20Q1%202020.pdf
7. Ibrahim MH, Shah ME. Bank lending, macroeconomic conditions and financial uncertainty: Evidence from Malaysia. Review of Development Finance. 2012; 2(3–4): 156–164.
   DOI: 10.1016/j.rdf.2012.09.001
8. Ivanović M. Determinants of credit growth: The case of Montenegro. Journal of Central Banking Theory and Practice. 2016;5(2):101–118.
   DOI: 10.1515/jcbtp-2016-0013
9. Hasanov FJ, Bayramli N, Al-Musehel N. Bank-specific and macroeconomic determinants of bank profitability: Evidence from an oil-dependent economy. International Journal of Financial Studies. 2018;6(3):1–21.

DOI: 10.3390/ijfs6030078
10. Adeleke AM, Awodumi OB. A bound testing analysis of bank credit supply determinants in Nigeria. Review of innovation and competitiveness. 2018;4(1):5-26.
11. Ahmed HM, Jayaraman G, Ahmed HMS. The impact of selected economic indicators on the total credit offered by conventional commercial banks in Sultanate of Oman. Journal of Critical Reviews. 2020;7(5):528-535.
12. Pesaran HH, Shin Y. Generalized impulse response analysis in linear multivariate models. Economics Letters.1998;58(1): 17–29.
DOI: 10.1016/S0165-1765(97)00214-0
13. Pesaran MH, Shin Y, Smith RJ. Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics. 2001;16(3):289-326.
DOI: 10.1002/jae.616
14. Haug AA. Temporal aggregation and the power of cointegration tests: A Monte Carlo study. Oxford Bulletin of Economics and Statistics. 2002;64(4):399–412.
DOI: 10.1111/1468-0084.00025
15. Kumar NP. The saving and investment nexus for China: Evidence from cointegration tests. Applied Economics. 2005;37(17):1979–1990.
DOI: 10.1080/00036840500278103
16. Subramaniam Y, Masron, TA. Education, methane emission and poverty in developing countries. Journal of Environmental Economics and Policy. 2019;1–15.
DOI: 10.1080/21606544.2019.1689175
17. Vodova P. Credit market and prediction of its future development in the Czech Republic; 2008.
Available:https://core.ac.uk/download/pdf/7301536.pdf
18. Kumar NP, Smyth R. Higher education, real income and real investment in China: Evidence from Granger causality tests. Education Economics. 2006;14(1):107–125.
DOI: 10.1080/09645290500481931
19. Morley B. Causality between economic growth and migration: An ARDL bounds testing approach. Economics Letters. 2006;90(1):72–76.
DOI: 10.1016/j.econlet.2005.07.008.
20. General Authority for Statistics. National accounts and price indices. [Online]. Riyadh: GASTAT; 2020.
[Accessed 15 Aug 2020].
Available:https://www.stats.gov.sa/en
21. Pesaran MH. A simple panel unit root test in the presence of cross section dependence. Journal of Applied Econometrics. 2007;22(2):265–312.
DOI: 10.1002/jae.951
22. Pesaran MH, Pesaran B. Working with Microfit 4.0: Interactive econometric analysis, Oxford: Oxford University Press; 1997.
23. Siregar H, Maulana TNA, Hasanah H. The impact of macroeconomic condition on the banks' performance in Indonesia. Bulletin of Monetary Economics and Banking. 2015;17(4):1–24.
24. Cucinelli D. The impact of non-performing loans on bank lending behavior: Evidence from the Italian banking sector. Eurasian Journal of Business and Economics. 2015; 8(16):59–71.
DOI: 10.17015/ejbe.2015.016.04
25. Quantitative Micro Software (1994–2000). EViews user's guide, Irvine, Calif; 2000.
26. Gujarati DN. Basic econometrics, 3rd ed. New York: McGraw-Hill International Editions; 1995.
27. Brown RL, Durbin J, Evans JM. Techniques for testing the constancy of regression relationships over time. Journal of the Royal Statistical Society: Series B. 1975;37(2):149–163.
DOI: 10.1111/j.2517-6161.1975.tb01532.x

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