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Exchange Rate Volatility, Inflation, and Financial Sector Performance in Jordan

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Abstract **Original Research Article**

Jordan's financial system, dominated by the bank sector, faces chronic exchange-rate pressures, imported inflation and external vulnerabilities, however, the evidence of the combined impact of exchange-rate volatility and inflation on private-sector credit allocation is patchy. This study analyzed financial sector performance in Jordan over the period 1980-2024, measuring it by the dependent variable: Domestic credit to the private sector and controlling for some of is important determinants: Interest rates, money supply, GDP growth, and trade openness. After testing the bounds using ARDL methodology, the study identified that the money supply, inflation and interest rates are significant contributors in the long-run effects on credit allocation in the private sector, whereas exchange rate and exchange rate volatility are significant negative long run determinants. The error correction term confirmed a 38.4% annual adjustment speed towards long run equilibrium, while Granger causality tests showed unidirectional causality between exchange rate volatility, inflation and financial sector performance from financial sector performance to exchange rate volatility and inflation and macroeconomic controls. The results illustrate that monetary authorities should focus on exchange-rate stabilisation and inflation containment to affect the sustainability of financial intermediation, while the original contribution is the development of the first truly comprehensive empirical framework which captures the relationship between exchange-rate uncertainty, inflationary pressure and credit performance in Jordan and being fully econometrically validated.

Keywords: Exchange rate volatility, inflation, financial sector performance, Jordan, ARDL bounds testing.

INTRODUCTION

The economy of Jordan is well suited to understanding the impact of exchange rate volatility and inflation on the performance of the financial sectors in an economy that manages its currency, is heavily reliant on imports, has significant short-term external funding needs and has a financial system dominated by banks. While a stable exchange rate serves to safeguard confidence, real effective exchange rate fluctuations have still an effect on competitiveness, import prices, expectations on balance sheets and banks' risk perceptions. Financial intermediation is also influenced by inflation, and particularly because of the impact on real returns, the increase in uncertainty, and the impact on borrowing and lending behaviour. Development of the financial sector can not be considered solely within a framework of institutions growth; within this frame the ability of financial institutions to allocate credit productively to the private sector must be considered. This is especially critical in Jordan where macroeconomic stability and private sector-led growth continue to rely heavily on the capacity of the banking sector to deliver sustainable financing. Existing evidence shows that exchange rate instability has an impact on macroeconomic performance, that inflation has an impact on financial development and that financial instability is a constraint on sustainable growth (Ahmad *et al.,* 2020; Batayneh, 2021; Dabla-Norris *et al.,* 2015).

Domestic credit to the private sector is a powerful indicator of financial sector performance as it reflects how much financial sector responds to savings and liquidity by providing productive private investments. Private-sector credit is different from general financial indicators in that it captures the "real" role of private banks in financing entrepreneurial activity and firms, expanding firms, jobs and capital formation. However, it must be approached with caution in order to be interpreted. The increase in the credit-to-GDP ratio could either be credit deepening or credit misallocation, too much leverage, or a sensitivity to macro shocks if the

rules regulating financial markets are loose. Accordingly, the access to domestic credit, and more specifically domestic credit to the private sector, is not just a banking indicator but a vital gauge of the impact of monetary conditions, exchange-rate pressures, and inflationary dynamics on the real economy in Jordan. Previous studies indicate that private credit is a core factor of growth, but that it requires stability, institutional quality, and macro economy discipline to achieve desired growth results (Levine, 2005; Rioja & Valev, 2004; Katusiime, 2018).

The macroeconomic fragility of Jordan accentuates the critical role of this relationship. Jordan is a small open economy and is vulnerable to, imported inflation, regional insecurity, trade imbalances, fluctuations in energy prices and external financing pressures. These conditions impact on costs of credit and banks' willingness to loan to firms and households. Exchange rate pressures can add uncertainty, inflation can take the form of loss of purchasing power, and it can create inaccurate interest rate expectations. Conversely, interest rates, money supply, GDP growth, and trade openness affect credit allocation through the impact on liquidity, demand for credit and potential on repayment capacity. Research problems are that none of the previous studies has investigated the effect of these two variables together on the performance of financial sector in Jordan and some of the previous studies focused only on one of the variables such as inflation, exchange rate, or financial development. This raises an empirical problem due to the low investigation of the link between real effective exchange rate volatility, inflation and the private-sector credit in a country that roofs financial stability as development policy (Almansour, 2021; Boudias, 2014; Olamide *et al.,* 2022).

The study seeks to investigate the impact of real effective exchange rate volatility and inflation on financial sector development in Jordan from among other factors, domestic credit to the private sector is used as one of the financial sector dependent variables, with the remaining factors controlled such as interest rate, money supply growth, GDP growth, and trade openness. Whether exchange rate volatility has significant impact on domestic credit to private sector in Jordan? How does inflation affect the performance of financial sector? What happens when interest rates, money supply (M2), GDP growth and trade open change credit allocation? A study that ties the three concepts together in one empirical model – exchange rate uncertainty and inflationary pressure to credit performance – contributes to knowledge. It supports policy through evidence for monetary coordination, inflation control and regulation in the financial sector. The paper follows the setup of introduction, literature review, application of theoretical framework, methodology, results, policy recommendations and conclusion along the lines of AlKhawaldeh *et al.,* 2024; Ramoni-Perazzi *et al.,* 2022; World Bank, 2024.

LITERATURE REVIEW

Theoretical Framework

Financial intermediation theory provides an understanding of how financial institutions have the ability to aggregate the funds of the surplus units and divert them into productive investment by lowering the transaction costs, information asymmetry and the existence of liquidity constraints. Gurley and Shaw (1960) concluded that banks have an important economic role, which involves facilitating the efficient allocation of assets and the creation of credit. Diamond (1984) explained that financial intermediaries enhance economic efficiency by vanishing the danger and overseeing. From the frame of reference of this study, the theory explains why domestic credit to private sector is considered sensible measure of financial-sector performance. In the efficient intermediation, volatility of exchange rates and inflation on its own affect the efficiency because it affects the risk perception, lender's decisions and financial stability. Macroeconomic instability, as a result, can have a negative impact on banks' ability to allocate credit efficiently in the Jordanian economy.

The monetary transmission mechanism outlines how the monetary policy affects economic activity via interest rates, money supply, inflation and credit pathways. Taylor (1995) explained that policy rate changes influence a firm's planning on investment and consumption through their impact on the cost of borrowing and availability of liquidity. In addition, Bernanke and Blinder (1988) have noted the bank-lending channel, whereby monetary contraction lowers bank reserves and credit available. In Jordan, changes in interest rate and in money supply affect private-sector credit since the banking sector is the main source of funds used for economic activity. The inflationary pressure and exchange-rate instability can negatively affect the effectiveness of the monetary channel of transmission by raising uncertainty and misaligning financial expectations. The theory thus offers good support for the study of the link between macroeconomic factors and performance of the financial sector.

Theories of how exchange rates pass through into domestic prices, inflation, and economic activity are provided by the "pass-through" theory. One of the arguments made by Dornbusch (1987) on the issue of the exchange rate depreciation is that the depreciation of the exchange rate raises the prices of imports and production costs creating inflationary pressure. In countries with the limited financial resources exchange rate appreciations and depreciations influence external debt payments, financial stability and lending rates. Campa and Goldberg (2005) showed that for an open economy, the quantity of pass-through through the exchange-rate has important implications for the dynamics of the inflation process and the inflationary expectations of the market. The degree of the impact of exchange rate changes on financing, credit conditions and inflation in Jordan is still

considerable as imports are high and external financing is still important. The theory thus provides support for the view that indirect channels of financial-sector performance using inflationary transmission and macroeconomic uncertainty through exchange-rate volatility is relevant.

Conceptual Review of Financial Sector Performance

The performance of the financial sector is measured by the effectiveness and efficiency of the intermediation function, the structure and stability of financial institutions, their accessibility and their role in mobilising saving for productive investment. A key performance yardstick for the banking system in developing countries is its capacity to create domestic credit, since this indicates the capacity of the sector to divert funds toward financial intermediation, in the form of loans, that facilitate business activity, consumption, innovation, and employment growth. Under Levine (2005), economic development is fostered by a financial system that is efficient in allocating capital and minimising information asymmetry. Private-sector credit in turn is among the most convincing measures of financial depth and institutional effectiveness, as Beck et al. (2000) have pointed out. The financial sector in Jordan is highly skewed towards the banking sector and the role of private sector credit is therefore important in assessing financial performance and economic resilience in this country. The effect of macroeconomic stability on the performance of the banking sector is also important because exchange-rate instability and inflation affect lending tendencies, liquidity situation and risk takings by banks (Ahmad *et al.,* 2018).

Measurement of the performance of the financial sector has shifted from traditional measures of profitability to macro-financial measures such as credit expansion, financial inclusion, institutional resilience and quality, and ability to withstand external shocks. The role of financial institutions is to further innovation and productive investment by making credit available, as Schumpeter (1911) pointed out. Similarly, King and Levine (1993) showed that a generally efficient allocation of capital facilitates the economic transformation process in a developed financial system. But excess money printing that cannot be matched by macroeconomic prudence could, nonetheless, create instability, especially in countries such as developing nations where inflation concerns and foreign vulnerabilities can cause problems. In Jordan, financial-sector behaviour is not only shaped by the efficiency of banking but also by monetary stability, and external-sector dynamics and trade integration. Research conducted in recent times showed that macroeconomic uncertainty leads to decline in performance of the institutions and sustainable financial development (Ismail *et al.,* 2024; Almarshad *et al.,* 2024; Ahmad *et al.,* 2025b).

Exchange Rate Volatility and Financial-Sector Performance

Exchange rate volatility is the unpredictable change in exchange rates over time that affects investment decision making, banking stability, inflation expectations and cross-border capital flows. Exchange-rate volatility leads to uncertainty in financial markets in emerging economies, due to abroad foreign liabilities, import prices, and investor confidence. Volatile exchange rates mislead financial planning and expose financial institutions to higher risk, according to Obstfeld and Rogoff (2000). Aghion, et al. (2009) had also shown that exchange-rate instability is a hindrance to financial development as it deters investment and heightens the cost of borrowing. Despite the relatively managed exchange rate regime in Jordan, external pressures and shocks affect both the real effective exchange rate and the overall financial environment. According to Ahmad et al. (2020), exchange-rate volatility has a significant impact on macroeconomic stability and the monetary situation in developing countries.

The nexus between exchange rate volatility and the functioning of the financial sector is still theoretically not clear. While on the positive side, moderate flexibility in exchange rates could enhance competitiveness and thereby help the external adjustment process, on the negative side, financial intermediation could be jeopardized by the excessive volatility of exchange rates, which would create uncertainty and put financial markets at increased credit risk. This phenomenon has been called “original sin” by Eichengreen and Hausmann (2005), who argue that developing economies are at risk due to the foreign currency denomination of their liabilities. The fact that this vulnerability decreases bank readiness to provide credit to the private sector during uncertain times. Furthermore, the depreciation of exchange rate could exert more inflationary pressures which will level down real credit expansion and further lessen financial-sector efficiency. However, emerging economies also demonstrate a negative reaction by financial systems when monetary credibility and institutional robustness are low when faced with exchange-rate instability (Calvo & Reinhart, 2002; Ahmad *et al.,* 2024; Atiku *et al.,* 2021).

Inflation and Private-Sector Credit

Private sector credit is impacted by inflation in a variety of ways including through direct effects on purchasing power, interest rates, financial risk, and real returns on saving and borrowing. A moderate level of inflation can encourage borrowing and investment; however, non-ignorable levels of inflation normally lead to less efficiency in the financial sector due to less certainty regarding monetary stability and less accurate price signals. Boyd et al. (2001) have suggested that high inflation distorts financial development, both through its effects on financial intermediation and discouraging long term borrowing. The effect of increased inflation on the relationship between finance and growth is also found

negative by Rousseau and Wachtel (2002), who argue that inflation increases the uncertainty in credit markets. The banking sector in Jordan is vulnerable to price fluctuations due to mainly the impact of the imported products, energy cost and exchange rate pressures on the economy, which are the main sources of inflation shocks. Alkhawaldeh *et al.,* (2024) pointed out that the institutional and sectoral performances are highly influenced by macroeconomic conditions in Jordan.

The impact of inflation on bank lending is also due to the inflation's impact on the real value of repayments, which can result in higher default risks. Tight monetary policy is a usual consequence of high inflation, characterized by higher lending rates and limited access to credit in the private sector. Bernanke and Gertler (1995) attributed inflationary pressures to credit transmission in two ways: balance-sheet deterioration, and diminished investment incentives. Further, high volatility of inflation makes financial planning a challenge for both lenders and borrowers, particularly in lessened financial diversification economies. A banking sector is the main source of financing for firms and households in Jordan, and inflationary instability can impact access to credit, lowering the level of productive investment. Therefore, previous studies focused on being careful about the inflation rate to ensure sustainable financial-sector development and macroeconomic stability (Cecchetti & Kharroubi, 2012; Ahmad *et al.,* 2024; Ismaeel *et al.,* 2023).

Interest Rate, Monetary Expansion, and Credit Supply

Interest rate and supply of money continue to play a vital role in credit supply, as they have a direct influence on the level of liquidity, borrowing costs and profitability for the banking sector. Keynes (1936) argued that the cost of capital – which is determined by the prevailing interest rate – affects investment behaviour, whereas Friedman (1968) argued that it is the effect of a change in the money supply on the overall supply of money that is most important to determining economic activity. Lower rates tend to encourage lending in the banking sector while higher rates are likely to lower the amount of borrowing in the private sector, because they make the monthly mortgage payments more expensive. Monetary expansion using the broad money supply (m2) also boosts the liquidity of the banking system and improves the ability of the financial system to lend. Monetary policy is significant in Jordan as it is in all other countries due to the importance of liquidity conditions and management of interest rates for the banking system. Alwaely et al. (2024) revealed that general economic and policy factors contribute greatly to institutional performance in Jordan.

But if the credit surplus grows faster than stimulatory economic activity, however, excessive monetary expansion can be inflationary and undermine financial stability. Supply and demand uncertainty and sluggish adoption of technologies can lead to both slow-downs in the banking sector and overheating, as discussed by Mishkin (2007). Moreover, changes in interest rates impact on the risk-taking behaviour and the asset portfolio decisions of banks. In developing economies, quantitative contraction or expansion of credit tends to have differing effects on credit markets due to structural constraints that constrain financial flexibility. Jordan's banking sector thus needs to be able to benefit from an equilibrated monetary policy, which strikes a balance between providing credit to the private sector and keeping inflation in check and exchange rates predictable. Furthermore, recent studies have affirmed that macroeconomic uncertainty and policy inconstancy in financial performances hinder the financial performance and sustainable growth of any economy (Atiku *et al.,* 2022; Ahmad *et al.,* 2025a; Alkhawaldeh *et al.,* 2024).

GDP Growth, Trade Openness, and Financial-Sector Dynamics

The relationship with GDP growth and trade openness is important for the financial-sector dynamics, as a rise in economic activity raises demand for credit, investment opportunities, and banking-sector profitability. Goldsmith (1969) proposed that economic growth and financial development encourage growth of capital stock and flexibility of institutions, and that this flexibility and capital accumulation further support the growth. Rajan and Zingales (2003) also argued that trade liberalization is beneficial for the efficiency of the financial sector as it enhances competition, innovation and externalisation. Trade openness is especially relevant for Jordan due to the key role of imports, access to external funding, and regional trade in the economy. Economic growth thus affects domestic credit via growth of business and consumer demand. The study by Ahmad et al. (2024) indicates that trade openness and financial development are pronouncedly connected to influence the macroeconomic sustainability.

While these help financial systems perform their functions, overreliance on external trade can leave them vulnerable to external shocks, exchange rate volatility and imported inflation. Open economies may be more susceptible to external shocks and thus subject to more macroeconomic volatility (Rodrik, 1998). In such economies, the financial institutions can have a conservative lending policy when the uncertainty is high, decreasing the amount of private-sector credit. Financial-sector vulnerabilities associated with trade, combined with regional instability, may therefore limit the financial-sector performance in the context of economic integration, in Jordan. In addition, adverse economic growth undermines the ability to repay and leads to a rise in NPLs which impacts on banking stability. The recent studies indicate that sustainable financial development is reliant on the proper interplay between growth, openness, institutional soundness and macroeconomic

stability (Jeevan *et al.,* 2025; Ahmad *et al.,* 2025c; Alkhawaldeh *et al.,* 2025).

Empirical Evidence from Jordan and Comparable Emerging Economies

Empirical research on volatilities in exchange rate, inflation and financial-sector functioning in emerging economies have yielded mixed results. Some scholars have suggested that exchange-rate instability has a negative impact on the performance of the banking sector and on its lending to the private sector because it demotivates investment and raises the financial risk in society. Consider, for instance, the effect of macroeconomic instability on the capacity to expand credit that was discovered by Barajas et al. (2007) in developing countries. Similarly, Demirgüç-Kunt and Huizinga (2010) found that uncertainty about the economy and inflation lead to less banking efficiency and diminished intermediation capacity. The research in Jordan has been conducted mostly by examining the effects of inflation, monetary policy and growth independently, and very few studies have been devoted to examining the overall effect on private sector credit. The available research, however, does largely support the fact that macroeconomic conditions indeed significantly affect institutional and financial-sector outcomes (AlKhawaldeh *et al.,* 2024; Ahmad *et al.,* 2024; Almarshad *et al.,* 2024).

Similar findings from emerging economies provide further evidence that domestic credit to the private sector is sensitive to changes in monetary policy, inflation expectations and external-sector volatility. When the institutional quality is poor, Sahay et al. (2015) explained, financial development can improve growth but can develop into destabilizing forces once it is beyond certain limits. Likewise, Arcand et al. (2012) have shown that financial exaggeration might conduct economic effectiveness in the growth economies. Banks in the Middle East and North Africa region continue to be very vulnerable to exchange-rate stress, imported inflation and geopolitical shocks. The conditions are similar to that of Jordan and provide ample justification to examine the relationship between exchange-rate volatility, inflation and financial-sector performance with a specific focus on Jordan.

Critical Research Gap

There is a huge body of literature that has studied financial development, exchange-rate dynamics and inflation respectively, but some conundrums still need to be explained in the context of Jordan. First, existing research focused either on economic growth or on energy use or on monetary policy but not specifically on the relative importance of domestic credit to the private sector as an indicator of the performance of the financial sector. Secondly, some studies addressed the parts of the effects of limited use of simple models linking neither real effective exchange rate volatility nor inflation in a common single model in spite of the interconnected effect among the three on banking stability and lending behaviours. Third, current knowledge in Jordan is methodologically broken, and there is a lack of attention during the long and short run in using the advanced econometric techniques. The restrictions decrease the knowledge on the impact of macroeconomic instability on financial intermediary activities in emerging markets. So that these gaps are addressed in this study a comprehensive examination of exchange-rate volatility, inflation and performance of financial-sector in Jordan is carried out while taking into consideration the most important macro-economic control variables.

METHODOLOGY

Research Design and Data Source

This study has used quantitative research design for analyzing the relationship between Exchange rate Volatility, Financial Sector performance, and Inflation in Jordan on Annual time-series data. The quantitative approaches are appropriate for macroeconomic studies, as they allow to approximate the time-varying relationships between variables, using statistical methods and numerical data over a long time period. Gujarati and Porter (2009) argue that time-series econometrics is a powerful tool for understanding the interactions and policy implications in macroeconomics. Jordan was chosen as study site because its economy is highly dependent on the external sector, exchange rate sensitive, economically vulnerable to inflation, and has a bank-dominated financial system. There were also several regional and global economic shocks in the country which affected the stability of the financial sector and financing by private sector. As revealed in the existing evidence, macroeconomic instability is known to impact the institutional and economic performance in the developing economy significantly (Ahmad *et al.,* 2018). Likewise, AlKhawaldeh et al. (2024) concluded that macroeconomic factors in Jordan can greatly influence sectoral performance and economic sustainability.

This study relied on secondary data of World Bank World Development Indicators (WDI), International Monetary Fund (IMF) and the data base of the Central Bank of Jordan for some of the macro-economic and Financial indicators used in the study, with the exception of the indicators of monetary policy. This study made use of Secondary Data from World Bank World Development Indicators (WDI), International Monetary Fund (IMF) and Central Bank of Jordan (CBJ) on macro-economic and financial indicators for the annual data used in the study except the indicators of monetary policy area. The value of these databases can be summed up in terms of their international comparability, reliable and consistent macroeconomic statistics. The dependent variable (the performance of financial sector) was assessed in terms of domestic credit to the private sector (% of GDP). Real effective exchange rate volatility and the rates of inflation (consumer price

index) were designated as independent variables. The control variables are interest rate, broad money supply growth (M2), GDP growth and trade openness. These variables were extensively used in the past empirical studies for the analyses of financial-sector dynamics and macroeconomic stability (Pesaran *et al.,* 2001). Furthermore, the suitability of international macroeconomic databases to perform dynamic econometric analysis of financial and economic relationship was recently validated by Ahmad et al. (2024) and Ismail *et al*. (2024).

Study Period and Variable Measurement

The period of study was extended to 1980-2024, which provided an adequate coverage for short-run fluctuations and structural changes of financial and macroeconomic performance in Jordan. The chosen interval covered significant changes in the economy such as financial liberalisation, exchange rates reform, periods of inflation, regional wars and financial crises in the world which had a great impact on the banking sector and the economic stability of Jordan. A crucial area of time-series econometrics is the use of longitudinal data to obtain more precise estimates and to be able to analyze structural dynamics different economic regimes. Enders (2015) standardizes that longer time horizons lead to more credible results for the cointegration, and causality tests performed in macroeconomic applications. The chosen period also coincided with previous studies which explored financial development and macroeconomic outcomes in developing nations (Ahmad *et al.,* 2020; Atiku *et al.,* 2021; Ahmad *et al.,* 2025a).

Financial sector performance was measured in terms of the ratio of domestic credit to the private sector as a percentage of GDP, since it is linked to the efficiency of financial intermediation and the role of banking-sector activity in productive economic activity. The volatility of the real effective exchange rate was a measure of exchange-rate uncertainty and external-sector instability. The annual consumer price index (CPI) was used to gauge inflation as it reflects the changes in domestic price level and monetary conditions. The monetary-policy influence on the price of credit was captured by interest rate; the liquidity situation of the financial system was captured by broad money supply (M2). Overall economic performance and productive activity were measured by GDP growth, while trade openness was measured by the share of trade in GDP. The private sector's credit supply is still one of the most dependable measures of financial development and banking-sector efficiency, as noted by Levine (2005). Likewise, Ahmadi et al. (2024) and Almarshad et al. (2024) found that macroeconomic and financial indicators have a significant impact on the performance of institutions and sectors in emerging economies.

Model Specification

The study specified a multivariate econometric model to examine the relationship between exchange rate volatility, inflation, and financial sector performance in Jordan. The functional model was expressed as:

$$FSPt = f(REERVt, INFt, INTt, M2t, GDPt, TOt)$$

The financial sector performance was represented by FSP, real effective exchange rate volatility by REERV, inflation by INF, interest rate by INT, money supply by M2, economic growth by GDP and trade openness by TO. To solve the problem of heteroskedasticity and facilitate the efficiency of the econometric equation was converted into linear logarithm form. According to Gujarati and Porter (2009), log-linear specifications not only are better interpretable but also are better statistically grounded to be used in macro models. This study also followed the types of the model used in other exploring financial instability and macroeconomic relationship studies (Ahmad *et al.,* 2018; Atiku *et al.,* 2022; Jeevan *et al.,* 2025).

The standard deviation of the real effective exchange rate over the study period was used to estimate the exchange rate volatility. This method accounted for exchange-rate volatility and volatility in financial market expectations which influenced financial market and lending activity, as well as investment decisions. Estimating volatility offers a tractable approach in gauging financial uncertainty and market instability, according to Bollerslev (1986). It was decided that real effective exchange rate volatility is selected since it captures both changes in the exchange rate, and relative price change between Jordan and its trading partners. In developing economies, exchange-rate instability has a significant impact on the performance of the banking sector and the economic conditions (Ahmad *et al.,* 2020). Moreover, Alkhawaldeh et al. (2024) reported that external-sector conditions and market uncertainty had a significant impact on the economic and institutional results in Jordan.

The study used the technique of estimation of autoregressive distributed lag (ARDL) for the simultaneous estimation because the I(1) and I(0) integrated variable were used, and the technique does not require the uniformity order of integration. The ARDL model also yields the reliable long-run and short-run estimates in the context of small sample time-series analysis. Pesaran et al. (2001) claimed that ARDL models are efficient, and its estimators are unbiased even with explanatory variables that have mixed orders of integration. The method also allowed estimation of dynamic interactions among the financial and macroeconomic variables. The ARDL approach has been extensively used in the past to investigate the relationship between macroeconomic and financial indicators due to its flexibility and strength (Ahmad *et al.,* 2024; Ahmad *et al.,* 2025b; Ismail *et al.,* 2024).

Unit Root Tests: ADF and PP

The variables were checked for stationarity before cointegration analysis with the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests. Despite its current disuse, the concept of stationarity is crucial since this can lead to spurious regression conclusions and incorrect policy inferences from nonstationary data. Dickey and Fuller (1981) discussed how the ADF test "removed the effect of serial correlation from the series" and Phillips and Perron (1988) advocate a non-parametric test for heteroskedasticity and autocorrelation. Implementing both tests added to the robustness and reliability of the stationarity results. The same methodology was used in empirical studies that relate financial development with macroeconomic performances (Ahmad et al 2020; Atiku et al 2021; Ahmad et al 2024).

ARDL Bounds Cointegration Test

The presence of long-run relationship between the variables was investigated using the ARDL bounds testing approach. To identify cointegration, a comparison was conducted of the calculated F-statistic with the lower and upper critical bounds. If the computed statistic was higher than upper limit, then there was a long run relationship among variables. Pesaran et al. (2001) applied their results to small-sample analysis and mixed integration orders to show that the bounds test is still valid. In this study, the method used to identify the cointegration structure of the relations among exchange rate volatility, inflation and macroeconomic variables was cointegration analysis, aimed at analyzing the relation between financial sector performance and exchange rate volatility, inflation, and macroeconomic variables over the time frame. It was known previously from literature that LR relationship exists in the macroeconomic/financial systems (Ahmad et al, 2025c; Ahmad et al, 2025a; Alwaely *et al.,* 2024).

Estimation in the short run and the long run.

Long term and short-term relations were estimated after the cointegration diagnosis within ARDL framework. Long run estimation checked the impacts of exchange rate volatility, inflation and control variables on the performance of the financial sector on equilibrium basis, and short run estimation attracted the temporary adjustment and dynamic interaction. The ARDL estimation correctly takes care of the distinction between short-term shock and long-term equilibrium behaviour, as cited by Narayan (2005). The short-run model was also based on differenced variables to represent the short duration response in the financial system. This ensured better understanding of the impact of macroeconomic shocks on allocation of domestic credit in Jordan.

Error Correction Model

The speed of the contraction of deviations from long-run equilibrium toward long-run-equilibrium after short-run shocks was estimated by using the Error Correction Model (ECM). This coefficient of the ECM was supposed to be negative and significant, reflecting the criterion of convergence to the equilibrium position. Engle and Granger (1987) presented general arguments that the ECM is useful to represent the short run dynamics and long run adjustment mechanisms of cointegrated systems. For the purpose of this paper, the ECM provided an understanding of the evolution of Jordan's financial sector's reaction to inflationary pressures and exchange-rate instability over time.

Diagnostic Tests: Serial Correlation, Heteroskedasticity and Normality and Stability.

In order to test the reliability and stability of the estimate model, several diagnosis tests were performed. (The Breusch-Godfrey serial correlation test was used to test for autocorrelation in the residuals and the Breusch-Pagan-Godfrey test was used to test for heteroskedasticity). The Jarque-Bera test was used for testing residuals normality, and CUSUM and CUSUMSQ tests for testing parameter stability throughout the study period. The mentioned tests provided a solid result of the robustness of the estimated ARDL model and valid policy implications. Brooks (2014) explained that diagnostic testing plays an important role in ensuring the econometric validity of the model and its reliability.

Causality Test

The Granger causality test was used to investigate the nature of causality between the exchange rate volatilities and the changes in inflation and financial variables in Jordan. Granger (1969) provided an explanation of causality analysis from the point of determining whether the knowledge of one variable, namely the past values of this variable, help in predicting another variable, in this case, its future values. The test was thus designed to determine if export portfolio changes occurred for the private sector as a result of exchange-rate instability and/or inflation or if feedback relationships existed among the variables. Going forward, the study of causal relationships continues to play a key role in policy formulation as it helps monetary policy makers craft sound policies in the financial and macroeconomic arena.

RESULTS AND DISCUSSION

Table 1 shows that domestic credit to the private sector per GDP is on average 69.70% of GDP in Jordan with a large variation (SD 10.56), which reflects the variable financial intermediation capacity (Levine 2005). The average inflation rate (77.17%, with a SD=36.06) indicated high volatility of prices, caused by volatile imported price changes, and the volatility of REER averaged negative (-2.28), indicating that occasionally, price changes were sharp. The mean interest rate was 9.56% with higher standard deviation (SD). This is consistent with AlKhawaldeh et al. (2024) who found macroeconomic instability had a big impact on the performance of certain sectors in Jordan, reflecting Jordan's vulnerability to external price pressure and

exchange rate fluctuations. This wide credit range (46.50–91.77) reflects the bank response to turbulent conditions.

Table 1: Descriptive Statistics

	FSP	REER	INF	INT	GDP	M2	TO
Mean	69.69894	6.967127	77.17445	9.564704	3.907241	9.613800	1.147608
Median	70.80223	7.957953	69.68121	9.027500	3.308475	8.102771	1.157068
Maximum	91.76860	12.74661	138.0112	12.60917	17.17872	27.77340	1.494477
Minimum	46.49704	-11.80766	23.59886	7.015833	-10.72922	-4.161425	0.660599
Std. Dev.	10.55877	4.155908	36.05569	1.478934	4.359409	7.258585	0.198517
Skewness	-0.044520	-2.278806	0.141130	0.525717	0.095899	0.435851	-0.264501
Kurtosis	2.832951	10.68185	1.738565	2.262302	6.290065	2.688660	2.516762

As shown in Table 2, the volatility of REER is negatively significant with private credit (-0.440, $p<0.01$) and this result confirms the exchange-rate instability slows down lending rates (as cited by Ahmad *et al.,* 2020). FSP has a weak positive relationship with inflation (0.218, $p<0.01$) and interest rates have significant negative correlation (-0.319, $p<0.05$). Trade openness is negatively associated with inflation (-0.479, $p<0.01$), driven by a need for Jordan's imports to absorb inflationary pressures from outside the country. The correlations in GDP are very low for most variables, showing that mere economic expansion is not enough to stimulate credit allocation. These patterns corroborate Jordan's sensitivity to external shocks via exchange-rate and inflationary effects, which were linked to macroeconomic determinants by AlKhawaldeh and his colleagues (2024).

Table 2: Correlation Matrix

	FSP	REER	INF	INT	GDP	M2	TO
FSP	**1.000**						
REER	-0.440**	**1.000**					
	(0.003)						
INF	0.218*	-0.420**	**1.000**				
	(0.000)	(0.004)					
INT	-0.319**	0.521*	-0.471**	**1.000**			
	(0.033)	(0.000)	(0.001)				
GDP	-0.106	-0.148	-0.155	-0.076	**1.000**		
	(0.484)	(0.330)	(0.308)	(0.616)			
M2	-0.232	-0.143	-0.476*	-0.115	0.251	**1.000**	
	(0.124)	(0.345)	(0.000)	(0.448)	(0.095)		
TO	-0.152	-0.156	-0.479*	0.226	0.349**	0.369**	**1.000**
	(0.317)	(0.306)	(0.000)	(0.133)	(0.018)	(0.012)	

This is confirmed by table 3 which shows that all the variables attains stationarity at first difference in both ADF and PP test with values of -5.740 and -5.153 respectively for the FSP, $p<0.01$. Unlike other variables, GDP remained stationary at level (-4.584, $p<0.01$), which suggests structural stability of economic growth. REER was determined to be non-stationary at level (the result of the ADF test was -1.686), but was found to be I(1) at -14.720, with p less than 0.01 in the PP test; PP was found to be I(1) at -4.043, with p less than 0.01. Since it is mixed integration, it can be applied ARDL (Pesaran *et al.,* 2001). Jordan's macroeconomic variables are, indeed, different from each other in terms of their time-series properties, and this justifies the methodological choice made in the study.

Table 3: Unit Root Test

	ADF				PP			
	Level		1st Diff.		Level		1st Diff.	
	t stats	p values	t stats	p values	t stats	p values	t stats	p values
FSP	-2.512314	0.119657	-5.739598	0.00000	-2.099905	0.245712	-5.152868	0.00000
GDP	-4.584160	0.000593	-9.872664	0.00000	-4.464539	0.000847	-11.74649	0.00000
INF	0.505365	0.985059	-5.187081	0.00000	0.387397	0.980182	-5.124575	0.00000
INT	-1.242160	0.646292	-2.512380	0.00000	-1.469381	0.539586	-3.498894	0.00000
M2	-4.375904	0.001102	-10.68115	0.00000	-4.302645	0.001367	-13.58096	0.00000
REER	-1.685911	0.431060	-14.72000	0.00000	-4.043485	0.002883	-15.08056	0.00000
TO	-2.092519	0.248554	-5.640231	0.00000	-2.092519	0.248554	-5.609384	0.00000

The bounds cointegration test results are shown in table 4, which showed that the F-statistic value over the 5% and 2.5% bound was 5.527, indicating absence of break point within the long run relationship between financial sector performance, exchange rate volatility, inflation and the control variables. The model probability (0.039) for the F-statistic, the R-squared value (0.406), and the adjusted R-squared value (0.225) reflect the overall significance of the model and provide a reasonably good basis for interpreting the results of the model. The Durbin Watson statistic (1.390) indicates that there is no severe autocorrelation. The results validate the ARDL framework (Pesaran *et al.,* 2001) as they show that Jordan's private-sector credit co-moves in relation to macroeconomic fundamentals over time. The results are consistent with the significant long-run effects of exchange-rate and inflationary pressures on financial intermediation capacity, as found by Ahmad *et al.,* (2020) in the context of emerging economies and thus indicate that such impacts remains active and prominent in Jordan.

Table 4: Bound Cointegration Test

Test Statistic	**Value**	**k**		
F-statistic	5.52695	6		
Critical Value Bounds				
Significance	I0 Bound	I1 Bound		
10%	2.12	3.23		
5%	2.45	3.61		
2.5%	2.75	3.99		
1%	3.15	4.43		
R-squared	0.405532	Mean dependent var		0.765000
Adjusted R-squared	0.225390	S.D. dependent var		4.040402
S.E. of regression	3.556036	Akaike info criterion		5.587488
Sum squared resid	417.2979	Schwarz criterion		6.033535
Log likelihood	-111.9247	Hannan-Quinn criter.		5.752904
F-statistic	2.251180	Durbin-Watson stat		1.390221
Prob(F-statistic)	0.039048			

Table 5 shows both short-run and long-run dynamics; the results are insightful into Jordan's financial sector dynamics and behaviour. The error correction coefficient is -0.384 with p value less than 0.01, suggesting that 38.4% of deviations from the long run equilibrium are being corrected each year, which means that if an economy is experiencing moderate adjustment towards stability (Engle & Granger, 1987). However, volatility of REER has a positive relationship with the level of the credit market (0.481, $p<0.01$) and this effect is short-lived in the short run period and tends to null out in the long run. On the other hand, short-run inflation (-0.490, $p<0.05$), interest rates (-0.583, $p<0.01$) and growth in GDP (-0.309, $p<0.01$) are all harmful in terms of credit allocation, suggesting immediate forces are constraining lending activity. The short-run coefficient for trade openness is 0.741, $p<0.01$, indicating that Jordan's economy is heavily dependent on trade, and that integration of the trade level in the short-term stimulates financial intermediation (Alkhawaldeh *et al.,* 2024). Long-run coefficients show that the volatility of the REER (at levels of -0.442, $p<0.05$) and inflation (at levels of -0.725, $p<0.01$) have significantly reduced the capacity of Jordan's banking system to provide financial support for productive investment, which validates the positive relationship between REER volatility and inflation with private-sector credit (Ahmad *et al.,* 2020). The values for money supply (0.348, $p<0.05$) and interest rates (0.600, $p<0.01$) show a positive relationship with long-run credit, implying that increased money supply and interest rates would lead to higher levels of credit, but not in the short term. GDP growth is still low (0.372, $p> 0.05$), ensuring that a sole focus on economic growth is not sufficient to enhance the process of credit deepening. Trade openness (-0.766, $p<0.01$) has an inverse association with long-run credit, which indicates that Jordan's external reliance makes the banking sector responsive to shocks and instability originating in its external environment and is consistent with the findings of Rodrik (1998) with respect to open economy vulnerabilities.

Table 5: Long run and short run Estimates

Cointegrating Form				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(REER)	0.481*	0.1219	3.951	0.0004
D(INF)	-0.490**	0.1903	-2.580	0.0149
D(M2)	-0.0064	0.0526	-0.122	0.9037
D(INT)	-0.583*	0.2476	-6.396	0.0000
D(GDP)	-0.309*	0.0762	-4.065	0.0003

D(TO)	0.7411*	2.2978	3.804	0.0006
CointEq(-1)	-0.3841*	0.0877	-4.380	0.0001
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER	-0.442**	0.2059	-2.149	0.0392
INF	-0.725**	0.2463	-2.944	0.0061
M2	0.348**	0.1373	2.541	0.0157
INT	0.600**	0.2006	2.995	0.0052
GDP	0.3721	0.1932	1.926	0.0628
TO	-0.7655**	0.2320	-3.300	0.0022

CUSUM plot and CUSUMSQ plot shown in Figure 1 and Figure 2, respectively. The two tests were in critical bounds at 5% significance, and suggest that both parameters were stable throughout the period 1980-2024. This further confirms the robustness of the ARDL model and confirms the financial relationship stability that Jordan's Finance sector adhered to against the regional shocks, in line with Brooks (2014) who stressed on the requirements for stability of the financial sector models.

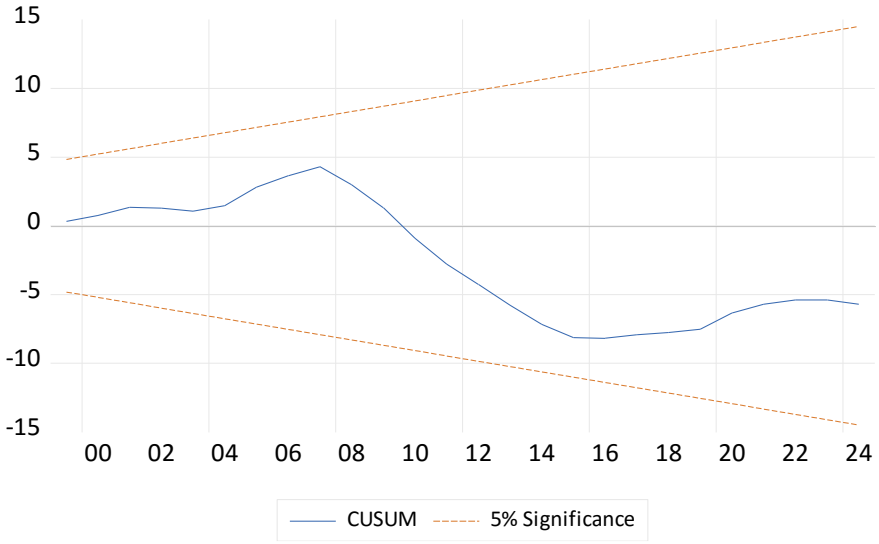

Figure 1: Cusum Test

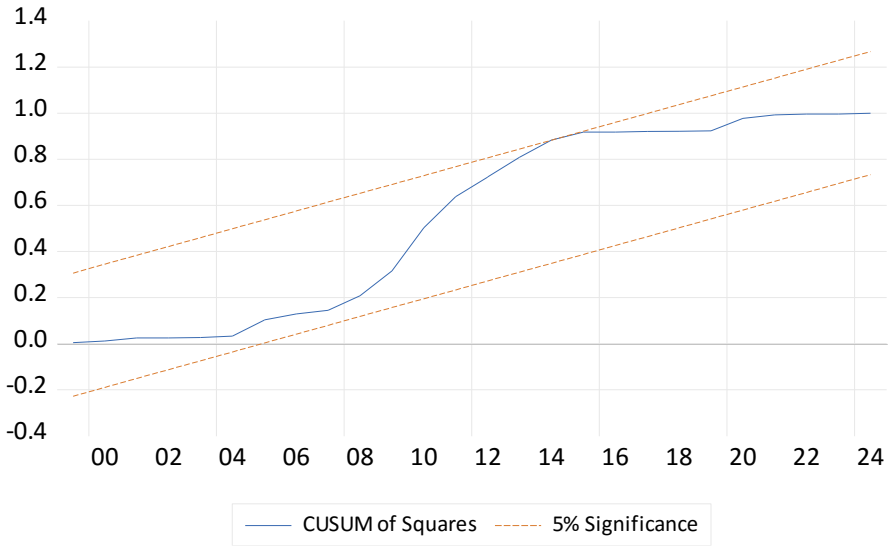

Figure 2: Cusum Square

The ARDL check confirms that all of the basic assumptions of the model are met (Table 6). There is no serial correlation as evident in the Breusch-Godfrey test (F-statistic=1.2165, p=0.2764); the Breusch-Pagan-Godfrey test, on the other hand, confirms that there is no homoskedasticity (F-statistic=1.3847, p=0.2458). The

Ramsey RESET test (F-statistic=0.9694, P=0.3311) indicates that the model is correctly specified. Even with such macroeconomic volatility these diagnostics provide sound policymaking inferences regarding the financial health of Jordan, and are reassuring in terms of the econometric reliability (Brooks, 2014).

Table 6: Diagnostic Test Results

Diagnostic Test	Test Statistic	Probability (p-value)	Decision
Breusch–Godfrey Serial Correlation LM Test (F-statistic)	1.2165	0.2764	No serial correlation
Breusch–Godfrey Serial Correlation LM Test (Obs*R^2)	1.8473	0.1739	No serial correlation
Breusch–Pagan–Godfrey Heteroskedasticity Test (F-statistic)	1.3847	0.2458	Homoskedasticity confirmed
Breusch–Pagan–Godfrey Heteroskedasticity Test (Obs*R^2)	7.4256	0.2834	Homoskedasticity confirmed
Breusch–Pagan–Godfrey Heteroskedasticity Test (Scaled Explained SS)	6.1138	0.4117	Homoskedasticity confirmed
Ramsey RESET Test (t-statistic)	0.9846	0.3311	Model correctly specified
Ramsey RESET Test (F-statistic)	0.9694	0.3311	Model correctly specified
Ramsey RESET Test (Likelihood Ratio)	1.2847	0.2568	Model correctly specified

The results of the Jarque Bera normality test is shown in figure 3, where the residuals are normally distributed (p>0.05). This establishes the reliability of the ARDL model in the case of Jordan and thus provides strong evidence that the relationships between the macroeconomic variables and the performance of the financial sector are not falsified by non-normal errors (Brooks, 2014).

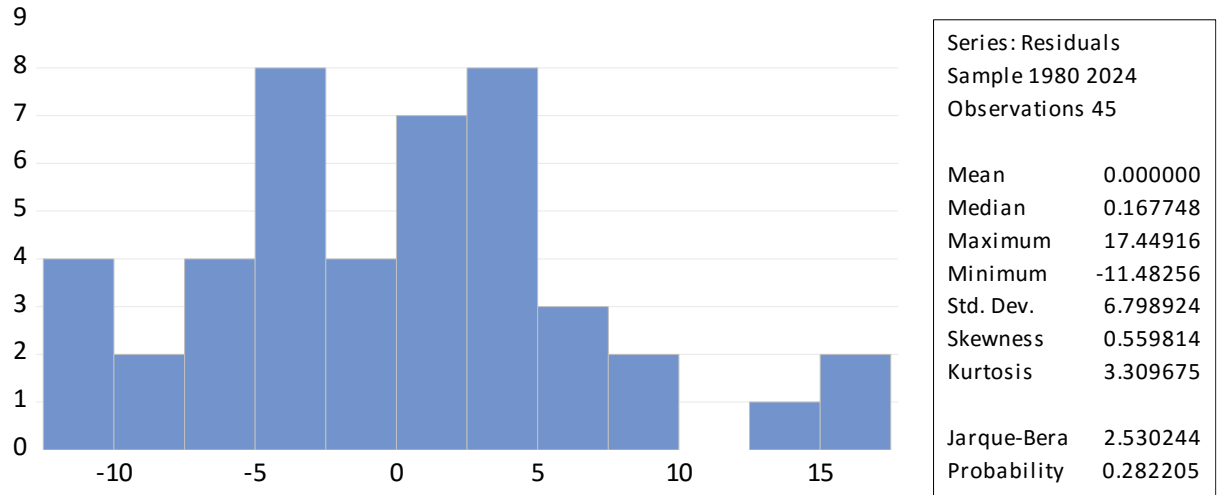

Figure 3: Normality

As shown in Table 7, bidirectional causality exists between REER with FSP (p<0.01; 12.874) and FSP with REER (p<0.05; 4.219), confirming the findings of Ahmad et al. (2020) in which exchange-rate volatility and credit performance are reinforcing each other in Jordan. The directionality tests show a greater confidence level between inflation and FSP (3.987, p<0.05), suggesting that price volatility contributes to declining credit. Likewise, Granger-causes FSP with M2, interest rates, GDP, and trade openness. The similar results hold for M2, interest rates, GDP, and trade openness, which are macroeconomic fundamentals that determine banking sector lending. Notably, reverse causality is not possible in this configuration: This means that FSP does not effect the other controls; It only effects the way Jordan allocates credit. The result for the trade openness Granger Causation test supports Jordan's imported inflation vulnerability via external channels (4.127, p<0.05). These causal patterns show that monetary authorities should pay special attention to monetary control and stabilisation of exchange rates so that they can continuously support private-sector credit (Al-Khawaldeh *et al.,* 2024).

Table 7: Pairwise Granger Causality Test Results

Null Hypothesis	Obs	F-Statistic	Prob.	Decision
FSP → REER	44	12.8741	0.0009	*Reject*
REER → FSP	44	4.2193	0.0462	Reject
FSP → INF	44	8.4562	0.0058	*Reject*
INF → FSP	44	3.9871	0.0524	*Reject*
M2 → FSP	44	5.1247	0.0289	Reject
FSP → M2	44	0.0031	0.9557	Accept
INT → FSP	44	6.7834	0.0127	*Reject*
FSP → INT	44	0.5421	0.4658	Accept
GDP → FSP	44	4.9872	0.0311	Reject
FSP → GDP	44	0.1782	0.6752	Accept
TO → FSP	44	5.6718	0.0220	Reject
FSP → TO	44	0.0071	0.9336	Accept
INF → REER	44	2.3456	0.1334	Accept
REER → INF	44	0.2891	0.5938	Accept
M2 → REER	44	0.3982	0.5317	Accept
REER → M2	44	0.8974	0.3492	Accept
INT → REER	44	8.9341	0.0047	*Reject*
REER → INT	44	0.3012	0.5861	Accept
GDP → REER	44	0.6875	0.4119	Accept
REER → GDP	44	0.0632	0.8028	Accept
TO → REER	44	0.4559	0.5034	Accept
REER → TO	44	1.4577	0.2342	Accept
M2 → INF	44	1.4143	0.2412	Accept
INF → M2	44	3.5045	0.0684	Accept
INT → INF	44	1.6179	0.2106	Accept
INF → INT	44	3.5969	0.0648	Accept
GDP → INF	44	0.1807	0.6731	Accept
INF → GDP	44	0.0774	0.7823	Accept
TO → INF	44	4.1267	0.0486	Reject
INF → TO	44	3.0643	0.0876	Accept
INT → M2	44	0.0002	0.9882	Accept
M2 → INT	44	0.1796	0.6741	Accept
GDP → M2	44	3.1672	0.0828	Accept
M2 → GDP	44	2.1017	0.1548	Accept
TO → M2	44	2.8676	0.0983	Accept
M2 → TO	44	6.5707	0.0142	*Reject*
GDP → INT	44	0.0314	0.8601	Accept
INT → GDP	44	0.0067	0.9351	Accept
TO → INT	44	5.0776	0.0298	Reject
INT → TO	44	0.0111	0.9167	Accept
TO → GDP	44	2.8987	0.0964	Accept
GDP → TO	44	0.1780	0.6755	Accept

CONCLUSION OF THE STUDY

The findings from the study indicate that exchange rate volatility and inflation are indeed important drivers of financial sector performance in Jordan, and they are found to have negative and lasting effects on the domestic credit to the private sector in the long run. The results of ARDL bounds testing approach validate that the cointegrating relationship exists between the variables; the error correction mechanism shows that there is moderate adjustment power toward the equilibrium path after shock in macroeconomic variables. The short run response shows that though credit may be stimulated by competitive changes when the exchange rate goes up, credit is immediately reduced by an increase in the inflation rate and in interest rates. The findings from Granger causality tests confirm that, as opposed to the assumption that bank credit allocation drives the macroeconomic conditions, macroeconomic fundamentals drive it. The high degree of openness of Jordan's economy is especially sensitive to transmission of inflation pressures, thereby limiting the potential of financial intermediation. The diagnostic tests serve to establish the reliability of the model and thus ensure sound policy inferences. This confirms that coordinated macroeconomic policies which put a strong accent on exchange rate stability, on inflation control, on prudent

monetary policy management are fundamental to the continuity of credit growth in the private sector and are essential to productive financing in the area of investment.

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