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Credit market performance and economic security nexus in the UAE: Evidence from various estimation techniques

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ABSTRACT

This study aims to investigate the association between credit market performance and economic security in the United Arab Emirates (UAE) from 1990 to 2023 using various estimation techniques. The Gregory-Hansen cointegration test, ARDL bounds-testing approach, and DOLS, CCR, and FMOLS estimators were employed. Results from the cointegration tests show a long-term relationship between economic security and credit market performance, even with structural breaks. ARDL estimation indicates that domestic credit supply, nonperforming loans, lending interest rates, and institutional quality negatively affect both short-term and long-term economic security. These findings demonstrate that inefficiencies in the credit market, characterized by a rapid increase in credit supply and nonperforming loans, weak institutions, and a high cost of borrowing, pose a substantial challenge to the UAE's economic security and stability. Moreover, the ARDL findings suggest that oil price increases, public expenditure, foreign capital inflows, and real GDP contribute positively to economic security. These findings are confirmed by the robustness of FMOLS, CCR, and DOLS estimations. Based on these findings, policies, measures, and strategies to strengthen credit risk management in the financial sector, control unchecked credit growth, enhance the quality of economic institutions, and sustain the diversification of the economy away from oil and credit risks are recommended.

Contribution/ Originality: To date, no studies have specifically looked at the interplay between economic security and the credit market in the UAE. This study is the first to examine the association between credit market performance and economic security in the UAE from 1990 to 2023, employing a range of estimation methods.

1. INTRODUCTION

The role of a well-functioning credit market in mobilizing and allocating financial resources for sustainable economic growth and development is well established in both empirical and theoretical literature. Following the 2008/2009 global financial crisis, inefficient credit markets have been shown to lead to speculative bubbles, financial instability, and economic downturns (Khan, Siddique, & Sarwar, 2020).

Recognizing the benefits of an effective credit market for long-term growth and stability, the United Arab Emirates (UAE) has implemented policies to transform its financial system, particularly its credit market. Benefiting from its strategic location, its status as a central point for business, capital flow, tourism, and aviation, and its tradition of open trade, the UAE has experienced sustained credit market development since the 1970s. This growth is evidenced by the rapid expansion of credit granted to households, corporations, and public enterprises. Over time, the growth of credit provided to the private sector, measured against gross domestic product (GDP), increased from about 9.76 percent (approximately US$1.437 billion) in 1975 to over 88.41 percent (around US$321.764 billion) in 2020. Similarly, credit to state-owned enterprises rose from roughly 1.95 percent (about US$848.338 million) in 1980 to about 44.66 percent (over US$156.059 billion) in 2020 (World Bank, 2024).

While the significant increase in domestic credit demand can be attributed to rapid population growth, the opening of the residential property sector to foreigners, expansion of free zones, booming tourism, and large-scale infrastructure financing, the rise in credit defaults threatens market stability, which eventually translates to the disruption of the country's economic security (Kumar & Kishore, 2019). Since the global financial crisis, concerns over credit defaults have re-emerged, as shown by a marked increase in the country's nonperforming loans (NPLs). Pre-crisis, the ratio of NPLs compared to total lending steadily dropped from about 13.5 percent in 1998 to 2.3 percent in 2008. In 2009, this ratio increased to 4.3 percent and continued to rise to 8.16 percent in 2020 (World Bank, 2024). The stock of gross NPLs also grew modestly over these periods.

Few would dispute that easy procedures for granting credit to individuals, households, and productive industries demonstrate a central contribution to driving the growth of the credit market in the UAE. The Central Bank of the UAE allows both nationals and foreigners to obtain credit facilities up to twenty times their salary or total income, with repayments drawn from salary, gratuity payments, or other documented sources of income over a period of up to 48 months. Unfortunately, this ease of access, coupled with insufficient credit assessments by financial institutions, has led to rising loan default rates. For instance, recent reports indicate that some Indian borrowers have defaulted on an estimated Dh25 billion (approximately US$6.807 billion) between 2015 and 2021, with many fleeing the country, while others have abandoned assets such as vehicles (Augustine, 2021; Kuruvilla, 2021).

Evidence from the literature shows that excessive credit growth and rising loan defaults often precede financial crises, as demonstrated in the 2008 global financial crisis and the Asian financial crisis (Khan et al., 2020). Disruptions in credit market development have devastating implications for sustainable growth and have reignited debates about the influence of credit market performance on economic security[1]. A well-performing credit market strengthens economic security by ensuring efficient capital allocation and fostering resilience among households and firms during downturns. Conversely, failures in the credit market can result in income volatility, unemployment, and declines in asset values, thereby undermining economic security (Hacker, 2018).

In recent decades, the UAE has experienced rapid credit growth and increasing NPLs alongside significant macroeconomic disruptions, including rising unemployment, higher out-of-pocket health expenditures, and fluctuations in per capita income and aggregate economic activity. These distortions are largely driven by variations in oil and gas prices, highlighting the economy's vulnerability. Although strategic management of oil wealth by Abu Dhabi and diversification efforts by Dubai have reduced the oil sector's relative importance, oil and gas still account for about one-third of the economy and contribute 50 percent of public revenue (Federal Competitiveness and Statistics Authority [FCSA], 2021; World Bank, 2024) thereby influencing income stability.

[1] Economic security is a multidimensional concept encompassing the capacity of individuals, households, or nations to bring a certain level of well-being, stability, and resilience in the face of economic shocks and challenges. It involves access to stable employment opportunities, adequate income, social safety nets, healthcare, education, and the capacity to set aside funds and plan for the future. Economic security is impacted by a range of economic, social, and political factors and is a critical aspect of overall human development and societal stability.

Furthermore, the recent rise in unemployment, especially among youth, coupled with the fact that non-nationals make up more than 80 percent of the labour force poses additional risks to economic security. These developments, together with fluctuations in credit market dynamics, underscore the importance of thoroughly exploring the link between credit market performance and economic security for policymaking.

Building on this context, the study adds new insights to the literature by exploring the effect of credit market performance on economic security in the UAE during the 1990-2023 period. The chosen time frame of 1990 to 2023 is suitable as it covers important stages of economic transformation in the UAE's economy, marked by significant developments in the financial sector alongside substantial volatility in oil prices. This time frame enables the application of advanced econometric techniques due to structural changes, allowing a comprehensive evaluation of the considerable interactions between financial variables and the country's economic security.

The work is significant and deviates from the extant literature in several ways. Firstly, besides being the first attempt to assess the influence of credit market performance on economic security in the UAE, the study also develops a multidimensional economic security index (ESI) following Hacker et al. (2014). By employing a comprehensive ESI rather than selected indicators, the study provides robust outcomes by establishing the long-run and short-run effects of credit market dynamics on economic security in the UAE using a symmetric autoregressive distributed lag (ARDL) econometric technique. Secondly, it also uses various estimation techniques, including canonical cointegration regression (CCR), dynamic ordinary least squares (DOLS), and fully modified OLS (FMOLS), following the ARDL analysis to validate the consistency and robustness of the long-term estimations by addressing potential endogeneity and serial correlation issues. These innovative cointegration procedures offer more effective and unbiased parameter estimates, strengthening the reliability of the ARDL results. Thirdly, this study suggests policy-relevant insights by exploring explicit financial and institutional variables that restrict or boost economic stability in a resource-dependent economy. Lastly, the results aim to offer a clearer understanding of the association between credit market development and economic security, providing policymakers with relevant strategies to enhance both the performance of the credit market and the overall economic security of the UAE.

The remainder of the paper discloses the following: the second section reviews previous research in the field; the third outlines the methodology and data used; the fourth discusses the findings and their interpretation; and the fifth concludes with key insights.

2. LITERATURE REVIEW

Although widespread macroeconomic disruptions stemming from inefficiencies in credit markets have significant implications, limited scholarly attention has been devoted to examining their impact on national economic security. Consequently, empirical research in this specific area remains relatively sparse. However, various researchers have explored the broader economic effects of credit expansion, both within the UAE and internationally. For instance, researchers have analyzed the link between credit supply and economic performance across country groupings based on geographic location, economic alliances such as the BRICS (Brazil, Russia, India, and China) and the Economic Community of West African States (ECOWAS) and levels of economic development. Some of this research reports a positive association between credit growth and economic performance, particularly in BRICS nations and advanced European economies (Garcia-Escribano & Han, 2015; Korkmaz, 2015; Vieira & da Silva, 2023). In contrast, other findings suggest that credit expansion can hinder economic performance (Ozili, Oladipo, & Iorember, 2022; Sassi, 2014). Furthermore, Seifallah and Sami (2014) employing the generalized method of moments (GMM) and pooled mean group (PMG) estimators, observed that credit growth negatively affects short-term economic outcomes but contributes positively to long-term growth, constructed on data from 20 developed and developing economies over the 1960–2009 span.

Moreover, using a panel VAR and two-step system GMM approach on data from 142 developed and developing economies spanning 1995 to 2014, Goaied and Gasmi (2021) found that an increase in household credit allocation tends to hinder economic performance while contributing to a reduction in income inequality, irrespective of a country's development status. In contrast, credit extended to enterprises was shown to positively influence economic performance, though this effect is observed with a one-year lag in developing economies. Similar conclusions have been reported in studies based on alternative country samples and methodological approaches (Léon, 2016; Majeed & Iftikhar, 2019; Sassi & Gasmi, 2014). Additionally, Bui (2020) employed a range of econometric techniques to investigate the nonlinear connection between credit supply and economic performance in six ASEAN nations over the period 2004–2017. His analysis identified an inverted U-shaped relationship, suggesting that while credit growth initially enhances economic performance, exceeding a certain threshold leads to diminishing returns and a subsequent decline in performance.

Furthermore, several scholars have examined the relationship between credit supply, growth, and economic performance at the country-specific level in developed and emerging economies such as Azerbaijan, Indonesia, Malaysia, Saudi Arabia, Turkey, and the United States, finding a strong positive connection (Amali, Alymkulova, & Ejila, 2023; Dişbudak, 2010; Ginting & Widyawati, 2022; Hartarska, Nadolnyak, & Shen, 2015; İsmiç & Şen, 2023; Law, Naseem, Roslan, & Singh, 2021; Osman, 2014; Zeynalova, 2023). In contrast, other studies indicate that credit growth negatively affects economic performance, poverty, and unemployment in some developing and emerging economies such as Indonesia, Libya, and Nigeria (Adekunle & Ayeni, 2021; Amali & Ejila, 2023; Omar, Al-Towati, & Amlus, 2020; Sipahutar, 2016). Tan and Mohamad Shafi (2021) demonstrate that rapid credit supply growth has an insignificant long-term effect while impairing short-term economic performance. For the few studies focusing on the UAE, the findings indicate that credit supply growth spurs economic performance (Al-Malkawi, Marashdeh, & Abdullah, 2012; Shadab, 2021).

In addition, several studies have considered the economic implications of loan defaults and non-performing loans in emerging and developed economies, including Estonia, Latvia, Lithuania, Iran, Turkey, and the United States (Abolhasani, Shaygani, & Jamshidnezhad, 2021; Accornero, Alessandri, Carpinelli, & Sorrentino, 2017; Apan & İslamoğlu, 2019; Casabianca, 2020; Ghosh, 2017; Kjosevski & Petkovski, 2017; Morakinyo & Sibanda, 2016; Ojima & Ojima, 2019). These studies consistently demonstrate that credit defaults adversely affect the efficiency of the credit market. Such inefficiencies, in turn, negatively impact economic performance, further credit supply, employment generation, aggregate and sector-level output and income, and they tend to raise the inflation rate.

Past research indicates that limited attention has been paid to investigating the connection between credit market performance and economic security, both in the UAE and globally. Despite the significant disruptions caused by the 2008/2009 global financial crisis, this area has received relatively little attention regarding how credit market dynamics particularly inefficiencies, affect national economic security. While previous research has shown that credit market development, reflected in the expansion of credit to both private and public sectors, influences key economic outcomes such as growth, employment, income distribution, consumption, investment, and the impact of credit risk and loan defaults, explicit analyses linking credit market performance to economic security remain scarce. Importantly, variables such as credit supply or nonperforming loans alone do not fully capture the efficiency or functionality of the credit market, just as positive economic performance does not necessarily equate to enhanced economic security. To shed light on an understudied issue, this paper closely analyzes how credit market performance has influenced economic security in the UAE between 1990 and 2022. Distinct from prior studies, this research constructs a comprehensive, multidimensional economic security index grounded in the framework proposed by Hacker et al. (2014). Furthermore, instead of relying on a single proxy for credit market performance, the study adopts a more integrative approach, considering a range of factors including credit supply, interest rates, default risk, and regulatory conditions to more accurately assess credit market efficiency.

3. THEORETICAL FRAMEWORK, MODEL SPECIFICATION, METHOD, AND DATA

3.1. Conceptual Basis and Model Design

Although no comprehensive system explicitly clarifies the connection between economic security and credit market performance, this relationship can be explored by adapting the credit friction and market freeze model. This model demonstrates that moral hazard and adverse selection create frictions that hamper the efficient flow of credit from lenders to borrowers (Goldstein & Razin, 2015). When these frictions intensify, a financial crisis may ensue, eventually leading to a credit freeze. As economic conditions deteriorate, borrowing by firms and households decreases sharply, further worsening economic conditions and amplifying the initial shock. In other words, the model suggests that financial crises associated with inefficiencies in the credit market have a major impact on overall economic conditions. With credit rationing and freezes being central features of major financial turmoil, for instance, the global downturn of 2008–2009, these models offer an opportunity to analyze the economic shocks resulting from credit market frictions.

In the literature, the performance or efficiency of the credit market is understood as a nuanced interplay among factors such as credit supply, interest rates, default probabilities, and regulatory frameworks (Claessens, Kose, Laeven, & Valencia, 2014; Gertler & Kiyotaki, 2015). For instance, the domestic credit supplied by banks and other financial institutions to private sectors and state-owned enterprises (dcs) is widely recognized as a measure of how developed and efficient the financial system is (Rajan & Zingales, 1996; Svirydzenka, 2016). Rapid expansion in credit supply, particularly to the private sector, signals increased access to credit and efficient allocation of financial resources toward productive investment, thereby fostering output growth and enhancing innovative activities and human capital (Hainz & Nabokin, 2019). However, excessive lending often precedes major financial crises, indicating that unchecked credit growth may also signal inefficiencies within the credit market (Khan et al., 2020).

Default probabilities, as reflected in nonperforming loans (npl), offer insights into the resilience of the credit market. A high level of NPLs, which signals increased credit risk, can lead to a collapse of the banking sector and may trigger systemic vulnerabilities that cascade through the broader economy, as observed during the late 2000s financial crises (Khan et al., 2020). Elevated NPLs reduce bank profits by increasing provisions, lowering interest income, and raising monitoring expenses, causing a decline in the availability of credit for households and businesses (Foglia, 2021). Interest rates (i), often regarded as the heartbeat of the credit market, reflect the cost of borrowing and are influenced by central bank policies, inflationary pressures, and credit risk assessments (Mishkin & Eakins, 2006). Fluctuations in interest rates have profound implications for both borrowers and lenders, affecting investment decisions and the overall allocation of capital. Higher interest rates can indicate heightened risk perception or tighter credit conditions, potentially impeding economic expansion. Lastly, the regulatory environment, as measured by the quality of economic institutions (iq), significantly influences credit market performance. Prudent regulations are essential for safeguarding against systemic risks and ensuring market integrity; however, overly stringent regulations can stifle credit accessibility and impede economic growth. Therefore, striking a balance between mitigating financial crises and fostering an environment conducive to vibrant credit markets remains a persistent challenge for policymakers (Claessens et al., 2014).

Based on the foregoing discussion, the connection between economic security and credit market conditions in the UAE can be assessed by examining how economic security responds to key elements of credit market performance, including domestic credit supply, loan defaults, interest rates, and institutional quality. To capture this relationship, an econometric model is specified as follows.

$$es_t = \alpha_0 + \beta_1 dcs_t + \beta_2 npl_t + \beta_3 i_t + \beta_4 iq_t + \mu_t \quad (1)$$

Where t denotes time. α is the intercept. β_i is the slope coefficients. μ_t represents a random error term with a mean of zero and constant variance. es is the economic security, dcs is the domestic credit supplied, npl is the nonperforming loans, i is the Interest rates, and iq is the regulatory environment, as measured by the quality of economic institutions.

In addition to these key elements of credit market performance, several other factors influence economic security in the UAE, including oil prices, public expenditure, foreign capital flows, and aggregate economic activities. As a major oil producer and exporter, fluctuations in international crude oil prices significantly impact the UAE's economic security. With the oil and gas sector accounting for about one-third of the economy and generating roughly 50 percent of public revenue, changes in oil prices directly affect individual, household, and national fiscal well-being by influencing the government's capacity to fund social programs (Gong, Liu, Xiong, & Zhang, 2021). Moreover, heavy dependence on oil exposes the economy to volatility in per-capita income and overall economic activity. Furthermore, public expenditure (pex), which funds social safety nets, healthcare, infrastructure, and education (Baicker & Finkelstein, 2011) plays a critical role in enhancing economic security. An increase in social spending can cushion households against economic hardship, redistribute income, and stabilize employment during downturns (Saez & Zucman, 2016). Foreign capital flows (fcf) further affect economic security. While inflows provide vital capital for productive investments and job creation (Baharumshah, Slesman, & Devadason, 2017), sudden outflows may trigger financial instability and crises (Jeanne & Rancière, 2011). Finally, robust aggregate economic activity (y) reduces unemployment, poverty, and income inequality, thereby bolstering overall economic security (Škare & Družeta, 2016). Taking all of these into consideration, the model (1) is re-specified as.

$$es_t = \alpha_0 + \beta_1 dcs_t + \beta_2 npl_t + \beta_3 i_t + \beta_4 iq_t + \beta_5 oilp_t + \beta_6 pex_t + \beta_7 fcf_t + \beta_8 y_t + \mu_t \quad (2)$$

Concerning Equation 2 with regard to the UAE as an economy reliant on natural resources, these nominated variables mirror crucial financial and macroeconomic dimensions that directly impact national stability. Credit-related indicators such as the domestic credit market, nonperforming loans, lending interest rates, and institutional quality are jointly critical in assessing the effectiveness and risk levels within the financial system, which illustrates an essential motive for enhancing economic diversification. Simultaneously, oil prices, public spending, foreign capital inflows, and overall economic activity are the ultimate drivers of economic security in a resource-based economy like the UAE, forming both the fiscal and investment capacity of the country.

3.2. Econometric Techniques

Both the Gregory-Hansen (GH) cointegration testing technique and the ARDL bounds-testing method explore the cointegrating link between economic security and credit market performance in the UAE. The ARDL approach is well-suited for this study over others, as it can handle variables with different levels of integration, which is a common characteristic in macroeconomic time series data analysis over long periods. It allows for the simultaneous assessment of both short- and long-term properties, providing important insights into how credit market variables impact economic security during the study period. Additionally, ARDL is practically effective for small samples and remains robust in the presence of structural breaks, aligning with the focus on the UAE's economy.

The Gregory-Hansen cointegration approach, introduced by Gregory and Hansen (1996) is employed to investigate whether a cointegrating relationship exists in Equation 2, while explicitly incorporating the potential of a single structural shift. This methodology facilitates the detection of the specific timing of structural shifts within the long-run relationship. Gregory and Hansen formulated three distinct models to represent various forms of structural change: a level shift (C), a level shift with trend (C/T), and a regime shift (C/S), with the latter accounting for variations in both the intercept and slope of the cointegrating vector. The method evaluates the null hypothesis of no cointegration, contrasted with the alternative hypothesis suggesting cointegration with a structural break, utilizing modified versions of the ADF, Z_α, and Z_t tests. Rejection of the null hypothesis occurs when the adjusted test statistics (ADF^*, Z_α^* or Z_t^*) surpass the associated critical values, indicating the presence of a stable long-run relationship among the variables, despite the structural disruption.

To enhance the reliability of detecting a cointegrating relationship, the ARDL bounds testing procedure developed by Pesaran, Shin, and Smith (2001) is utilized. This approach exhibits benefits over classical techniques,

particularly due to its capacity to establish cointegration irrespective of sample size and whether the explanatory variables are stationary or follow a unit root process. It relies on a dynamic error correction framework within a single-equation setting, enabling simultaneous estimation of both short-term fluctuations and long-term equilibrium relationships, while also permitting variable-specific lag lengths. Furthermore, the structural break detected using the Gregory-Hansen method is included in the ARDL form, thereby improving the accuracy of the estimates in Equation 2 and offering deeper insight into the underlying long-run interactions.

Generally, a bivariate ARDL model is formulated as:

$$y_t = \alpha + \sum_{i=1}^{p} \beta_i' y_{t-i} + \sum_{i=0}^{p} \vartheta_i' x_{t-i} + \sum_{j=1}^{r} \chi_j' DU_{t,j} + \varepsilon_t \quad (3)$$

Where $t = 1,2 \ldots, T$ is time, i and j represent the lag structure index, $i = 1,2, \ldots, p$; $j = 0,1,2, \ldots, q$. x_t, y_t, and $DU_{t,j}$ represent the explanatory and response variables, and the dummy variable representing the structural change (recognized by the Gregory-Hansen test), respectively. β_i, ϑ_i, and χ_j are the parameters of the lags of y_t, x_t, and $DU_{t,j}$, respectively, and α is the constant, and ε_t is the residual component.

In order to reframe the ARDL model within an error correction form, Equation 3 is Re-parameterizing as follows:

$$\Delta y_t = \alpha + \rho' y_{t-1} + \gamma' x_{t-1} + \sum_{i=1}^{p-1} \lambda_i' \Delta y_{t-i} + \sum_{i=1}^{p-1} \delta_i' \Delta x_{t-i} + \sum_{j=1}^{r} \eta_j' DU_{t,j} + \varepsilon_t \quad (4)$$

Where Δ represents the difference operator; λ_i, δ_i, η_i represent expressions based on the main parameters in Equation 3. $\rho = -\left(1 - \sum_{i=0}^{p} \beta_i\right)$, and $\gamma = \sum_{j=0}^{q} \vartheta_j$.

According to the procedure outlined by Pesaran et al. (2001) the existence of a cointegrating relationship between the variables x and y is assessed by examining the hypothesis that no cointegration exists ($H_0: \rho = \gamma = 0$) compared to the alternative hypothesis suggesting the existence of cointegration ($H_1: \rho \neq \gamma \neq 0$.). To confirm cointegration, the null hypothesis must be rejected, which happens when the F-statistic from the Wald test exceeds the upper critical bound set by Pesaran et al. (2001). If the F-statistic falls between the lower and upper bounds, the outcome is considered inconclusive. Once cointegration is confirmed, the long-run relationship is determined by normalizing the coefficients of the lagged independent variables (γ) with respect to the coefficient of the previous period's dependent variable (ρ), expressed as the negative ratio $-(\gamma/\rho)$. The corresponding short-run dynamics are then estimated by applying a restricted error correction model (ECM) version of the ARDL specification, as follows:

$$\Delta y_t = \alpha + \sum_{i=1}^{p-1} \zeta_i' \Delta y_{t-i} + \sum_{i=1}^{p-1} \xi_i' \Delta x_{t-i} + \sum_{j=1}^{r} \chi_j' DU_{t,j} + \phi \mu_{t-1} + \varepsilon_t \quad (5)$$

Where ϕ denotes the coefficient associated with the error term from the previous period (μ_{t-1}), capturing the rate at which the system reverts to its long-run equilibrium after experiencing short-run deviations. The appropriate lag duration for both the restricted and unrestricted error correction specifications is determined using the Akaike Information Criterion (AIC).

Alongside the ARDL estimation approach, three additional cointegration techniques are utilized to analyze the relationship between credit market performance and economic security in the UAE. These methods comprise the canonical cointegrating regression (CCR) introduced by Park (1992) the dynamic ordinary least squares (DOLS) developed by Stock and Watson (1993) and the fully modified ordinary least squares (FMOLS) proposed by Hansen and Phillips (1990). A key strength of these single-equation cointegration estimators lies in their capacity to mitigate problems such as endogeneity and serial correlation, thereby enhancing estimation efficiency, particularly in small samples (David et al., 2024).

3.3. Data

This research uses annual time-series data spanning from 1990 to 2023. The variables are defined as follows. Economic security is assessed measured using the approach outlined by Hacker et al. (2014) which constructs an index based on the yearly percentage of the population facing a significant income loss (for detailed methodological insights, see (Hacker, 2018; Hacker et al., 2014). Domestic credit supply is measured by the percentage of credit allocated to the private sector and state-owned enterprises by financial institutions relative to GDP. The variable *npl* denotes the share of nonperforming loans in total gross loans. The interest rate, *i*, reflects the lending rate imposed by banks or financial institutions. Institutional quality, *iq*, is represented by a political corruption index, where 0 indicates low quality and 1 signifies high quality. Oil price refers to the annual average price per barrel of Murban crude oil in U.S. dollars. Public expenditure (*pex*) is defined as total federal government spending, measured in billions of U.S. dollars. Foreign capital flows (*FCF*) are represented by the proportion of foreign direct investment inflows relative to GDP. Finally, aggregate economic activity (*y*) is gauged using real GDP over the study period.

The dataset for this research is sourced from credible institutions. Specifically, the economic security index data are gathered from the UAE Federal Competitiveness and Statistics Authority (FCSA), the Central Bank of the UAE, and the UAE Ministry of Economy. Information on lending interest rates is sourced from the yearly economic report published by the Central Bank of the UAE, while oil price data is taken from OPEC's annual statistics bulletin. The political corruption index is provided by the Varieties of Democracy (V-Dem) Institute. Data on public expenditure are sourced from FCSA, and figures on domestic credit supply, nonperforming loans, foreign capital flows, and overall economic activity are sourced from the World Bank's World Development Indicators (WDI) database.

4. FINDINGS AND DISCUSSION

4.1. Preliminary Data Analysis

Before exploring the relationship between economic security and credit market performance in the UAE, descriptive statistics and stationarity properties were computed. Table 1 shows that between 1990 and 2023, the average computed economic security index is 0.006, with a standard deviation of 0.011, and a right-skewed distribution, indicating relatively insecure economic conditions in the country over time. Domestic credit supply averaged US$302 billion, with a significant upward trend and a right-tailed distribution reflecting growth over time.

Table 1. Descriptive statistics.

	Mean	Std. dev.	Skewness	Kurtosis	Min.	Max.	Obs.
es	0.006	0.011	1.46	3.12	0	0.028	34
dcs	302	250	0.194	1.33	25.56	691	34
npl	9.25	4.34	0.055	1.43	2.3	15.7	34
i	6.87	1.86	-0.168	2.84	2.3	10.6	34
iq	0.131	0.031	2.03	5.85	0.108	0.219	34
oilp	52.1	32.5	0.443	1.86	12.7	112	34
pex	61.4	435	0.181	1.19	142	121	34
fcf	2.34	2.25	0.447	2.01	-1.17	6.77	34
y	272	101	0.066	1.68	127	446	34

Note: *es* represents the economic security index. *dcs* refers to domestic credit supply, calculated as the ratio of credit extended to the private sector and state-owned enterprises relative to GDP. *npl* signifies the percentage of non-performing loans in total gross loans. *i* denotes the lending interest rate (Expressed as a percentage). *iq* indicates the level of political corruption, measured by the political corruption index. *oilp* stands for the annual average price of Murban crude oil. *pex* represents public expenditure, expressed in billions of US dollars. *Fcf* refers to foreign capital flow, which is measured by the percentage of FDI relative to GDP. Lastly, y refers to real GDP, measured in billions of US dollars.

The proportion of nonperforming loans averaged 9.25 percent, displaying moderate variation and a relatively flat distribution. Lending interest rates averaged 6.87 percent, with slight left skewness and moderate variability. The corruption perception index (a proxy for institutional quality), with a mean of 0.131, showed strong positive skewness and leptokurtosis. Murban crude oil prices averaged US$52.1 per barrel and exhibited high volatility with a right-skewed, platykurtic distribution. Public expenditure averaged about US$61.4 billion, showing considerable fluctuation and slight right skewness. Foreign capital flows averaged 2.34 percent of GDP, with occasional net outflows, while real GDP averaged US$272 billion with high variability and a nearly symmetric distribution.

To assess whether the series is stable over time, we utilized the ADF, PP, and Zivot-Andrews tests, which are designed to detect the presence of a unit root. The results, presented in Table 2, show that the ADF test identifies the economic security index, lending interest rate, and institutional quality as stationary at the 5% significance level. However, the PP procedure reveals that only the economic security index and political corruption index are stationary at the level. In contrast, both tests indicate that the other variables, domestic credit supply, nonperforming loans, oil price, foreign capital flows, and real GDP, become stationary after first differencing. Since neither the ADF nor the PP tests consider shifts or changes in the underlying data pattern, we conducted the Zivot-Andrews test for robustness. The Zivot-Andrews test results show that only the economic security index and nonperforming loans are stationary at levels at the 1% significance level, while the remaining variables exhibit stability after applying the first difference, based on the 5% significance level. These findings suggest that, except for the economic security index and nonperforming loans, which are I(0) integrated, the Zivot-Andrews test confirms that all other variables are I(1) integrated. Despite variations in the order of integration across these tests, the combination of I(0) and I(1) variables supports the application of the ARDL bounds-testing approach.

Table 2. Results of unit root tests.

		es	*dcs*	*npl*	*i*	*iq*	*oilp*	*pex*	*fcf*	*y*
ADF	Level	-3.60**	-1.32	-1.44	-3.24**	-3.27**	-1.46	-0.69	-1.62	-1.19
	1st diff.	–	-1.65*	-3.30***	–	–	-5.26***	-3.92***	-5.14***	-2.74***
PP	Level	-3.73***	-1.19	-1.06	-2.17	-7.94***	-1.39	-0.69	-1.76	-1.15
	1st diff.	–	-1.65*	-3.40***	-4.54***	–	-5.27***	-3.94***	-5.12***	-2.67***
ZA	Level	-5.40***	-3.53	-5.52***	-3.69	-2.45	-4.59*	-4.56	-5.49*	-2.43
	T_b		2004	2005	2011	2018	2015	2008	2013	2017
	1st diff.	–	-5.44***	–	-5.08**	-7.94***	-6.30***	-6.04***	-5.09**	-5.46***
	T_b		2009		2000	1996	2014	2010	2008	2007

Note: T_b represents the structural break date. The ADF denotes the 1979 method developed by Dickey and Fuller, PP represents the approach introduced by Phillips and Perron, and ZA corresponds to the 1992 technique by Zivot and Andrews that incorporates a one-time structural shift. The ADF and PP methods test whether a time series possesses a unit root, challenging this assumption by proposing that the data may instead follow a stable trend. The ZA procedure tests whether a series contains a unit root, contrasting this with the possibility that the data follow a trend-stable process that includes a single, unspecified shift. Both the ZA and PP approaches are applied under Model A, which incorporates abrupt changes in the series level or intercept. For the ADF and ZA analyses, the most suitable lag length is determined using the Schwarz Information Criterion (SIC) from 1978, with a maximum lag cap of 8. For the PP test, the bandwidth is calculated automatically using the Newey-West procedure with the Bartlett kernel for spectral estimation. The critical values (CV) from MacKinnon (1996) for the ADF and PP tests (excluding intercept and trend) are: -2.6471 (1%), -1.9529 (5%), and -1.6100 (10%) at the 1%, 5%, and 10% significance levels, respectively. The critical values for the ZA test, which considers a shift in the level, are: -5.34 at the 1% level, -4.93 at the 5% level, and -4.58 at the 10% level.

4.2. Cointegration Tests

As discussed in the previous section, we applied the Gregory-Hansen (GH) cointegration test and the ARDL bounds-testing method introduced by Pesaran et al. (2001) to investigate the cointegrating relationship in Equation 2. The results, presented in Tables 3 and 4, show that the ADF* test statistic of -7.99 exceeds the critical value of -4.61 (in absolute value) at the 5% significance level in the GH-1 model (which accounts for cointegration with a level shift). This provides strong evidence to reject the null hypothesis of no cointegration for the GH-1 model. Similarly, the results are robust enough to dismiss the null hypothesis of no cointegration in the GH-2 model,

which includes a level shift with a trend and an unknown break point, at the 5% significance level. However, the findings do not confirm the presence of a cointegrating or long-run relationship in the GH-3 model, which involves a regime change or a full break. These findings suggest that a cointegrating relationship between the variables exists only in the GH-1 and GH-2 models, which incorporate structural breaks in levels and trends.

The structural break identified in 1996 in the GH-1 and GH-2 models corresponds to significant economic events that influenced the UAE's economy and public expenditure during that period. This break date aligns with a positive shock in global oil prices, driven by Saudi Arabia's increased oil supply as part of its strategy to regain market share. The resulting rise in oil prices had a substantial impact on oil-exporting economies, including the UAE. For the UAE, this shock spurred significant economic growth, boosted government revenues, and increased the availability of domestic credit (World Bank, 2024). The expanded fiscal capacity enabled the government to enhance public expenditure on infrastructure, social programs, and economic diversification. The economic growth driven by these factors played a key role in enhancing the UAE's economic security, while also highlighting the country's susceptibility to externalities in the global oil market.

Table 3. Outcomes of the Gregory-Hansen cointegration procedure.

Model	ADF^*	T_b	t-critical	Decision
GH-Level shift component	-7.99**	1996	-5.56	Refuse H_0
GH-Level shift with a trend component	-7.78**	1996	-5.83	Refuse H_0
GH-Regime shift or full break component	-5.73	2001	-6.41	Accept H_0

Note: T_b represents the time of the structural change. Mark (**) indicates the 5% significance level. The critical values are taken from Gregory and Hansen (1996) (Table 1) for m=4.

Similarly, the ARDL bounds-testing results, including a 1996 break dummy and presented in Table 4, show that the F-statistic (9.96) surpasses the upper critical bound value (3.77) at the 1% significance level. This provides strong evidence to reject the null hypothesis of no cointegration between the variables. As a result, it can be confirmed that a meaningful long-term cointegrating link exists between economic security, credit market performance factors, and the chosen control variables.

Table 4. Findings from the ARDL bounds-test analysis.

Lag length	F-statistic	k	n	Bounds	10%	5%	1%
				I(0)	1.85	2.11	2.62
1,1,0,1,0,1,2,2,2	9.9632***	8	32	I(1)	2.85	2.62	3.77

Note: k denotes the count of explanatory factors. Asterisk (***) indicates statistical significance at the 1% level, compared to the critical values outlined by Pesaran et al. (2001). The optimal lag is determined using the AIC.

4.3. The Economic Security and Credit Market Performance Relationship

After confirming a robust cointegrating relationship over the long-run connection between the variables, we proceeded to estimate both the long-run coefficients and the short-run dynamics through the error-correction ARDL form (Equation 5), employing the optimal lag structure of (1,1,0,1,0,1,2,2,2) as determined by the AIC. The outcomes for both the long-run and short-run estimates, as well as the results from post-estimation checks for serial correlation, heteroscedasticity, model specification errors, and normality, can be found in Panels A, B, and C of Table 5, respectively.

The long-run ARDL estimation outcomes, presented in Panel A of Table 5, show that domestic credit supply, nonperforming loans, and poor institutional quality (corruption) have significant adverse effects on economic security in the long run, with significance levels of 1%, 10%, and 5%, respectively. Although the long-term influence of lending interest rates is negative, it is not statistically significant, whereas the short-run model indicates that the immediate influence of lending rates on economic security is both negative and statistically significant at the 1% level. Specifically, a 1% change in domestic credit supply (as a proportion of GDP), nonperforming loans (as a part

of aggregate credits), and a unit increase in institutional quality lead to reductions in economic security by 0.1306, 0.0024, and 0.2584 percentage points, respectively, in the long run. In contrast, a 1% rise in lending interest rates causes a 0.0033 percentage point drop in the short term. These results align with previous studies suggesting that rapid credit growth, increasing loan defaults, high borrowing costs, and widespread corruption can negatively affect economic security in developing and emerging economies (Abolhasani et al., 2021; Akimova, Litvinova, Ilchenko, Pomaza-Ponomarenko, & Yemets, 2020; Balgova, Nies, & Plekhanov, 2016; David, 2024; Ghosh, 2017; Morakinyo & Sibanda, 2016; Sakanko, David, Abu, & Gamal, 2024; Yurkiv & Maslii, 2018; Zhang, Zhang, Zhou, & Zaidi, 2022).

Essentially, the estimation findings show that inefficiencies in the credit market, evidenced by an expanding domestic credit supply, increasing loan defaults, higher borrowing costs, and weak institutional quality, adversely affect economic security in the UAE. For example, although the long-term impact of interest rates is statistically insignificant, the short-term effect indicates that higher borrowing costs reduce investment and consumption, destabilizing economic security. The negative impact of credit supply reflects recent expansion in private sector and state enterprise lending driven by government-led economic diversification, infrastructure investments, and increased private sector participation. Although this increase in credit has fueled growth, it has also exposed weaknesses, particularly in sectors such as real estate, construction, and independent or mid-tier businesses.

Furthermore, the negative long-term association between nonperforming loans and economic security suggests that a sustained increase in nonperforming loans, driven by rising credit supply, signals potential financial instability. These trends are particularly concerning given the UAE's reliance on credit-intensive sectors, as disturbances, such as those during the COVID-19 pandemic, have exacerbated default risks among SMEs vital to economic diversification. Evidence further indicates that excessive credit growth and rapid increases in defaults often precede financial crises. Regarding weak institutional quality, measured by pervasive corruption, the results underscore its critical role in undermining economic stability. Although the UAE has made progress in curbing corruption through strict regulations and transparency initiatives, challenges remain in sectors prone to rent-seeking. Even limited corruption can erode investor confidence by impeding infrastructure development, human capital growth, and public revenue efficiency.

Table 5. ARDL model estimation outcomes.

Panel A: ARDL (1,1,0,1,0,1,2,2,2) Estimated Coefficient over the Long-Run–Regressand: es								
Cons	***dcs***	***npl***	***i***	***iq***	***oilp***	***pex***	***fcf***	***y***
-0.926	-0.131 (-2.704)**	-0.002 (-1.734)*	-0.001 (-0.554)	-0.258 (-2.438)**	0.0004 (5.341)***	0.016 (0.401)	0.002 (1.583)*	0.208 (2.496)**

Panel B: ARDL (1,1,0,1,0,1,2,2,2) Estimated coefficient over short-run-Regressand: Δes		
Regressors	Setting Lag	
	0	1
Δes	-0.4543 (-8.7318)***	
Δi	-0.0033 (-4.5453)***	
$\Delta oilp$	0.0004 (5.2822)***	
Δpex	0.0529 (2.1615)**	-0.0916 (-5.1564)***
Δfcf	0.0003 (0.0024)	0.0024 (2.4989)**
Δy	-0.0766 (-1.1227)	-0.4039 (-5.0868)***
DU_1996	-0.0029 (-0.5234)	

Panel C: Diagnostic test statistics					
ECT_{t-1}	$\chi^2_{SC}(2)$	χ^2_{HET}	$\chi^2_{FF}(1)$	χ^2_{J-B}	$Adj.R^2$
-1.568 (-13.204)***	6.238 [0.125]	25.382 [0.148]	1.007 [0.337]	0.128 [0.938]	0.854

Note: The estimated model draws on 4 previous periods, with the most appropriate number chosen using the AIC. Δ stands for the calculation of value changes from one-time point to the next. Asterisk (***), (**) and (*) represent statistical significance at the 1%, 5%, and 10% thresholds, respectively. In Panels A and B, the t-ratios are shown in parentheses (.), and in Panel C, the probability values for the LM test statistics are presented in square brackets [.]. χ^2_{SC}, χ^2_{HET}, χ^2_{J-B}, and χ^2_{FF} correspond to the test statistics for Breusch-Godfrey serial correlation, Breusch-Pagan-Godfrey heteroscedasticity, Jarque-Bera normality, and Ramsey RESET functional form, in that order.

The estimation results for the control variables indicate that oil prices exert a positive and statistically significant effect on economic security in both the short and long term, at the 1% significance level. A one-unit increase in crude oil prices corresponds to a rise in economic security by 0.0004 percentage points in both time frames. Additionally, the long-term estimates suggest that public spending, foreign capital inflows, and overall economic activity positively influence economic security. However, only foreign capital inflows and total economic activity show statistically significant relationships, at the 10% and 5% levels, respectively. A 1% increase in foreign capital inflows (measured as FDI relative to GDP) and overall economic activity results in improvements in economic security by 0.002 percentage points and 0.208 percentage points, respectively, in the long term.

Furthermore, the short-run ARDL estimation findings specify that public spending exerts an immediate positive influence on economic security, with significance at the 5% level. While the immediate short-run effects of foreign capital inflows and real GDP do not show statistical significance, the delayed effect of foreign capital inflows is positive and significant at the 5% level. On the other hand, the short-run relationship between national output and economic security, when delayed by one period, shows a negative effect and is significant at the 1% level. Overall, the findings show that changes in current public spending and delayed foreign capital inflows enhance economic security by 0.0529 and 0.0024 percentage points, respectively, while an increase in real GDP from the previous period decreases economic security by 0.4039 percentage points.

The positive short-term and long-term influences of oil prices and aggregate spending on economic security highlight how increased oil revenues contribute to the UAE's economic stability. Since oil and gas revenues account for over two-thirds of public income, higher oil earnings allow the government to support vital programs, including unemployment benefits, healthcare, education, and infrastructure development, all of which enhance economic security. However, overdependence on oil revenue also poses risks, as fluctuations in global oil markets could threaten fiscal stability. With proper resource management, surplus revenue can be used to strengthen sovereign wealth funds and help cushion against future economic shocks. Additionally, the positive influence of *FCF* inflows on economic security highlights the critical role of foreign investment in promoting economic stability. These inflows foster growth by introducing advanced technologies, creating employment opportunities, and improving human capital, with further positive effects that strengthen overall economic stability. The long-term positive link between real GDP and economic security also underscores the importance of sustained economic growth for maintaining a stable society. Strategic investments in sectors like infrastructure, technology, and tourism have been a key factor in driving GDP growth, which in turn reinforces the country's economic security.

Lastly, Table 5 shows that the coefficient of the *ECT* lagged by one period (ECT_{t-1}) is -1.568, statistically significant at the 1 percent level, and falls between -1 and -2. The size of this coefficient suggests a quick adjustment of economic security toward its long-term equilibrium, with the possibility of overshooting (Abu et al., 2024; Narayan & Smyth, 2006). This means that if the system moves away from equilibrium by one unit, it will correct by 1.5685 units in the next period, potentially causing oscillations or instability as the system overcompensates and then readjusts. In other words, the system does not move directly or steadily toward equilibrium. Instead, the adjustment process involves dampened fluctuations around the long-term equilibrium. However, once the error correction mechanism settles, the system speeds up its return to the equilibrium state.

4.3.1. Diagnostic Checks and Model Stability Analysis

To evaluate the reliability and stability of the estimated ARDL model, a series of diagnostic tests were conducted to check for serial correlation, heteroscedasticity, normality, and possible specification errors. As indicated in Panel C of Table 5, the results from the Breusch-Godfrey test for serial correlation, the Breusch-Pagan-Godfrey test for heteroscedasticity, and Ramsey (1969) RESET test confirm that the model is free from these issues. Furthermore, the Jarque-Bera test indicates that the residuals of the model follow a normal distribution.

Figures 1(a) and 1(b), which display the CUSUM and CUSUMSQ plots, respectively, indicate that the ARDL model's parameters remain stable throughout the sample period.

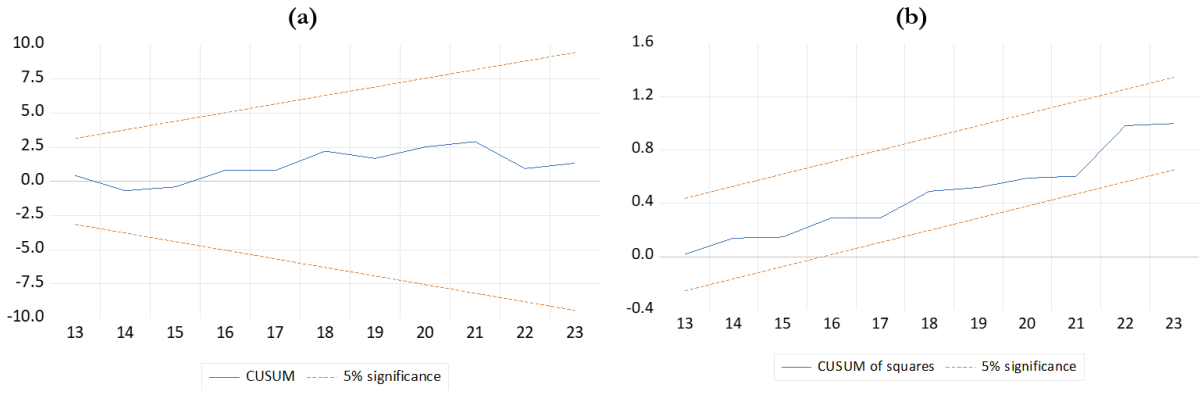

Figure 1. CUSUM (a) and CUSUMQ (b).

4.4. Validity and Reliability Assessment

To verify the robustness and consistency of the ARDL model results, three alternative estimation techniques DOLS, FMOLS, and CCR are employed to examine the long-term relationship between economic security and credit market activity in the UAE. The outcomes of these methods, shown in Panels D, E, and F of Table 6, closely align with the ARDL results. Notably, findings from the DOLS (Panel D), CCR (Panel E), and FMOLS (Panel F) approaches consistently indicate that both domestic credit availability and institutional quality have a significant adverse impact on economic security. Conversely, oil prices and overall economic performance have a meaningful and positive effect over the long term. Additionally, the CCR and FMOLS findings suggest that lending interest rates negatively impact economic security in the long run, while public expenditure and foreign capital inflows support it positively.

In comparison, FMOLS results indicate a strong positive link between nonperforming loans and economic security, while DOLS and CCR point to a significant negative long-term impact. Overall, the consistent patterns and significance levels of key variables across all three methods DOLS, CCR, and FMOLS reinforce the credibility and strength of the ARDL model's findings.

Table 6. Estimates derived from DOLS, CCR, and FMOLS methods.

Panel D: DOLS model outcomes – Dependent variable: *es*								
Cons	***dcs***	***npl***	***i***	***iq***	***oilp***	***pex***	***fcf***	***y***
-1.81	-0.18 (-2.26)**	-0.005 (-2.55)**	-0.001 (-0.26)	-0.239 (-1.94)*	0.001 (3.86)***	-0.013 (-0.22)	0.002 (1.33)	0.349 (2.59)**
Adj. R^2:		0.122						
Panel E: CCR model outcomes – Dependent variable: *es*								
Cons	*dcs*	*npl*	*i*	*iq*	*oilp*	*pex*	*fcf*	*y*
-1.12	-0.172 (-11.29)***	-0.002 (-3.38)***	-0.002 (-4.71)***	-0.312 (-8.73)***	0.001 (17.96)***	0.068 (5.56)***	0.001 (1.78)*	0.245 (9.15)***
Adj. R^2:		0.856						
Panel F: FMOLS model outcomes – Dependent variable: *es*								
Cons	*dcs*	*npl*	*i*	*iq*	*oilp*	*pex*	*fcf*	*y*
0.08	-0.087 (-7.68)***	0.001 (4.57)***	-0.001 (-1.62)*	-0.210 (-7.08)***	0.0004 (19.12)***	0.081 (10.48)***	0.002 (5.66)***	0.046 (2.61)**
Adj. R^2:		0.225						

Note: Asterisk (***), (**) and (*) denote statistical significance at the 1%, 5%, and 10% levels, respectively. Figures in parentheses reflect the corresponding t-statistics. In the DOLS estimation, the long-run variance is derived using a pre-whitening lag selected via the AIC, applying the Bartlett kernel and Newey-West automatic bandwidth, with both lead and lag terms set to 1. For the CCR and FMOLS approaches, the long-run covariance matrix is estimated using a whitening lag determined by the AIC, along with the same kernel and bandwidth methods.

5. CONCLUSION AND POLICY RECOMMENDATIONS

This paper addresses the link between economic security and credit market performance in the UAE from 1990 to 2023, utilizing a range of estimation methods, including the Gregory-Hansen cointegration investigation, the ARDL bounds analysis technique, and the DOLS, CCR, and FMOLS estimators. Additionally, it constructs a detailed, multidimensional Economic Security Index (ESI) using the approach suggested by Hacker et al. (2014). The results from the Gregory-Hansen residual-based cointegration test and the ARDL bounds-testing method strongly indicate a long-term cointegrating relationship between economic security and aspects of credit market performance. Furthermore, the ARDL model findings show that domestic credit supply, nonperforming loans, lending interest rates, and institutional quality have significant negative impacts on economic security in both the short and long term. These findings highlight potential inefficiencies and vulnerabilities in the credit market and emphasize the importance of maintaining sound financial practices and governance. Additionally, the results show that improvements in oil prices, public expenditure, foreign capital inflows, and real GDP enhance economic security in the country. These findings are supported by the FMOLS, CCR, and DOLS estimation results, which confirm the robustness of the analysis. Overall, weak credit market performance, characterized by rising credit supply and increasing nonperforming loans, poses a substantial challenge to the UAE's economic stability.

Drawing from these findings, the study suggests policies and strategies aimed at enhancing credit risk management in the UAE's financial sector to address challenges related to credit risk and the increasing occurrence of non-repayable credit. Moreover, it recommends that the government, through the central bank, take steps to manage unchecked credit growth and reinforce monetary policy to boost the confidence of both local and international investors. Lastly, the study emphasizes the need to prioritize initiatives to reduce reliance on the oil and gas sector to minimize its potential negative impact on the UAE's overall economic security.

While this research advances the field through the development of a comprehensive economic security index and explores the complex relationship between economic security and credit market performance in the UAE, it does have some limitations. A notable limitation is the relatively brief time frame, covering only the period from 1990 to 2023, which is limited due to data availability for constructing the economic security index. Additionally, the focus on the UAE limits the broader applicability of the findings. The reliance on specific time series estimation techniques is also a limitation. Although the techniques employed are robust and appropriate for the analysis, the application of more advanced methodologies could potentially enhance the depth and scope of the findings. Despite these constraints, the study retains its distinct value and relevance for policymaking.

Future studies could expand on this research to gain deeper insights into the intricate link between economic security and credit market performance by extending the time period to include earlier years or by using datasets with a longer time span. Broadening the analysis to encompass multiple economies, especially those with similar economic, political, and social characteristics, could significantly improve the generalizability of the results. For example, examining other Gulf Cooperation Council countries alongside the UAE could shed light on shared challenges and unique policy solutions. Researchers could also adopt advanced estimation techniques to enhance the robustness and applicability of their findings.

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