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Banking Sector Stability in Arab Countries: A Classification-Based Analysis of Banking and Institutional Determinants across Income Levels and Oil-Exporting Status

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استقرار القطاع المصرفي في الدول العربية: تحليل قائم على التصنيف للمحددات المصرفية والمؤسسية عبر مستويات الدخل وحالة تصدير النفط

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Abstract:
This article investigates the factors that determine the stability of banking in 14 Arab countries over the period 2002-2021.It considers bank-specific variables namely, non-performing loans and operational efficiency and institutional factors, including political stability, Legal Rights Index, and credit information sharing Index. The study also accounts for differences in the economic structures of the sampled countries by employing income levels and the degree of oil dependence. To achieve its objectives, the study utilizes data mining techniques; an exploratory data analysis (EDA) was first conducted to identify patterns and variations in banking stability measured by the "Z-Score" To accomplish the aims of the study, the data mining methods were applied. Exploratory Data Analysis (EDA) was performed to determine the patterns and variations in the banking stability index (Z-score) and its correlation with the economic and institutional characteristics of the countries. The research indicated the great divergence in the levels of banking stability of the countries, as well as the relatively high Z-scores in Jordan, Morocco and Libya. The second stage was the Fisher's Linear Discriminant Analysis (LDA) that grouped the countries into three groups by the level of banking stability (low, medium and high) with the overall classification accuracy of 67.9%. Four predictive variables were found to be effective: the country's dependence on oil, the income level, political stability and the credit information exchange index. Automated chi-square interaction analysis (CHAID) was also used with 63.2% overall classification accuracy on the basis of income level and political stability to classify the countries. In general, the findings show that the stability of banking is associated with the interaction of economic, institutional

and political factors rather than with the impact of a single factor. It also pointed out that the income level and political stability are the predictive factors of the levels of banking stability in Arab countries.

Key wards: z- score, non-performing loans, operational efficiency, political stability, Legal Rights, credit information sharing, income level, Fisher and CHAID module.

الملخص:

تبحث هذه الدراسة في محددات استقرار القطاع المصرفي في 14 دولة عربية خلال الفترة 2002–2021. وتأخذ الدراسة في الاعتبار متغيرات خاصة بالبنوك، وهي القروض المتعثرة والكفاءة التشغيلية، إلى جانب عوامل مؤسسية تشمل الاستقرار السياسي، وسيادة القانون، وتبادل المعلومات الائتمانية. كما تراعي الدراسة الاختلافات في الهيكل الاقتصادي للدول المشمولة في العينة من خلال مستويات الدخل والاعتماد على النفط. ولتحقيق أهدافها، تم توظيف تقنيات التنقيب في البيانات؛ حيث أُجري أولاً تحليل استكشافي للبيانات (((EDA لتحديد الأنماط والتباينات في الاستقرار المصرفي –مقاساً بمؤشر "Z-score"وفحص علاقته بالخصائص الاقتصادية والمؤسسية لكل دولة. وأظهرت النتائج تباين ملحوظ في الاستقرار المصرفي عبر العينة، حيث سجلت كل من الأردن والمغرب وليبيا قيماً مرتفعة نسبياً لمؤشر "Z-score ". بعد ذلك تم تطبيق "تحليل التمييز الخطي لفيشر Fisher's Linear Discriminant Analysis (LDA) لتصنيف الدول إلى ثلاث فئات من حيث الاستقرار المصرفي (منخفض، ومتوسط، ومرتفع)، محققةً دقة تصنيف إجمالية بلغت 67.9%. كما حدد التحليل أربع متغيرات كعوامل تنبؤيه فعالة للاستقرار المصرفي، وهي: الاعتماد على النفط، مستوى الدخل، الاستقرار السياسي، وتبادل المعلومات الائتمانية. وبالإضافة إلى ذلك، استُخدمت خوارزمية "الكشف التلقائي عن التفاعل باستخدام مربع كاي" ((CHAIDوقد تم تصنيف الدول وفقاً لمستوى الدخل والاستقرار السياسي، محققةً دقة تصنيف إجمالية بلغت 63.2%. وبشكل عام، تشير النتائج إلى أن الاستقرار المصرفي يرتبط بتفاعل مجموعة من العوامل الاقتصادية والمؤسسية والبنكية، بدلاً من كونه نتاجاً لتأثير عامل واحد بمعزل عن العوامل الأخرى. وتخلص الدراسة إلى أن مستوى الدخل والاستقرار السياسي يُعدان مؤشرين مهمين للتنبؤ بالاستقرار المصرفي في الدول العربية.

الكلمات المفتاحية: مؤشر الاستقرار المالي (Z-Score)، القروض المتعثرة، الكفاءة التشغيلية، قوة حماية الدائنين، مشاركة المعلومات الائتمانية، الاستقرار السياسي، مستوى الدخل، ونموذج فيشر وشيد.

Introduction:

Banking stability is an important aspect of financial stability and economic growth since banks are involved in mobilising savings, allocating funds, offering credit, and payment and settlement. It is indicated by the capacity of the banking system to effectively carry out its activities and enhance its ability to absorb the impacts of economic and financial imbalances and shocks, instead of impeding economic activity. In addition, banking sector stability enhances economic growth by enhancing the capacity of the financial system to absorb internal and external shocks (Tan & Floros, 2013; Balcilar et al., 2018). Decreased banking stability, by contrast, may limit credit, raise costs, and reduce borrowers' and investors' confidence, which can harm economic activity.

The stability of the banking sector is not just determined by the performance of the banks, but also by the quality of the assets and the level of risk. Credit risk is a significant source of vulnerability of the banking sector, and NPLs are its most prominent example. An increase in NPLs indicates a higher probability of borrowers defaulting on their obligations, which results in greater provisions for credit losses, reduced returns on assets and more pressure on capital, which in turn constrains lending growth and resistance to economic shocks. Thus, increased credit risk, as indicated by the ratio of NPLs, is supposed to be associated with decreased banking stability (Ozili, 2025; Taha & Ali, 2026). Operational efficiency is an important internal factor in the stability of a bank. It is a measure of the capacity of the bank to make use of its human, technological and financial resources to provide services and profits at the lowest possible cost, but at the same time, not violating the quality of services and risk management requirements. Operational efficiency can also enhance profitability, enhance reserve capacity and provide margins that enable banks to absorb unexpected losses (Arebo et al., 2024; Hafeez & Sehari, 2025).

However, the differences in the stability of the banking sector of countries are not only due to the internal features of the banks, but also to the institutional and political circumstances of the operation

of banks. The quality of the institutional environment, legal and regulatory frameworks, contract enforcement and protection of creditors' rights may affect the capacity of banks to control risk and enhance lending decisions (Heitz & Narayanamoorthy, 2021). In this case, credit information sharing is a part of the institutional framework of banking stability since it minimises information asymmetry and enhances the capability of the banks to evaluate the creditworthiness of the borrowers, which may enhance the banking stability of assets (Pagano & Jappelli, 1993; Jappelli & Pagano, 2002; Büyükkarabacak & Valev, 2012; Kusi et al., 2017).

In addition, political stability is related to the institutional environment, but it is still an independent variable worth studying, especially in economies exposed to political and security instability. It is an independent analytical dimension that should be studied separately, in particular in economies exposed to political and security instability. Institutional quality is a measure of the efficiency and effectiveness of the regulatory and legal frameworks, whereas political stability is a measure of the capability of a state to provide a stable political and security environment and reduce the likelihood of violence and unrest. This is particularly relevant to the banking sector since the increase in political instability may lead to an increase in economic uncertainty, a reduction in the confidence of investors and an impact on the capacity of borrowers to repay their credit obligations (Al-Shboul et al., 2020; Mabkhout & Al-Wasabi, 2022). Political conflicts and unrest may also impede the implementation of economic and regulatory policies and the capability of public authorities to ensure the effective functioning of financial institutions. Political stability is thus not only a reflection of institutional quality but an independent variable whose influence on the stability of the banking sector may be mediated through a number of economic and security channels. This is why it is valid to examine its effect in conjunction with institutional quality in order to account for the differences in banking stability.

Studying the determinants of banking stability is particularly important in Arab countries because their varying levels of economic development, depth of financial intermediation, and institutional and economic characteristics lead to different impacts across economies. Income level is one dimension that explains this variation; high-income economies, with greater financial resources and more sophisticated banking infrastructure, differ from middle- and low-income economies, which face resource and institutional capacity constraints. (Nugrohowati & Shidiqi,2025; Kaya,2025) confirmed the varying impact of economic and institutional determinants and financial crises according to income levels. Therefore, it is crucial to examine how the impact of credit risk, operational efficiency, institutional quality on banking stability varies by income level.

Furthermore, dependence on oil is an important structural dimension in explaining Arab banking stability, as oil price fluctuations are transmitted to the banking sector through government spending, liquidity, deposits, and credit demand. (Al-Badri & Bektash .2020) demonstrated a causal relationship between oil price volatility and banking sector stability. Higher oil revenues can boost public spending, liquidity, and debt repayment capacity, while lower revenues put pressure on public finances, economic activity, and banking liquidity, particularly in economies whose non-oil sectors rely on government spending. Less oil-dependent economies are affected by shocks through other channels, including energy import costs, remittances, foreign trade, tourism, and investment. Therefore, distinguishing between oil-producing and non-oil-producing economies is crucial for understanding how banking and institutional determinants affect banking stability based on the nature of the economic structure.

In this context, the research gap lies in the fact that previous studies addressed the determinants of banking stability in isolation, without building a unified Arab model that combines credit risk, the strength of legal protection, the quality of the institutional environment, operational efficiency, political stability, income levels, and dependence on oil within a single framework. Furthermore, most previous studies did not address the determinants of heterogeneity between countries, namely income levels and dependence on oil. Another gap also lies in the methodological aspect, as most previous studies have relied on Panel GMM, Fixed Effects, Random Effects, ARDL, and Panel ARDL models (Phan et al., 2022; Assous, 2022; Bouheni & Hasnaoui, 2017; Rabby et al., 2026). The use of decision tree-based classification methods has remained less common in studies, despite evidence suggesting that the CHAID model is capable of identifying the most discriminating variables and revealing nonlinear

relationships and interactions between variables (Podviezko, 2011; Öztürk et al., 2019; Saragih et al., 2024).

Accordingly, this study seeks to address two interrelated gaps: the first is the thematic gap, related to studying banking, institutional, and economic structure determinants within a single model, while the second is the methodological gap, through the application of the Fisher LAD and CHAID models to detect linear and non-linear relationships, and to identify patterns of differentiation between levels of banking stability.

Theoretical Framework:

The stability of banking systems is a pivotal element in achieving financial stability for countries and promoting economic growth, as it contributes to supporting the efficiency of the financial system and its ability to perform its essential functions (Stewart, 2021). This stability also serves as an indicator of the economy's strength and its ability to resist internal and external shocks. A secure and healthy banking system minimizes the risk of banking crises and the high price that would be paid by the real economy as a result of these crises. Experience has shown that financial crises that are associated with the banking sector have a greater impact on growth than other types of crises (Jokipii, 2013). Schinasi (2005) points out that banking stability is associated with the absence of crises in case specific conditions are satisfied. Among these conditions, the most notable are efficient and sustainable resource allocation, efficient pricing and management of risks, and maintaining the functions of the financial system despite external shocks or accumulated imbalances.

In this regard, the literature agrees that banking stability does not arise from a single factor, but rather represents the result of an interaction between banking, institutional, political, and economic determinants that work together to varying degrees across countries and banking systems (Athari et al., 2023; Ozili, 2018). At the banking level (from the credit risk theory standpoint), the risks of banking activity are associated with the borrowers' inability to fulfil their obligations, which means that the quality of the loan portfolio is one of the basic determinants of bank soundness and stability. When the probability of default increases and asset quality deteriorates, non-performing loans and credit losses increase, which puts pressure on the bank's profits and capital and limits its ability to absorb shocks. From this point of view, the NPL ratio may be interpreted as an indicator of credit risk and asset quality deterioration, as it reflects the increased credit losses and provisions, which have an impact on profitability and capital and restrict the capacity of the bank to absorb shocks. Non-performing loans represent an important indicator of asset quality and credit risk that weakens banking stability.

In line with risk theory, empirical evidence shows that asset quality is closely related to stability, as it reflects the efficiency of credit management. Its increase leads to increased risk and undermines the ability of banks to continue to perform their function as an intermediary efficiently. Studies have confirmed that the rise in non-performing loans is associated with a decline in banking stability or an increase in financial fragility, whether through its direct impact on risk or through the deterioration it causes in asset quality and the increased likelihood of default. (Athari, 2023; Taha & Ali, 2026; Ozili, 2025)

It can also be noted that banks' ability to generate profits, absorb shocks, and achieve financial stability depends on operational efficiency. From the perspective of the poor management hypothesis presented by (Berger & DeYoung ,1997), low operational efficiency may reflect weaknesses in management quality and decision-making, leading to deficiencies in borrower evaluation, loan monitoring, and credit portfolio management. This, in turn, results in higher non-performing loans and reduced banking stability. Empirical studies have shown that operational efficiency is a supportive channel for stability. Reducing costs and improving resource utilization enhance the ability to generate profits and absorb shocks (Athari et al., 2023; Aniemeke, 2024). The literature also reveals a close correlation between efficiency and non-performing loans. Loan defaults may be preceded by a decrease in efficiency due to high management costs, and conversely, low efficiency may precede an increase in non-performing loans. This supports the mismanagement hypothesis (Shahriar et al., 2022).

However, despite this, there is inconclusive evidence on the nature of this relationship, with studies tending to go in two different directions. On the one hand, there are studies indicating that there is a significant positive relationship, i.e. high operational efficiency leads to better profitability and lower risk,

thus enhancing financial stability (Hafeez & Sehari, 2025; Arebo et al., 2024; Shahriar et al., 2022). On the other hand, there are studies indicating that there is a negative relationship between operational efficiency and financial stability, meaning that the increased quest for efficiency, especially cost reduction or expansion of activities, may result in enhanced risk and decreased stability (Alam & Yusuf, 2024; Elmahgop, 2024). The relationship is, therefore, not always one-sided, and in some studies in developing economies, efficiency was found to be negatively correlated with stability when cost reduction or expansion was associated with a higher risk propensity (Shahriar, 2022).

Besides the features of the bank, the institutions in which the bank is involved can also influence the ability of the bank to manage risk and stability. According to institutional theory, the quality of institutions is not limited to the existence of rules and regulations, but extends to the effectiveness of their application and enforcement. This determines the efficiency of contracting, oversight, and rights protection, reduces information asymmetry and transaction costs, and improves the lending and repayment environment (Bermpei et al., 2018). Based on this, better-quality institutions should improve the capacity of banks to evaluate and track credit risks and high-risk behaviour, which is manifested in lower credit risk and greater banking stability, but the effect should not be the same in all countries, since the institutional environment will reduce the risks to a greater or lesser extent, depending on the characteristics of the banking system and the level of institutional and economic development, which is confirmed by empirical research in emerging and developing economies (Canh et al., 2021; Rabby et al., 2026).

This mechanism is also related to the Sharing credit information in the context of Information Asymmetry Theory, which describes the function of information sharing in narrowing the gap of information between the banks and borrowers and eliminating the issue of adverse selection and moral hazard. Information on the credit history of borrowers also contributes to enhancing credit ratings and rational lending decisions, thus decreasing the possibility of default and the chances of non-performing loans, which can enhance the stability of banks (Pagano & Jappelli, 1993; Jappelli & Pagano, 2002; Büyükkarabacak & Valev, 2012; Kusi et al., 2017). But the influence of this mechanism is conditioned by the institutional and regulatory framework: the role of Sharing credit information is influenced by governance and concentration (Fosu et al., 2020) and by credit cycles and the level of development (Guerineau & Léon, 2019). At the same time, lessening the asymmetry of information could stimulate the growth of credit and the loosening of lending standards, which can be detrimental instead of advantageous (Dell'Ariccia & Marquez, 2006), as well as the influx of riskier borrowers due to a larger customer base (Brown et al., 2009). This means that the impact of sharing credit information on banking stability (Z-score) is not necessarily completely positive, and it is contingent on the institutional and regulatory environment and the nature of the banking system. This aligns with evidence linking information sharing to banking stability, although its impact varies across different banking environments (Yarso & Ado-Asare, 2009)

In the same institutional context, the strength of legal rights is one of the channels through which institutional quality is transmitted to the credit market. Protecting creditors enhances lenders' ability to enforce their rights and recover their dues, thereby encouraging lending and supporting the depth of the financial system (Boyd et al., 2022). Enforcing guarantees and restructuring management in cases of default also contributes to strengthening lender confidence (Aghion & Bolton, 1992; Hart & Moore, 1998). However, this effect is not necessarily entirely positive: strengthening creditors' rights can support credit and risk-taking, especially where lending is directed towards low-creditworthiness borrowers (Heitz & Narayanamoorthy, 2021). Results may also depend on the legal and institutional setting and banking competition (Arias et al., 2020; Gonzalez, 2023; Biswas, 2019). Weak creditor protection and inefficient bankruptcy and safeguard systems are linked to increased sector fragility, non-performing loans and systemic risks (Bouaziz, 2020).

It can be said that, political stability is also an important precondition for rules, rights and information mechanisms because it lowers uncertainty and strengthens the continuity of institutions and their capability to implement economic and legal policies. This is very true in the Middle East and North Africa region, where political instability has affected economic development, foreign investment and the tourism sector. Political instability and corruption are associated with a decrease in foreign direct

investment, especially in Egypt and Libya, owing to poor governance (Aloui, 2019). Evidence has also been provided in some Arab countries to show the existence of long-term negative correlations between political instability indicators (Elbargathi & Al-Assaf,2019). Political turbulence has also affected tourism planning and development, and the role of crisis management in this regard has been underlined (Issa & Altınay, 2006).

Moreover, the Palestinian issue has been one of the important factors affecting political discourse in some Arab countries, which have added to the overall instability in the region during the second half of the twentieth century. Political stability is thus not a political issue, but a part of the institutional environment in which economic and financial activities take place. As the same context explained, political stability has an impact on economic and financial performance both directly and indirectly through growth and investment channels (Magalhães, 2022; Evan & Bolotov, 2021). It also influences the banking sector in terms of bank profitability, efficiency and stability in the GCC countries (Mabkhot & Al-Wesabi, 2022), but political instability may also increase uncertainty and credit risk and reduce banks' capacity to absorb shocks in the Middle East and North Africa region (Al-Shboul et al., 2020). The example of the GCC countries shows that political stability has been related to political, economic and regional issues such as the type of regime, oil income and regional intervention (Crystal, 2019). Likewise, Ahmed & Mohamed (2025) showed that the Qatar boycott crisis affected the regional banking sector, which underscores the relevance of the relationship between the political environment and bank institutional relationships. Also, the effect of political stability is not only manifested through its direct impact but also through its interaction with institutions and governance quality. There are indications that the effect of political stability on the financial environment may be mediated by institutions and governance quality (Ullah & Zaman, 2024; Chletsos & Sintos, 2024). Such a relationship is not necessarily linear. Ben Ali & Ben Mim (2023) revealed that the relationship between democracy and the stability of the banking system can be U-shaped, and Alim et al. (2024) reported that political instability shocks can lead to increased market volatility. In this regard, the strength of legal rights, credit information sharing and political stability are considered to be related institutional aspects. The strength of legal rights provides contract enforcement and protection of creditors, credit information sharing minimizes information asymmetry and improves credit decisions, and political stability creates the right environment of institutional continuity and rule enforcement. However, such mechanisms can never be similar. Legal protection and share of credit information might enhance credit quality, but they might also lead to credit growth and risk appetite, and their effect may be undermined by ineffective institutions or oversight. As a result, the impact of the institutional environment on the stability of the banks is not determined by one institutional factor, but by the degree of integration of these mechanisms, the quality of institutions and the economic and regulatory context of banks.

It is also important to mention that determinants of stability are not only related to the bank and the institutional environment, but also to the characteristics of the country, especially income and the type of economy (Canh et al., 2021; Athari et al., 2023). Literature suggests that the relationship between the income level of a country and the stability of its banking sectors is not simple and homogeneous. The fact that a country has a higher income level does not automatically make its banks more stable, but it does have an impact on the type and strength of the determinants of stability based on the institutional and economic environment and the level of risk. Athari et al. (2023) found that political, economic and financial risks influence the stability of banks differently depending on income and risk levels, and that the coefficients of banking and macroeconomic determinants vary among income groups. This aligns with the study by Canh et al. (2021), which showed that the impact of institutional quality in mitigating banking risks is more significant in lower-income, less capitalized, and less liquid countries. Evidence also suggests that developing and emerging economies face differences in governance quality and macroeconomic conditions that make their banking stability more sensitive to a wider range of determinants compared to more advanced economies. (Bermpei et al.,2018) showed that institutional quality modifies the impact of banking regulation and supervision on stability in emerging and developing economies, while Alihodžić et al. (2020) found that the determinants of banking stability vary according to the economic and institutional characteristics of the countries studied.

Embroidered studies also show mixed results among income groups. Dienillah et al. (2018) found that financial inclusion significantly enhances financial stability in high-income countries, while the same effect is not observed in low and middle-income countries. Conversely, (Aini &Prasetiantono,2020) showed that the impact of deposits and loans on stability varies according to income level. Deposits are positively, albeit not significantly, correlated with stability in high-income and upper-middle-income countries, while their effect is negative in lower-middle-income and low-income countries. Similarly, loan expansion is associated with decreased stability in high-income countries, with a different trend in low-income countries. A study by Muñoz Mendoza et al. (2020) suggests that some determinants of stability may exhibit non-linear relationships, meaning that positive effects do not persist with higher levels of banking development.The literature also indicates that the relationship between income level and banking stability varies across countries. Capital flows are more clearly associated with credit growth in upper-middle-income countries compared to lower-middle-income and high-income countries (Arslan & Taşkın, 2014), and foreign direct investment flows contribute to financial stability in middle-income countries. Ibrahim et al. (2021) and Aimon et al. (2024) also found a reciprocal relationship between banking stability and economic growth in upper-middle-income, while Abbas et al. (2022) demonstrated the importance of financial development in economic growth, showing a U-shaped relationship between financial development and income inequality. Marguerite & Marozova (2022) also indicated that banking stability may be linked to income inequality, with the quality of institutions being crucial in explaining this relationship.

Consequently, the literature finds that income level does not have a uniform relationship with the stability of banks. High-income economies may enjoy the growth of services and financial inclusion, but credit and some dimensions of financial development may be linked to risks in some of them. On the other hand, low- and middle-income economies can be more affected by governance, macroeconomic risk and regulation and supervision. Income level is thus not necessarily considered a direct cause of stability, but a contextual feature that defines the environment where the bank functions and the direction of the stability determinants. This justifies the distinction between high-, middle-, and low-income countries when analyzing banking stability (Athari et al., 2023; Canh et al., 2021; Bermpei et al., 2018).

In the context of banking, institutional and economic determinants of banking stability, the nature of the economic structure of a country, including its dependence on oil, may affect the nature of the transmission of the shock to the banking system.In this regard, evidence indicates a difference in banking stability levels between oil-producing and non-oil-producing countries, reflecting the importance of the nature of the economy and the degree of dependence on oil in explaining banking stability. The literature has pointed to a relationship between oil price fluctuations and banking stability, particularly in oil-producing countries. Albulescu (2019) noted that a decline in oil prices can negatively impact the banking stability of banks due to its effect on currency value and general economic conditions. Furthermore, prolonged negative shocks in oil prices can affect bank stability. Similarly, (Elbadri & Bektaş,2020) concluded that oil prices positively influence the banking stability of Islamic banks in the GCC countries. Alodayni (2016) also demonstrated that oil price shocks are a major determinant of non-performing loans and banking stability in GCC banks. The Oro & Ekpo study (2020) also showed that the bank-based financial structure in oil-producing countries is associated with slower and more volatile economic growth, highlighting the impact of the nature of the economy on banking stability. It is worth noting that some literature does not provide evidence that oil-based economies enjoy an absolute level of higher or lower banking stability, but rather suggests that dependence on oil reshapes the degree of banks' exposure to economic and financial shocks, and thus may alter the strength and direction of the relationship between stability determinants and bank risk (Mabkhot & Al-Wesabi, 2022; Jan et al., 2025; Taha & Ali, 2026). In GCC countries, oil price volatility has been found to be associated with banking stability, which means that the impact of oil shocks has been transmitted to the economy and banking environment (Mabkhot & Al-Wesabi, 2022). Moreover, not all shocks have the same impact. Evidence suggests that oil supply and demand shocks can have different impacts. Some shocks can increase banking risks, while higher oil revenues during expansion can improve asset quality and reduce non-performing loans in Iraq (Shahriar et al., 2022; Aniemeke, 2024; Taha & Ali, 2026). Less

oil-dependent economies with different sources of income may also not experience the same degree of transmission of oil shocks to the banking sector. This shows that oil dependence is not only an economic feature of a country but can also explain differences in banking stability and in banks' credit risk, efficiency, and institutional environment (Mabkhot & Al-Wesabi, 2022). On the contrary to what was mentioned above, Shajari & Mohebikhah (2012) found no significant difference in the case of banking stability between oil-producing and non-oil-producing countries in general, but stability is different according to the size and type of the bank. They found that the large Islamic banks have greater stability than the commercial banks. They also found that the fact of being an oil-producing country does not have a significant effect on the overall stability of the banking sector.

In this respect, the above indicates that stability is not a single-determinant phenomenon, but the product of interaction between the bank-related features (especially credit risk) and the institutional environment and economic structure. Credit risk theory may perceive non-performing loans as a direct mechanism for the transmission of bad assets to profitability, capital and, ultimately, stability. According to institutional theory, the ability to deal with the risks is not only contingent upon the internal bank capacity, but also contingent upon the quality of the legal and rights frameworks and political stability, which function as mechanisms of reducing information asymmetry and contract enforcement and monitoring. Consequently, the effect of these determinants is not supposed to be uniform in all countries as it may be conditioned on income levels, the nature of the economic structure and the level of oil. This makes the relationship between credit risk, efficiency, institutions, and banking stability context-dependent. This issue is particularly important in Arab economies, which combine diverse banking systems and institutional environments, along with a fundamental difference between oil-producing and non-oil-producing economies in their vulnerability to external shocks. Thus, while the literature generally agrees on the importance of bank-related, institutional, and economic determinants in explaining banking stability, it reveals variations in the direction and strength of these relationships. This suggests the possibility of non-linear or country-specific influences, or influences conditioned by the characteristics of the banking system.

Based on the literature on the determinants of banking stability, the relevance of the choice of models that can explain the nature of the relationships between the determinants and banking stability, as well as the nature of the ability to discriminate and predict stability and instability states, can be understood. In this regard, Fisher Linear Discriminant Analysis (LDA) is a traditional model for predicting bank failures and creditworthiness classification. Past studies have used it as a benchmark for comparison with other classification and prediction models, including statistical models and other advanced models. The study of Perrodo (1993) reviewed the uses of scoring models in the banking sector and compared Fisher's model of Fisher with other options; the studies of Yobas et al. (2000) and Donninelli & Lovaglio (2026) pointed out the significance of the model in prediction of banking risks and comparison of its results with other alternatives. In contrast, the CHAID (Chi-square Automatic Interaction Detection) model is a tree-based classification model which is unique in its capacity to detect interaction between variables and develop classification rules that can explain the relationships between the variables and the categories. In this case, the study by Zuccaro (2010) showed that the model is significant in the analysis of customer behaviour and in the provision of understandable results in decision-making, whereas the study by Wang & Stone (2018) found that it was applicable in credit rating and interaction detection between variables, which would lead to better results when combined with logistic regression compared to logistic regression only. Additionally, Assous (2022) proved the importance of using this model in analysing banking data in situations where the relations between the variables are overlapping or non-linear. Thus, the use of the Fisher and CHAID models in this study is not limited to the comparison of their ability to classify and predict levels of banking stability. It is also aimed at examining the relations connecting the determinants of banking stability in Arab countries to the levels of the latter. The Fisher model can examine relations in linear terms, whereas the CHAID model can offer the chance to show interactions, non-linear relations and thresholds in terms of the effect of internal, institutional and economic determinants. Accordingly, the use of both models gives an integrated view of the differences in the patterns of banking stability in Arab countries during the study period.

Research Method:

Data, Sample and variables:

It was based on a sample of 15 Arab countries during the period of 20 years (2002-2021). The study intended to compare the levels of banking stability and determinants within and among countries and over the years. The GCC countries, such as Saudi Arabia, UAE, Kuwait, Bahrain, Oman and Qatar, as well as Jordan, Egypt, Lebanon, Palestine, Libya, Tunisia, Algeria and Morocco, were also part of the sample.

The sample chosen was based on the availability of data for the variables and the ability to compare countries during the study period. The data are both cross-sectional and time-based, comparing a group of countries over a successive time period, so they are panel data. The theoretical sample has complete data for all countries. The secondary data were gathered through the World Bank and the Global Economy database based on the availability of the economic, institutional and banking variables.

Variables Measurement:

1. **Banking Stability (Z-score):** This is measured using the Z-score index, which combines bank profitability, capital, and return volatility. It is calculated by dividing the sum of return on assets and the equity-to-total-assets ratio by the standard deviation of return on assets. A higher value indicates greater bank stability and a lower risk of insolvency. The index is calculated using the following equation (Chan et al., 2024; Gondwe et al., 2025; Cuadros-Solas et al., 2024). ROA, where $\frac{\mathrm{ROA}+\frac{Equity}{Asset}}{\sigma \mathrm{ROA}}$ where ROA is the return on assets ratio equity/assets ratio, total assets); and sigma ROA is the standard deviation of return on assets

- For analytical purposes, banking stability is classified into three levels: low stability (Z-score < 10), medium stability (Z-score 10–20), and high stability (Z-score > 20). These thresholds are used for descriptive classification purposes in this study and do not represent standardized statistical boundaries or internationally accepted standards.

2. **Non-Performing Loans (NPL):** Measured as te ratio of total non-performing loans to total loan, multiplied by 100, NPL= $\frac{NON\ PERFORMING\ LOANS}{Total\ Gross\ Loans}$×`100. This ratio is used as an indicator of credit risk and the quality of banking assets. A higher value indicates higher credit risk (IMF, 2019; World Bank, n.d.a). NPL= $\frac{NON\ PERFORMING\ LOANS}{Total\ Gross\ Loans}$×`100. Increasing study used this indicator to measure NPL loans level as Mahyoub & Said; 2021; Başarır & Sarıhan 2017).
3. **Credit Information Sharing:** Measured using the World Bank's Credit Information Depth Index, which ranges from 0 to 8, this index reflects the breadth of credit information available to lenders and its accessibility. A higher score indicates greater availability of credit information (World Bank, n.d.b).
4. **Legal Rights Index:** Measured using the World Bank's Strength of Legal Rights Index, which ranges from 0 to 12, this index reflects the extent to which laws governing guarantees and bankruptcy support the rights of lenders and borrowers and facilitate access to credit (World Bank, n.d.c).
5. **Operating Efficiency:** Measured by the Cost-to-Income Ratio, calculated by dividing operating expenses by the sum of net interest income and other operating income, multiplied by 100 as follows:
6. **Operating efficiency =** $\frac{operating\ expence}{operating\ income}$ × 100. A high ratio indicates low efficiency in managing operating costs (World Bank, n.d.).
7. **Income Level (Dummy Variable):** Determined according to the World Bank's classifications based on per capita gross national income using the Atlas methodology. Countries are classified as low, middle, and high income, coded 1, 2, and 3, respectively.
8. **Oil Dependence (Dummy Variable):** This variable is measured by a dummy variable that distinguishes between oil-producing and non-oil-producing countries according to the study's classification. Oil-producing countries are assigned a value of 1, and non-oil-producing countries a value of 2, to test differences in banking stability between the two groups.

Statistical Analysis of Study Data:

The statistical analysis of the data is performed in two stages; the first is by applying Exploratory Data Analysis, which involves using the classical statistical measurements and graphical plots in addition to some inferential methods in order to assess the descriptive measures results. The second stage of the analysis will be the construction of two advanced statistical models and using them to understand the hidden causal relations between study variables and to predict any new future data.

1. **EDA of Data:**

Exploratory Data Analysis (EDA) is a statistical approach usually used in most modern research and studies to examine, summarize, and visualize data to identify its main characteristics, patterns, trends, relationships, and to highlight extreme values before applying "deep" inferential statistical modeling (Gebril, R. S., 2019).

As defined previously, the study data consists of seven independent variables and one response variable, in addition to country name and years. The main goal here is to explore the behavior of univariate and multivariate variables and to understand the distribution of the economic data under study in general.

From Table (1), it can be seen that the average Banking System Z-scores (response variable) value is around 22 units (considering the median), which reflects a general increase in banking system stability for many countries during the study period, and this average is associated with relatively high dispersion (over 12 units, ranging from 6.47 to 66.63) between countries.

As for political stability, the average was (-0.42), indicating low/very low political stability for most study countries, with high dispersion. The average Bank Cost to Income Ratio value (42.17%) shows medium banking efficiency among countries (since it ranges from 20.10 to 86.98). And concerning Non-Performing Loans, the average value (5%) shows a low percentage of non-performing loans in banks, which reflects high efficiency in the loan sector during the study years.

Table (1): Descriptive Statistical Measures of Quantitative Variables

		Political Stability	Bank Cost to Income Ratio	Non-Performing Loans	Banking System Z-scores
Mean		-0.37	42.17	7.35	25.12
Median		-0.42	43.19	5.00	22.06
Std. Deviation		0.88	10.90	5.90	12.33
Minimum		-2.57	20.10	1.00	6.47
Maximum		1.22	86.98	21.14	66.63
Percentiles	25%	-1.05	33.64	3.00	17.72
	50%	-0.42	43.19	5.00	22.06
	75%	9.35	49.99	11.34	30.98
Test of Normality (Shapiro-Wilk P-value)		0.00	0.00	0.00	0.00

And concerning normality, all four variables in Table (1) were found to be approximately normally distributed.

A comparison of the performance of Banking System Z-scores between countries can be explored in Figure (1). From this Boxplot, it can be seen that Jordan, Morocco, and Libya have achieved the highest z-scores of banking system stability among all other countries (with relatively high dispersion levels (also in Algeria) during the years of study), while Bahrain scored the lowest banking stability. The remaining countries of the study were around 20 units of stability, with some minor (lower or/and higher) extreme values.

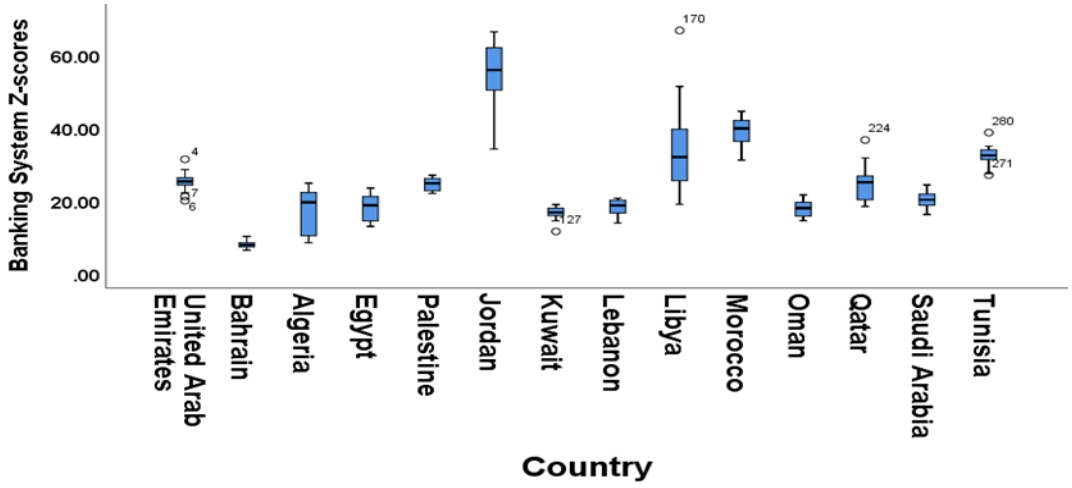

Fig (1): The Boxplots of Banking System Z-scores by Country

The results in Figure (1) indicate a high banking stability index in Jordan, Morocco, and Libya, with a noticeable dispersion in its values, reflecting varying levels of stability among banks within the same country. This can be explained by differences in bank characteristics (Ozili, 2018; Bermpei et al., 2018; Alqahtani & Mayes, 2018). In Jordan, the literature shows that the banking sector is resilient to shocks, but it is exposed to concentration risks and crisis transfer between banks (Al-Shboul et al., 2020). In Morocco, stability is associated with the resilience of the banking system and the institutional environment, although disparities exist among the banks (Ozili, 2018; Bermpei et al., 2018). However, the high value in Libya should be treated with care since it may occur concurrently with large differences in the performance of banks and the impact of the Arab Spring, which was related to risk and declining bank profitability in some countries (Sufian & Habibullah, 2010; Bin Idrees, 2025; Elhajji & Yiannaki, 2025). Conversely, the results revealed a lower banking stability index in Bahrain compared to other countries. This could be associated with the concentration of the banking sector and the transfer of shocks between banks, in addition to the increase in non-performing loans during the Arab Spring and the impact of regional crises (Qatar boycott crisis) (Alqahtani & Mayes, 2018; Ahmed & Mohamed, 2025). Generally, the results suggest that a high average value of the banking stability index does not necessarily imply homogeneity of bank performance or the absence of weaknesses in the sector. The index must be read in light of the dispersion and the institutional, political and structural features of countries.

Again, from Figure (2), no significant differences are noticed between banking stability in most of the study years, but the years from 2006 to 2019 witnessed the presence of minor (higher or/and lower) extreme z-score values.

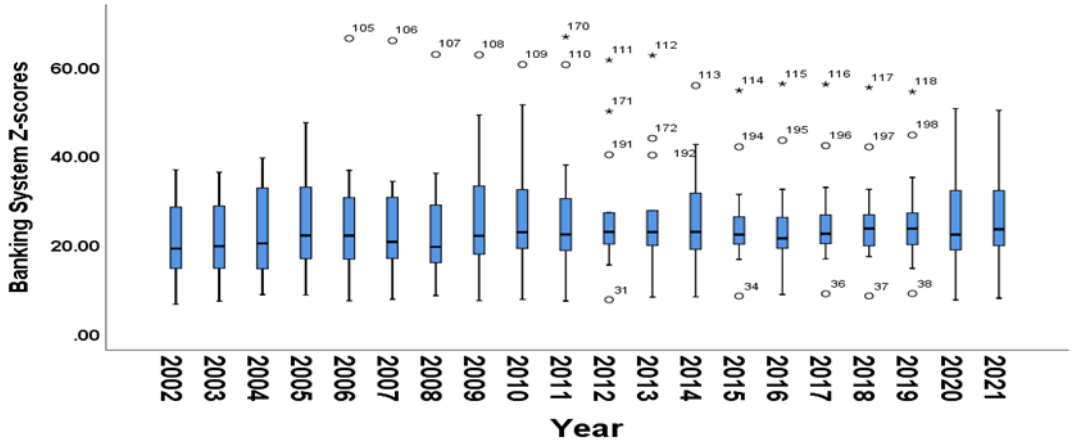

Fig. 2: The Boxplots of Banking System Z-scores by Years

The existence of the extreme high and low values of the Banking Stability Index (Bank stability) presented in Figure 2 from 2006-2019 indicates the ability of Arab banking systems to withstand external shocks. This variation is consistent with the findings of previous studies that indicated differences in banking stability levels and the degree of vulnerability to crises among countries in the Middle East and North Africa region (Ozili, 2018). Some countries in the sample recorded relatively high levels of stability, which can be explained by the strength of their capital bases and their specific economic and institutional characteristics. For example, banking systems in some Gulf Cooperation Council (GCC) countries were characterized by relatively higher levels of stability (Alqahtani & Mayes, 2018; Guidi, 2021). Conversely, other countries experienced a significant decline in the Banking Stability Index, particularly following the global financial crisis and the Arab Spring (Al-Shboul et al., 2020; Guidi, 2021). However, some banking systems maintained relative stability during the study period. Morocco demonstrated relatively high levels of stability, while some Gulf banking systems exhibited limited volatility compared to the economies of countries affected by political unrest. This partly explains the emergence of extreme values at the higher end of the distribution, as opposed to lower values in countries most exposed to shocks. This disparity is consistent with the literature linking banking stability to market concentration, capital levels, governance quality, and exposure to political conflicts (Albaity et al., 2021). Accordingly, the extreme values in Figure (2) reflect the heterogeneity of banking stability among Arab countries, resulting from their varying capacities to absorb shocks and adapt to their repercussions.

In Figure (3), a slight increase can be seen in the Banking System Z-scores for non-oil countries, with a notable amount of dispersion in stability.

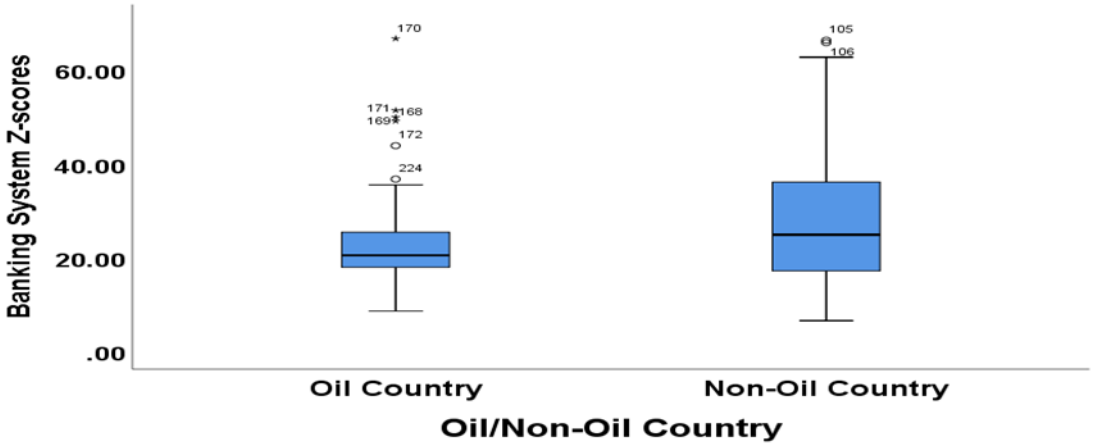

Fig (3): The Boxplots of Banking System Z-scores by Oil/Non-Oil Countries

In addition to the previous data exploration, a brief Correlation Analysis must be done to monitor significant relationships between the response variable and independent variables. This analysis was performed, and no significant linear correlations were found; hence, non-linear correlations are adopted for further analysis. A test of independence was performed using the re-scaled response variable to investigate more hidden non-linear correlations between major variables (Gebril, R. S., (2021).

From Table (2), a significant correlation is noticed (r = 0.35 with P-value = 0), where (31.4%) of the study countries are oil countries and have average banking system stability, whereas (20.7%) of the non-oil countries have high stability levels. This result suggests that oil production may not be an important factor of banking stability.

Table (2): Contingency Table and test of Independence for Banking System Level and Oil/Non-Oil Country

			Oil/Non-Oil Country		Total
			Oil Country	Non-Oil Country	
Banking System Level	Low Stability	Count	37	38	75
		% of Total	13.2%	13.6%	26.8%
	Average Stability	Count	88	44	132
		% of Total	31.4%	15.7%	47.1%
	High Stability	Count	15	58	73
		% of Total	5.4%	20.7%	26.1%
Total		Count	140	140	280
		% of Total	50.0%	50.0%	100.0%
Chi-Square test of Independence					
		Value	P-value		
Chi-Square Statistic		40.01	0.00		
Contingency Coeff.		0.35	0.00		

Figure (3) indicates a lower banking stability index in oil-producing countries compared to non-oil-producing countries, with relatively similar stability levels among oil-producing countries. This can be explained by the vulnerability of their economies to oil price fluctuations, which can weaken borrowers' ability to repay, increase non-performing loans, and affect the quality of banking assets, credit, and systemic risks (Saif-Alyousfi et al., 2018; Alodayni, 2016). Furthermore, the negative effects of oil shocks can be more severe than those of positive shocks, and the associated pressures were evident during the 2014–2015 oil price collapse and the COVID-19 pandemic (Saif-Alyousfi et al., 2018; Saif-Alyousfi et al., 2021). The similarity of economic structures and the reliance of public revenues on oil can help explain the convergence of banking stability levels among these countries, despite the varying degrees of their vulnerability (Qin, 2020; Maghyereh & Al-Shboul, 2022). In contrast, banking stability in non-oil-producing countries is influenced by a more diverse set of domestic determinants, most notably the quality of institutions, regulatory frameworks, governance, transparency, banking competition, and the characteristics of the banks themselves (Miller et al., 2021; Shabir et al., 2021). The differences in these factors may explain the greater variation in stability levels among non-oil-producing countries and banks, without implying that they are free from risk (Apergis et al., 2021).

In Figure (4), it can be seen that countries with upper-middle income tend to score higher values of banking stability in general.

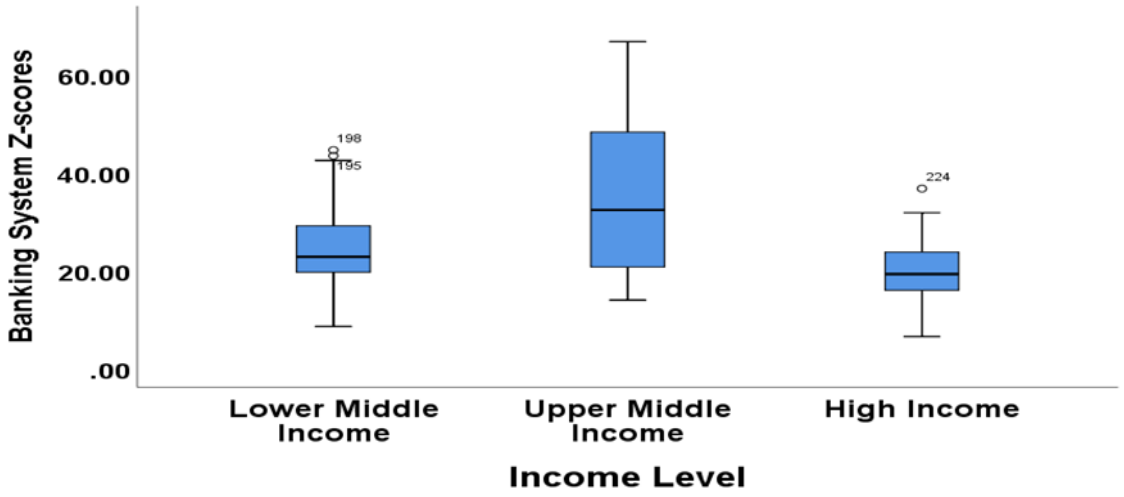

Fig (4): The Boxplots of Banking System Z-scores by Income Level.

Moreover, from Table (3), a significant correlation between the two variables is present (r = 0.50 with P-value = 0), where (24.3%) of the high-income countries have average banking stability and (17.9%) of the upper-middle-income countries have a high banking stability level. This result indicates that the income level of a country does not necessarily refer to a certain level of banking stability.

Table (3): Contingency Table and test of Independence for Banking System Level and Income Level

			Income Level			Total
			Lower Middle Income	Upper Middle Income	High Income	
Banking System Level	Low Stability	Count	18	8	49	75
		% Of Total	6.4%	2.9%	17.5%	26.8%
	Average Stability	Count	42	22	68	132
		% Of Total	15.0%	7.9%	24.3%	47.1%
	High Stability	Count	20	50	3	73
		% Of Total	7.1%	17.9%	1.1%	26.1%
Total		Count	80	80	120	280
		% Of Total	28.6%	28.6%	42.9%	100.0%
Chi-Square test of Independence						
		Value	P-value			
Chi-Square Statistic		93.48	0.00			
Contingency Coeff.		0.50	0.00			

Regarding income levels, Figure 4 shows that high-income countries in the study sample exhibit relatively low levels of banking stability, with greater convergence in performance. This may be connected to the fact that some of these countries are oil-dependent and their banking systems are thus more exposed to swings in oil revenues, economic crises and the effects of political instability in the region (Ahmed et al., 2025). It could also be due to the fact that the economies of these countries are similar in terms of their economic structure (Mabkhot, 2022). Upper-middle-income countries have higher levels of stability and a higher level of variation between banks. This may be related to their relatively lower dependence on oil and to differences in local conditions and bank characteristics, including the diversity of activities, products, business models, and banking strategies (Mansour & El-Moussawi, 2020; Aimon et al., 2024). Digital transformation, structural adjustments, and market liberalization can also contribute to improved banking performance, while differences in the quality of governance, supervision, and the institutional environment led to varying degrees of stability among banks (Mansour & El-Moussawi, 2020; Zaiane & Ben Moussa, 2021). Lower stability in high-income countries does not necessarily mean that all their banks are weak; strong institutions and improved macroeconomic conditions can enhance stability (Theiri, 2026). Furthermore, diversification does not necessarily guarantee stability, as unconventional activities may increase risk, and the relationship between diversification and stability may be non-linear (Saif-Alyousfi & Saha, 2021). Accordingly, greater variability in upper-middle-income countries may reflect actual differences in local conditions and bank characteristics, rather than simply random variation (Athari et al., 2023).

As for political stability (in Figure 5), the UAE, Kuwait, Oman and Qatar had high positive indices, which means that these countries had higher political stability compared to other countries in the study. It can be observed that Lebanon, Algeria, Egypt, Palestine and Libya had the highest negative effect in terms of political stability in the study period.

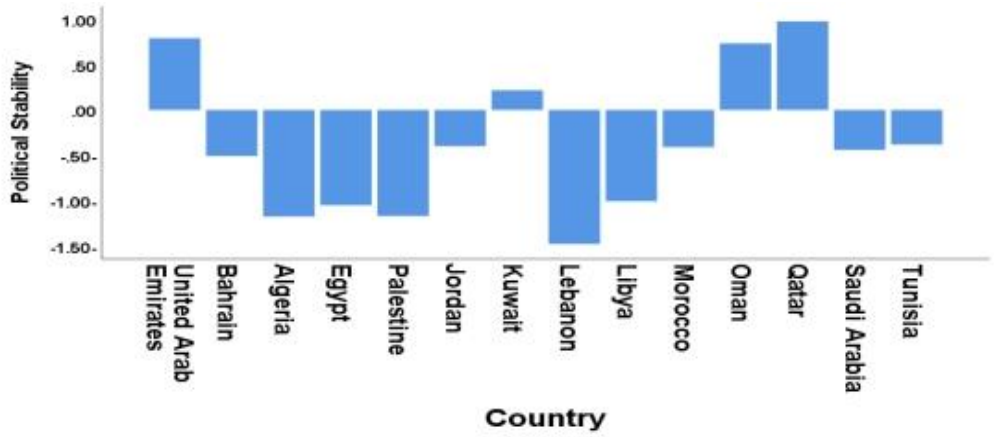

Fig (5): The Bar plot of Political Stability by Countries

Referring to Figure 5, the GCC countries had more political stability than that of Lebanon, Algeria, Egypt, Palestine and Libya. It also reinforced what has been referred to as the "Rentier shield," as the oil wealth of the GCC countries offered an economic safeguard which supported the survival and stability of the political system and limited protests until 2011 (Colombo, 2012; Lucas, 2014).

Such resources also permitted the export of stability in the form of deposits, aid and financial interventions abroad, which does not imply that shocks inside the GCC countries did not exist (Espinoza et al., 2011).

In contrast, the decrease in political stability in other countries was related to the fragility of rentier economies, legitimacy crises and Arab Spring consequences that had a direct effect on financial confidence and the banking sector (A) (Becheikh, 2021; Abdelaziz et al., 2025).

In Lebanon, a confluence of factors during 2019 and 2020 included financial mismanagement, sovereign debt pressures, a loss of confidence in the government, currency collapse, and a severe banking crisis (Mazzucotelli, 2020; Shallal et al., 2021). In Libya, the period following 2011 was characterized by ongoing armed conflicts and civil wars, weak institutions, high inflation, currency devaluation, and declining GDP (Lukyanov, 2023).

In Palestine, political instability has been linked to chronic political constraints, weak sovereignty, internal divisions, and recurring financial crises (Medvedev et al., 2020; Hamdallah, 2026). In Algeria, political instability has been linked to a fragile rentier economy and a crisis of legitimacy (Ouaissa, 2020; Kilavuz et al., 2023). Similarly, Egypt experienced a decline in stability after 2011, amidst a general state of instability and political conflicts coinciding with the repercussions of the Arab Spring (Becheikh, 2021).

Again, the Political Stability index decreases dramatically in non-oil countries (Figure 6), and also decreases in countries with lower and upper middle-income levels, while it increases in high-income countries, indicating the presence of a high correlation between political stability and each of the oil countries and income levels.

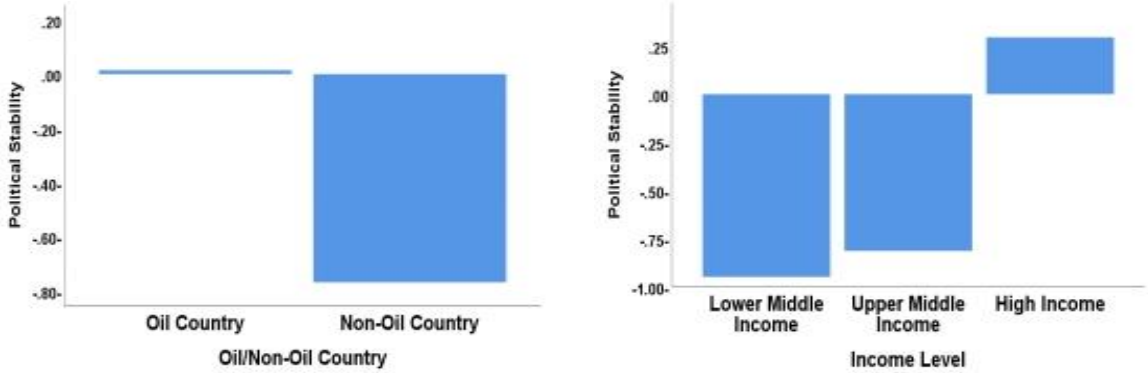

Fig (6): The Bar plots of Political Stability by Oil/Non-Oil Countries (left panel), and Income Level

(Right panel) Figure 6 suggests that the Arab states under study, both oil-producing and high-income, have recorded higher levels of political stability compared to non-oil-producing states and upper-middle-income or lower-middle-income states. This disparity can be explained by the literature discussing the relationship between rentier resources, development levels, and political stability (Ulrichsen, 2017). In oil-producing states, oil revenues may be associated with higher levels of political stability, given the financial resources they provide, enabling governments to fund public spending and subsidies, coupled with their relatively low reliance on taxation. These factors may help contain dissent and maintain continuity of rule (Yetiv, 2018; Richter, 2019). In high-income countries, greater political stability may be linked to their greater fiscal capacity to fund public services and cope with shocks (Baklouti & Boujelbène, 2020; Ali et al., 2020).

Conversely, Cappelli et al. (2023) support the "resource curse" hypothesis, linking heavy reliance on oil in exporting countries to rent-seeking behaviors, which may be associated with challenges to political stability.

Conversely, limited fiscal space and institutional fragility in non-oil-producing countries may coincide with lower levels of political stability, as these conditions can limit governments' ability to cope with shocks Galal & Selim, 2013; Al-Rawashdeh et al., 2013). The decline in political stability in upper- and lower-middle-income countries can also be discussed in light of the concept of the "development trap." Limited rentier resources compared to oil-producing countries, coupled with lower fiscal capacity compared to high-income countries, may coincide with difficulties in containing and managing political tensions (Sika, 2013; Kamal & Moukaddem, 2019).

Regarding banking stability, higher levels of political stability in oil-producing and high-income countries may coincide with lower levels of political uncertainty and risks associated with instability.

2. **Statistical Modeling of Study Data:**

In this study, two strong approaches are used to model the relationship between the response variable (Banking System Level) and other independent variables. The purpose of using more than one modeling method in our research is to compare the pattern in which these independent variables affect the response variable, and to determine the most important variables (predictors) to keep in the model. The techniques used here are Fisher's Linear Discriminant Analysis (Fisher's LDA) and Chi-Square Automatic Interaction Detector (CHAID), and both of them are considered to be powerful tools in the area of Data Mining.

A. The Application of Fisher's LDA:

Fisher's Linear Discriminant Analysis can be defined as a supervised statistical classification tool that finds a linear combination of predictor variables that maximizes, he separation between predefined levels (of the response variable) while minimizing variation within each group. The formal model can be defined as follows:

$$\boldsymbol{Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_p X_p}$$

Where, $\alpha, \beta_1, \beta_2, \dots, \beta_p$ are the model parameters, $X_1, X_2, \dots, X_p$ are the predictors, and *Y* is the response variable, and it must be mentioned here that the term "linear" in the name of the analysis refers to the type of mathematical equation used to separate response levels and not to the nature of the relationship between variables (Gebril, R. S., (2020).

Fisher's LDA was performed in a stepwise fashion in order to determine the most effective predictors among the 7 independent variables, and the following results were obtained. Table (4) represents the assessment of the Fisher's LDA model, where 67.9% of the cases (Banking System Levels) were classified correctly based on the most influential predictors, and this percentage is usually considered to be a very good overall percentage in real-life economic data.

Table (4): Results of the Classification Matrix (LDA).

	Banking System Level	Predicted Group Membership			Total
		Low Stability	Average Stability	High Stability	
Original	Low Stability	28.0%	62.7%	9.3%	100.0%
	Average Stability	9.1%	87.1%	3.8%	100.0%
	High Stability	9.6%	16.4%	74.0%	100.0%
67.9% of original grouped cases correctly classified.					

Again, from the above result, the classification of average and high stability levels (87.1% and 74%) showed very good predictive percentages compared to the low stability level (28%). This can be an indicator of uncertainty in countries with low stability, regardless of the independent variables.

Table (5) represents the Fisher Linear Discriminant Model coefficients for the three banking levels, and these equations can be used to predict future banking system stability at any time using the four most influential predictors: Oil/Non-Oil Country, Income Level, Political Stability, and Credit Information Sharing Index chosen from the original seven independent variables.

Table (5): The Classification Function Coefficients (LDA)

Predictor	Banking System Level		
	Low Stability	Average Stability	High Stability
Oil/Non-Oil Country	13.28	11.43	16.57
Income Level	9.38	8.44	8.37
Political Stability	-2.43	-2.40	-0.74
Credit Info. Sharing Index	-0.27	-0.14	-0.85
(Constant)	-22.31	-17.69	-22.10

As an example, a new dataset (with Oil/Non-Oil Country = oil country (1), Income Level = high income (3), Political Stability = 1.5, and Credit Information Sharing Index = 8) can be entered into the model and will give:

Banking System Level:

Low Stability	Average Stability	High Stability
13.31	**14.34**	11.67

The predicted Banking System Level will correspond to the highest estimated value (14.34) and hence the predicted banking level will be (Average Stability).

The results in Table (6) can be interpreted in light of Fisher's Linear Discriminant Analysis (LDA) model, indicating that internal bank determinants are not the sole determinant of banking stability in Arab countries. Institutional and economic determinants are also among the most influential factors and are the most capable of differentiating between levels of banking stability in Arab banking systems. The results showed that the classification of Arab countries as having high, medium, or low levels of banking stability is linked to the country's characteristics, such as whether it is an oil-producing or non-oil-producing country, its income level (high, above average, below average, or low), its level of political stability, and the degree of credit information sharing. Thus, these variables are among the most capable factors in differentiating between levels of banking stability. Oil-producing and higher-income countries belong to different levels of stability than non-oil-producing and lower-income countries, reflecting the importance of a country's economic environment in determining its level of banking stability. This finding aligns with studies that have established oil as a crucial economic factor in oil-producing economies (Qin, 2020; Maghyereh & Al-Shboul, 2022)

Regarding political stability, the study's findings align with those of (Ivan & Bolotov,2021), and Magalhães (2022), which demonstrated that enhancing political stability and reducing political instability

in countries contribute to improved asset quality and strengthen the banking sector's capacity for stability. Finally, the study identified credit information sharing as a key determinant of banking stability levels in Arab countries, consistent with the findings of (Jappelli & Pagano ,2002Büyükkarabacak & Valev ,2012; Yarso & Adu-Asare ,2024), which showed that reducing information asymmetry and improving the availability of credit information contribute to lowering risks, thereby enhancing banking stability.

Therefore, according to the results of Fisher's Linear Discriminant Analysis (LDA), banking stability in the Arab banking systems within the study sample is more sensitive to institutional and economic determinants than to internal bank determinants.

A graphical display of data classification can be useful in understanding the distribution of banking system levels depending on the selected predictors, as seen in Figure (7).

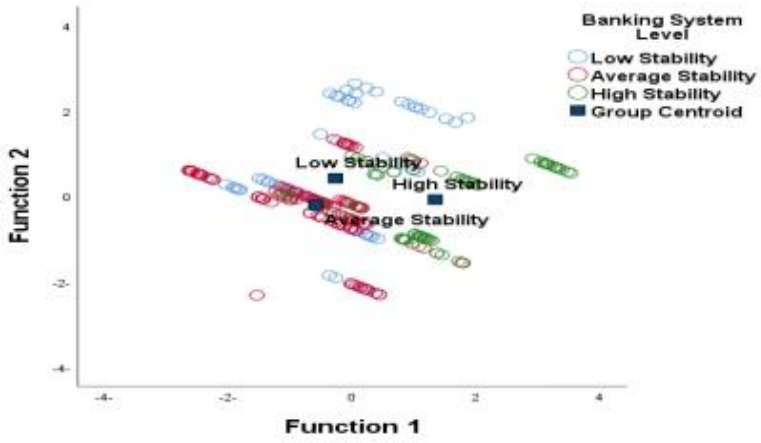

Fig (7): Graphical display of Discriminant functions for the study data, (LDA).

B. The Application of CHAID:

CHAID (Chi-square Automatic Interaction Detection) is a strong but easy-to-understand data mining decision-tree-based method (as in Classification and Regression Trees (CART)), and it is used in the area of data classification. It recursively divides data into homogeneous groups by selecting predictors with statistically significant associations with the response variable. The CHAID method is a distribution-free, non-parametric technique that works through a built-in algorithm with no parametric model structure, and the key to model building is simply the rule of (IF (Yes or No) → Then (Outcome), (Gebril, R. S., 2020). The results of applying CHAID are illustrated **as follows:**

In Table (6), the three levels of banking system stability showed good prediction accuracy percentages: 56%, 64.4%, and 68.5%, respectively, for low, average, and high banking stability.

Table (6): The Classification Accuracy of CHAID for the Study Data.

Observed	Predicted			
	Low Stability	Average Stability	High Stability	Percent Correct
Low Stability	42	25	8	56.0%
Average Stability	25	85	22	64.4%
High Stability	0	23	50	68.5%
Overall Percentage	23.9%	47.5%	28.6%	63.2%

The overall percentage of classification accuracy was also good (63.2%), indicating the efficiency and goodness of fit of the CHAID model for future prediction.

The Classification Tree of CHAID, which represents the classification model, is shown in Figure (7). From this plot, the following four Classification Rules can be established to classify any future target country;

If	Then	Classification (Banking System Level)
Income Level= Lower Middle	→	Average Stability
Income Level= Upper Middle	→	High Stability
Income Level= High Income and Political Stability ≤ 0.59	→	Low Stability
Income Level= High Income and Political Stability > 0.59	→	Average Stability

And so, it can be seen that the CHAID method used only two independent variables out of the original seven variables to build the classification model, namely: Income Level and Political Stability.

The results in the table above, according to the CHAID model, indicate that the level of banking stability in Arab countries is primarily linked to the interaction between the country's income level and political stability. This reflects the importance of economic and institutional determinants in distinguishing between levels of banking stability, and that their influence is not limited to independent effects, but extends to interactive effects that vary according to the characteristics of each country.

In this context, the results showed that income level is the primary explanatory variable in classifying banking stability levels. Countries with lower-than-average income are associated with an average level of banking stability, while countries with higher-than-average income are associated with a high level of banking stability. However, this correlation differs within the high-income group, where political stability emerges as an interactive variable determining the level of banking stability. A high country's income does not necessarily guarantee a high level of banking stability unless the political stability index exceeds the threshold of 0.59. In cases where the index falls below this threshold, banks operating in those countries belong to the low banking stability category, while they move to the medium stability category when the index exceeds this threshold. This finding aligns with the literature that has addressed the relationship between national income levels and banking stability, emphasizing the importance of economic and institutional determinants in explaining the financial resilience of banking systems (Ighedosa et al., 2025; Mahmood et al., 2026).

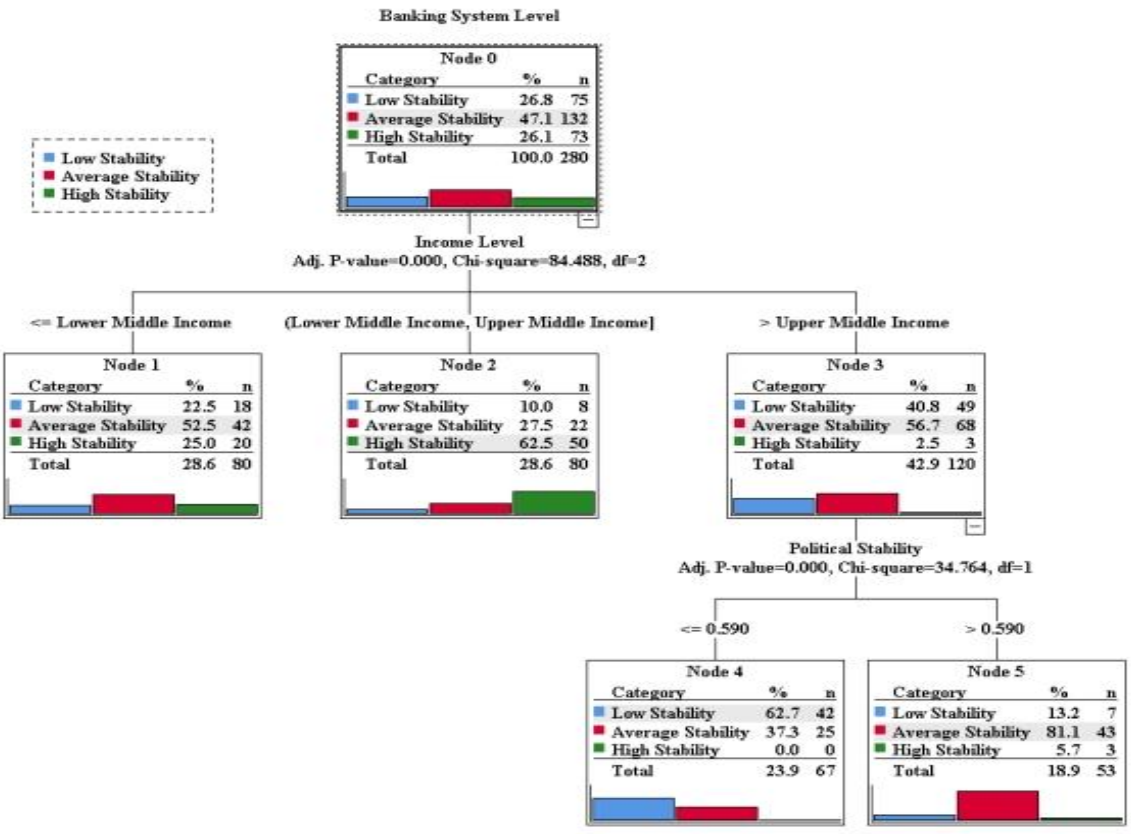

Fig (8): The Classification Tree of CHAID for the study Data

The figure above shows that the level of financial stability of the banking systems of the countries that were part of the study sample is distributed into three levels. About 27% of the banks had a low level of stability; the largest share, 47%, had a medium level of stability, and the remaining 26% had a high level of stability. Therefore, the majority of the banks included in the study are in the medium stability group.

The CHAID method used the income level as the variable that most affects banking stability in the study sample to determine the level of stability of the banks. The value of chi-square was 84 and was therefore highly significant (P=0.000). The first part was the lower-middle-income countries, which included 80 banking sectors, which is roughly 29% of the total sectors included in the study. About 53% of these sectors were in the medium stability category. This means that in lower-middle-income countries, most of the banking sectors fall in the category of medium stability, and some of the sectors are in the low and high categories.

On the other hand, the second group contained upper-middle-income countries, which contained 80 banking sectors (29% of the total sectors used in this paper). 63% of these countries had high stability. This means that upper middle-income countries have a majority of their sectors in the high stability category and some in the low and medium categories.

In the third group, the CHAID also found another variable other than high income level: political stability. The variable was found to determine the stability level of the banks in this group (Chi-sq = 34.754; P = 0.000). Thus, not only was income level used to determine the stability level of banks, but also political stability, according to its value being greater than or less than 0.59. This led to the identification of the fourth and fifth tiers.

The fourth tier was the high-income countries with political stability levels lower than 0.59 and included 76 banking sectors, or 24% of the total sectors studied. The percentage of low stability was about 63%. This means that in high-income countries with political stability levels less than 0.59, the majority of banking sectors belong to the low stability category, and some belong to the medium and high categories. Finally, the fifth tier included countries with high income levels and political stability levels> 0.59, which comprised 53 banking sectors, or roughly 19% of the total sectors used in the study.

The percentage of banking sectors in the medium stability category was roughly 81%. This means that most banking sectors in high-income countries with a political stability level greater than 0.59 are in the medium stability category, while some remain in the low and high categories. Based on the above, it is clear that the results of Fisher's Linear Discriminant Analysis (LDA) and CHAID models converge on a key finding: that banking stability in Arab banks is determined by the country's macroeconomic environment, primarily income level and political stability. The oil-based nature of the country and the sharing of credit information also emerge as additional determinants in Fisher's LDA model.

Conclusion and Recommendation:

This study contributes to the literature on the determinants of banking stability by providing empirical evidence on the impact of a set of macroeconomic variables, including a country's oil-based nature, income level, and political stability; variables related to the banking sector, such as asset quality, credit information sharing, and operational efficiency; and institutional variables, specifically the strength of legal protection. We sought to determine how much these determinants affect the stability of banking sectors. We included the banking sectors of 14 Arab countries for 2002-2021. We used Fisher's LDA and CHAID models.

The exploratory findings indicate that the Z score of the banking system shows high stability in many countries, but there are differences between the countries. Political stability was low in some of the countries. The difference in the levels of stability of the banks over the years was not big, but there were some outliers in 2006-2019. As far as the oil and income variables are concerned, the findings demonstrate that the non-oil-producing countries managed to attain slightly higher levels of banking stability and that upper-middle-income countries achieved higher levels of stability. Political stability was found to be different depending on whether a country was an oil producer or not and whether it was a particular income level, which shows that there is a relationship between these attributes and the level of political stability. Since there were no significant linear relationships between the dependent and independent variables, the study continued to test the non-linear relationships.

The independence test revealed a significant correlation between banking system stability and a country's status as an oil-producing or non-oil-producing nation.

The results also indicated a stronger correlation with the banking system stability and income level. Explanation of the results of Fisher's Linear Discriminant Analysis (LDA) LDA was used to model the variables that would best predict the three levels of banking system stability. procedure detected four predictive variables out of the seven original independent variables, including whether the country is oil producing or not, income level, political stability and credit information exchange index. The rating functions can be constructed using these variables to forecast the stability levels of the banking system. The CHAID algorithm also performed the non-parametric classification based on the decision tree method. One of the most important results of the CHAID algorithm is that the classification tree can be constructed using only two variables, which are income level and political stability.

The resulting classification rules show that lower-middle-income countries are assigned medium banking stability and upper-middle-income countries are assigned high stability. For high-income countries, political stability determines the banking stability category: a value of 0.59 or less is assigned low stability, whereas a higher value is assigned medium stability.

The scientific value is explained and predicted at the same time. The research did not only analyze the relationships between the macroeconomic, institutional, and sector-specific determinants of banking stability, but also how the banking sectors are divided into homogeneous groups according to their stability and what determinants most differentiate these groups. The research can also be used to argue that the banking stability of Arab countries is associated with the quality of the economic and institutional environment and the internal features of the banking sectors. The results of the research can also serve as the basis for early banking supervision and the development of preventive policies for countries with low income and less political stability, but taking into account the particularities of oil producing countries.

According to the above findings, countries should enhance their political stability as one of the supporting factors of banking stability. At banking level, the quality of credit information and its sharing among banks and regulators should be enhanced. The classification models can also be used in the planning of risks and this is because the decision tree results indicated that the effect of political stability could result in the differences in the level of banking stability in high-income countries.

Finally, the study recommends conducting future studies on more diverse samples like banking sectors in the Middle East and North Africa region or the European banking sectors, or repeating the study later on with a different time frame, as the results may vary. In addition, future studies may expand the scope of the research to other variables such as capital adequacy, liquidity, credit risk, governance, financial technology, and inflation. In addition, future studies should use more than one classification model like this study, to provide a clearer picture than using one model, and conduct comparative studies between the conventional and Islamic banks.

References:

1. Ighedosa, J., Murinde, V., & Lawal, T. (2026). How does credit information share shape the cyclicality of bank liquidity creation? Financial Review, 61(2), 601-628.
2. Mahmood, H., Nadeem Ashraf, B., & Tran, V. (2026). Political stability and money laundering risk. Economies, 14(2), 68.
3. Alodayni, S. (2016). Oil prices, credit risks in banking systems, and macro-financial linkages across GCC oil exporters. International Journal of Financial Studies, 4(4), 23.
4. Sholomytskyi, Y., Butler Blondel, N., & Hussain, M. (2026). Should Oil Economies Worry About Oil Shocks' Impact on the Banking System? The Case of Oman.
5. Ahmed, G. H., Haghighat, J., Salmani, B. M. R., & Asgharpur, H. (2026). Examining the Relationship Between Oil Cycle Shocks and Financial Stability in Selected OPEC Countries
6. Aimon, H., Kurniadi, A. P., Sentosa, S. U., & Yahya, Y. (2024). What is the Relationship Between Financial Stability and Economic Growth in APEC? International Journal of Sustainable Development & Planning, 19(7), 2691
7. Mutab, A.H., & Almula-Dhanoon, M. (2026). The Interrelationship Between Political and Economic Stability: A Case Study of Arab Countries. TANMIYAT AL-RAFIDAIN.

8. Cappelli, F., Carnazza, G., & Vellucci, P. (2023). Crude oil, international trade and political stability: do network relations matter? Energy Policy, 176, 113479.
9. Alqahtani, F., Mayes, D.G. (2018) Financial stability of Islamic banking and the global financial crisis: Evidence from the Gulf Cooperation Council. Economic Systems. https://doi.org/10.1016/j.ecosys.2017.09.001
10. Ozili, P.K. (2018) Banking stability determinants in Africa. International Journal of Managerial Finance. https://doi.org/10.1108/IJMF-01-2018-0007
11. Bermpei, T., Kalyvas, A., Nguyen, T.C. (2018) Does institutional quality condition the effect of bank regulations and supervision on bank stability? Evidence from emerging and developing economies. International Review of Financial Analysis. https://doi.org/10.1016/j.irfa.2018.06.002
12. Elsayed, A.H., Yarovaya, L. (2019) Financial stress dynamics in the MENA region: Evidence from the Arab Spring. Journal of International Financial Markets, Institutions and Money. https://doi.org/10.1016/j.intfin.2019.05.004
13. Zaiane, S., Ben Moussa, F.B. (2021) What Drives Banking Profitability During Financial Crisis and Political Turmoil? Evidence from the MENA Region. Global Journal of Emerging Market Economies. https://doi.org/10.1177/09749101211031102
14. Sufian, F., Habibullah, M.S. (2010) Does economic freedom fosters banks' performance? Panel evidence from Malaysia. Journal of Contemporary Accounting and Economics. https://doi.org/10.1016/j.jcae.2010.09.003
15. Bin Idrees, S., Alhabshi, S.M., Sharofiddin, A., Othman, A.H.A. (2025) Framing external environmental dimensions as institutional constraints on adopting Islamic financial transactions: empirical evidence from: Libyan commercial banks. International Journal of Ethics and Systems. https://doi.org/10.1108/IJOES-01-2022-0006
16. Elhajji, A.A., Mihai-Yiannaki, S. (2025) Strategic and regulatory challenges of mergers and acquisitions in the Libyan banking sector: a theoretical and practical approach. International Journal of Organizational Analysis. https://doi.org/10.1108/IJOA-11-2024-4968
17. Otero GonzÃ¡lez, L.O., Razia, A., Vivel-Búa, M.V., Lado-Sestayo, R.L. (2019) Market structure, performance, and efficiency: Evidence from the MENA banking sector. International Review of Economics and Finance. https://doi.org/10.1016/j.iref.2019.05.013
18. Bolarinwa, S.T., Soetan, F. (2019) The effect of corruption on bank profitability. Journal of Financial Crime. https://doi.org/10.1108/JFC-09-2018-0102
19. Ahmed, F. E., & Mohamed, A. G. (2025). Political patronage, and banks' profitability in Bahrain. Journal of Financial Reporting and Accounting, 23(3), 984-1000
20. González, L. O., Razia, A., Búa, M. V., & Sestayo, R. L. (2017). Competition, concentration and risk taking in Banking sector of MENA countries. Research in International Business and Finance, 42, 591-604.
21. Albaity, M., Saadaoui Mallek, R.S., Hassan al-Tamimi, H.A., Noman, A.H.M. (2021) Does competition lead to financial stability or financial fragility for Islamic and conventional banks? Evidence from the GCC countries. International Journal of Finance and Economics. https://doi.org/10.1002/ijfe.2037
22. Maghyereh, A., Abdoh, H., & Al-Shboul, M. (2022). Oil structural shocks, bank-level characteristics, and systemic risk: Evidence from dual banking systems. Economic Systems, 46(4), 101038
23. Qin, X. (2020) Oil shocks and financial systemic stress: International evidence. Energy Economics. https://doi.org/10.1016/j.eneco.2020.104945
24. Saif-Alyousfi, A.Y.H., Saha, A., Md Rus, R. (2018) Impact of oil and gas price shocks on the non-performing loans of banks in an oil and gas-rich economy: Evidence from Qatar. International Journal of Bank Marketing. https://doi.org/10.1108/IJBM-05-2017-0087
25. Saif-Alyousfi, A.Y.H., Saha, A., Md Rus, R., Taufil Mohd, K.N. (2021) Do oil and gas price shocks have an impact on bank performance? Journal of Commodity Markets. https://doi.org/10.1016/j.jcomm.2020.100147

26. Al-Shboul, M., Maghyereh, A., Hassan, A., Molyneux, P. (2020) Political risk and bank stability in the Middle East and North Africa region. Pacific Basin Finance Journal. https://doi.org/10.1016/j.pacfin.2020.101291
27. Miller, S.M., Moussawi, R., Wang, B., Yang, T. (2021) Institutional investors and bank governance: An international analysis of bank earnings management. Journal of Corporate Finance. https://doi.org/10.1016/j.jcorpfin.2021.102055
28. Shabir, M., Jiang, P., Bakhsh, S., Zhao, Z. (2021) Economic policy uncertainty and bank stability: Threshold effect of institutional quality and competition. Pacific Basin Finance Journal. https://doi.org/10.1016/j.pacfin.2021.101610
29. Apergis, N., Aysan, A.F., Bakkar, Y. (2021) How do institutional settings condition the effect of macroprudential policies on bank systemic risk? Economics Letters. https://doi.org/10.1016/j.econlet.2021.110123
30. Mabkhot, H. A., & Al-Wesabi, H. (2022). Banks' Financial Stability and Macroeconomic Key Factors in GCC Countries. Sustainability. https://doi.org/10.3390/su142315999
31. Mansour, R., El-Moussawi, C. (2020) Efficiency, technical progress and productivity of Arab banks: A non-parametric approach. Quarterly Review of Economics and Finance. https://doi.org/10.1016/j.qref.2019.02.002
32. Theiri, S., & Boukhatem, J. (2026). Fintech and bank stability nexus in selected MENA countries: a micro-level data analysis. International Journal of Islamic and Middle Eastern Finance and Management. https://doi.org/10.1108/imefm-10-2025-0750
33. Saif-Alyousfi, A. Y. H., & Saha, A. (2021). Determinants of banks' risk-taking behavior, stability and profitability: evidence from GCC countries. International Journal of Islamic and Middle Eastern Finance and Management. https://doi.org/10.1108/imefm-03-2019-0129
34. Athari, S. A., Irani, F., & Hadood, A. A. A. (2023). Country risk factors and banking sector stability: Do countries' income and risk-level matter? Evidence from global study. Heliyon, 9. https://doi.org/10.1016/j.heliyon.2023.e20398
35. Lucas, R. E. (2014). The Persian Gulf Monarchies and the Arab Spring. 313-340. https://doi.org/10.1093/acprof:oso/9780199384419.003.0012
36. Colombo, S. (2012). The GCC and the Arab Spring: A Tale of Double Standards. The International Spectator, 47, 110 - 126. https://doi.org/10.1080/03932729.2012.733199
37. Espinoza, R., Prasad, A., Williams, O. (2011) Regional financial integration in the GCC. Emerging Markets Review. https://doi.org/10.1016/j.ememar.2011.04.005
38. Abdelaziz Eissa, M., Al Refai, H., Chortareas, G. (2025) Oil dependency, political instability and the stock market: A perspective from the Middle East and Africa. Journal of Policy Modeling. https://doi.org/10.1016/j.jpolmod.2025.09.009
39. Becheikh, N. (2021). Political stability and economic growth in developing economies: lessons from Morocco, Tunisia and Egypt ten years after the Arab Spring. Insights into Regional Development. https://doi.org/10.9770/ird.2021.3.2(5)
40. Shallal, A. B., Lahoud, C., Zervos, M., & Matar, M. (2021). Lebanon is losing its front line. Journal of Global Health, 11. https://doi.org/10.7189/jogh.11.03052
41. Mazzucotelli, F. (2020). FRAGMENTS OF LEBANON: SECTARIANISM AND THE FINANCIAL CRISIS. 24-42. https://doi.org/10.4081/ilpolitico.2020.295
42. Lukyanov, G. V. (2023). The Economics of "Long War" in Libya: How Politics Define the Economy in the Libyan Crisis (2011–2017). Oriental Courier. https://doi.org/10.18254/s268684310029254-7
43. Hamdallah, F., Arshad, R., & Senasi, V. (2026). The Paris Protocol and Fiscal Fragility: Withholding Clearance Tax Revenues in Palestine (1997–2022). Journal of International Studies. https://doi.org/10.32890/jis2026.22.1.11
44. Medvedev, N., Slizovskiy, D. E., Iwaina, M., & Nesterchuk, O. (2020). The Fiscal Situation of Palestine: Can the Grip of Chronic Distress Be Loosened? Journal of Politics and Law. https://doi.org/10.5539/jpl.v13n1p19
45. Ouaissa, R. (2020). Algeria: Between Transformation and Re-Configuration. Re-Configurations. https://doi.org/10.1007/978-3-658-31160-5_4

46. Kilavuz, M. T., Grewal, S., & Kubinec, R. (2023). Ghosts of the Black Decade: How legacies of violence shaped Algeria's Hirak protests. Journal of Peace Research, 60, 9 - 25. https://doi.org/10.1177/00223433221137613
47. Ulrichsen, K.C. (2017) Post-rentier Economic Challenges. India Quarterly. https://doi.org/10.1177/0974928417700800
48. Yetiv, S.A. (2018) How Saudi Arabia Has Dodged the Arab Spring. The Arab Spring: The Hope and Reality of the Uprisings, 2nd edition. https://doi.org/10.4324/9780429494581-6
49. Richter, T. (2019) Oil and the rentier state in the Middle East. The Routledge Handbook to the Middle East and North African State and States System. https://doi.org/10.4324/9780429342486-16
50. Baklouti, N., Boujelbène, Y. (2020) An econometric study of the role of the political stability on the relationship between democracy and economic growth. Panoeconomicus. https://doi.org/10.2298/PAN170308015B
51. Ali, Q., Raza, A., Narjis, S., (...), Khan, M.T.I. (2020) Potential of renewable energy, agriculture, and financial sector for the economic growth: Evidence from politically free, partly free and not free countries. Renewable Energy. https://doi.org/10.1016/j.renene.2020.08.055
52. Galal, A., Selim, H. (2013) The Elusive Quest for Economic Development in the Arab Countries. Middle East Development Journal. https://doi.org/10.1142/S1793812013500028
53. Al-Rawashdeh, R., Al-Nawafleh, H., Al-Shboul, M. (2013) Understanding oil and mineral resources in a political economy context: the case of the Middle East and North Africa (MENA). Mineral Economics. https://doi.org/10.1007/s13563-013-0035-3
54. Kamal, R., Moukaddem, S. (2019) The Arab World: Advance amid diversity. The New Third World: Second Edition. https://doi.org/10.4324/9780429313189-11
55. Sika, N.M. (2013) Dynamics of development and uprisings in the Arab world. Mediterranean Quarterly. https://doi.org/10.1215/10474552-2380533
56. Abbas, Z., Afshan, G., & Mustifa, G. (2022). The effect of financial development on economic growth and income distribution: An empirical evidence from lower-middle and upper-middle-income countries. Development Studies Research, 9(1), 117-128.
57. Aghion, P., & Bolton, P. (1992). An incomplete contracts approach to financial contracting. The review of economic Studies, 59(3), 473-494. https://doi.org/10.2307/2297860.
58. Aini, W & Prasetiantono, T. (2020). Effect of Financial Inclusion on Financial Stability: Countrys by Income Level Clasiffication, 2004-2014. Indo-Fintech Intellectuals: Journal of Economics and Business, 1 (1), 11-22. http://doi.org/10.54373/ifijeb.v1i1.10
59. Alam, M.M., & Yusuf, W.S. (2024). DETERMINANTS OF BANK-SPECIFIC, BANK-RISK AND BANK STABILITY OF THE BANGLADESHI CONVENTIONAL BANKS. International Journal of Entrepreneurship and Management Practices.
60. Albulescu, C. (2020). Bank financial stability, bank valuation and international oil prices: Evidence from listed Russian public banks. arXiv preprint arXiv:2004.12791.
61. Alihodzic, A., Eksi, I. H., & Dogan, B. (2020). The determinants of bank stability: Evidence from selected Balkan countries and Turkey. International Review, (1-2), 95.
62. Aloui, Z. (2019). The role of political instability and corruption on foreign direct investment in the MENA region.
63. Aniemeke, E. H. (2024). Determinants of bank stability in Nigeria. American Journal of Economics and Business Innovation, 3(2), 85-93.
64. Arebo, M., Hando, F., & Mekonnen, A. (2025). Financial inclusion and stability in Ethiopia using bank-level data: A two-step system GMM estimation. F1000Research, 13, 1369.
65. Arias, J., Maquieira, C., & Jara, M. (2020). Do legal and institutional environments matter for banking system performance? Economic research-Ekonomska istraživanja, 33(1), 2203-2228.
66. Balcilar, M., Gupta, R., Lee, C. C., & Olasehinde-Williams, G. (2018). The synergistic effect of insurance and banking sector activities on economic growth in Africa. Economic Systems, 42(4), 637-648.

67. Ben Ali, M. S., & Ben Mim, S. (2023). Democracy and banking stability: is the relationship U-Shaped? Journal of the Knowledge Economy, 14(4), 4426-4448.
68. Biswas, S. S. (2019). Creditor rights and the market power-stability relationship in banking. Journal of Financial Stability, 40, 53-63.
69. Bouaziz, I. (2020). Creditor rights protection and bank stability in developing countries: evidence from Tunisia. BANKERS, MARKETS & INVESTORS Учредители: MA-ESKA Editions, 162, 25-34.
70. Boyd, J. H., Hakenes, H., & Heitz, A. (2022). Creditor Rights, Information Sharing, and Borrower Behavior: Theory and Evidence. Information Sharing, and Borrower Behavior: Theory and Evidence (January 22, 2022).
71. Brown, M., Jappelli, T., & Pagano, M. (2009). Information sharing and credit: Firm-level evidence from transition countries. Journal of Financial intermediation, 18(2), 151-172.
72. Büyükkarabacak, B., & Valev, N. (2012). Credit information sharing and banking crises: An empirical investigation. Journal of Macroeconomics, 34(3), 788-800.
73. Canh, N. P., Schinckus, C., Su, T. D., & Chong, F. H. L. (2021). Institutional quality and risk in the banking system. Journal of Economics, Finance and Administrative Science, 26(51), 22-40.
74. Chletsos, M., & Sintos, A. (2024). Political stability and financial development: An empirical investigation. The Quarterly Review of Economics and Finance, 94, 252-266.
75. Crystal, J. (2019). Gulf States: Kuwait, Bahrain, Qatar, United Arab Emirates, and Oman. In Government and Politics of the Middle East and North Africa (pp. 541-608). Routledge.
76. Dell'Ariccia, G., & Marquez, R. (2006). Lending booms and lending standards. The journal of finance, 61(5), 2511-2546.
77. Dienillah, A. A., Anggraeni, L., & Sahara, S. (2018). Impact of financial inclusion on financial stability based on income group countries. Bulletin of Monetary Economics and Banking, 20(4), 429-442.
78. Elbadri, M., & Bektaş, E. (2022). Dynamic relationship among the bank stability, oil, and gold prices: Evidence from the Islamic banks operating in the Gulf Cooperation Council countries. International Journal of Finance & Economics, 27(2), 2153-2168.
79. Elbargathi, K., & Al-Assaf, G. (2019). The impact of political instability on the economic growth: an empirical analysis for the case of selected Arab countries. International Journal of Business and Economics Research, 8(1), 14-22.
80. Elmahgop, F. O. (2024). Intellectual capital and bank stability in Saudi Arabia: navigating the dynamics in a transforming economy. Sustainability, 16(10), 4226.
81. Evan, T., & Bolotov, I. (2021). Measuring Mancur Olson: what is the influence of culture, institutions and policies on economic development? Prague Economic Papers, 30(3), 290-315.
82. Fosu, S., Danso, A., Agyei-Boapeah, H., Ntim, C. G., & Adegbite, E. (2020). Credit information sharing and loan default in developing countries: the moderating effect of banking market concentration and national governance quality: S. Fosu et al. Review of Quantitative Finance and Accounting, 55(1), 55-103.
83. González, F. (2023). Creditor rights, bank competition, and stability: International evidence. Journal of International Financial Markets, Institutions and Money, 82, 101711.
84. Guérineau, S., & Léon, F. (2019). Information sharing, credit booms and financial stability: do developing economies differ from advanced countries? Journal of Financial Stability, 40, 64-76.
85. Hafeez, K., & Sehari, S.B. (2025). Credit Risk, Financial Inclusion and Microfinance Performance in Pakistan: An Empirical Analysis. International Journal of Academic Research in Accounting, Finance and Management Sciences.
86. Hart, O., & Moore, J. (1998). Default and renegotiation: A dynamic model of debt. The Quarterly journal of economics, 113(1), 1-41.
87. Heitz, A. R., & Narayanamoorthy, G. (2021). Creditor rights and bank loan losses. Journal of Financial and Quantitative Analysis, 56(8), 2800-2842.
88. Ibrahim, S. N., Ismail, S., Abd Rahman, N. H., Malan, I. N. B., & Ismail, W. M. W. (2024). Financial distress prediction of islamic banks in top sukuk-issuing countries: An application of Altman's z-score model. Information Management and Business Review, 16(2), 28-36.

89. Issa, I. A., & Altinay, L. (2006). Impacts of political instability on tourism planning and development: The case of Lebanon. Tourism Economics, 12(3), 361-381.
90. Jan, D., Arzu, F., Khan, M. J., & Rahman, S. U. (2025). Risk dynamics and financial stability in GCC banks: The moderating role of efficiency. Social Sciences Spectrum, 4(1), 710-722.
91. Jappelli, T., & Pagano, M. (2002). Information sharing, lending and defaults: Cross-country evidence. Journal of Banking & Finance, 26(10), 2017–2045.
92. Jokipii, T., & Monnin, P. (2013). The impact of banking sector stability on the real economy. Journal of International Money and Finance, 32, 1-16.
93. Kaya, H. D. (2025). The Global Financial Crises: Early Warnings, Consequences, and Policy Responses. SocioEconomic Challenges, 9(3), 21-37.
94. Kusi, B. A., Agbloyor, E. K., Ansah-Adu, K., & Gyeke-Dako, A. (2017). Bank credit risk and credit information sharing in Africa: Does credit information sharing institutions and context matter? Research in International Business and Finance, 42, 1123-1136.
95. T. Magalhães, P. (2022). Charisma and democracy: max weber on the riddle of political change in modern societies. Topoi, 41(1), 69-78.
96. Magwedere, M. R., & Marozva, G. (2022). Financial stability and income inequality in developing countries. Prague Economic Papers, 31(6), 464-481.
97. Mensah, A. (2025). Role of Green Financing in Enhancing Financial Stability of Commercial Banks in Ghana. International Journal of Finance, 10(2), 53-62.
98. Muñoz-Mendoza, J. A., Sepúlveda-Yelpo, S. M., Veloso-Ramos, C. L., & Delgado-Fuentealba, C. L. (2020). Market Concentration and Income Diversification: Do They Always Promote the Financial Stability of Banking Industry? Revista Finanzas y Política Económica, 12(2), 341-365.
99. Nugrohowati, R. N. I., & Shidiqie, J. S. A. (2025). Impact of financial inclusion and institutional quality on banking stability: Lessons from the Asia region. Economic Journal of Emerging Markets, 12-29.
100. Ozili, P. K. (2025). Bank non-performing loans research around the world. Asian Journal of Economics and Banking, 9(3), 437-462.
101. Pagano, M., & Jappelli, T. (1993). Information sharing in credit markets. The journal of finance, 48(5), 1693-1718.
102. Salim, D., Wadana, G., & Kristanti, F. (2024). Determinant factors of financial stability of fintech companies in Indonesia. International Journal of Religion, 5(11), 6065-6073.
103. Schinasi, G. J. (2005). Preserving Financial Stability. International Monetary Fund. (Economic Issues, No. 36)
104. Shahriar, A., Mehzabin, S., Ahmed, Z., Döngül, E. S., & Azad, M. A. K. (2022). Bank stability, performance and efficiency: an experience from West Asian countries. IIM Ranchi journal of management studies, 2(1), 31-47.
105. Shajari, P., & Mohebikhah, B. (2012). Financial stability in Islamic banking system; the capacity to react to current world-wide crisis. Money and Economy, 6(4), 133-165.
106. Stewart, R., Chowdhury, M., & Arjoon, V. (2021). Bank stability and economic growth: trade-offs or opportunities? R. Stewart et al. Empirical Economics, 61(2), 827-853.
107. yousif Taha, H., & Ali, H. A. (2026). The problem of non-performing loans in Iraqi banks: An econometric study of the impact of economic and institutional factors on asset quality. International Journal of Business and Management (IJBM), 5(1), 35-49.). https://doi.org/10.56879/ijbm.v5i1.02
108. Tan, Y., & Floros, C. (2013). Risk, capital and efficiency in Chinese banking. Journal of international financial Markets, Institutions and Money, 26, 378-393. https://doi.org/10.1016/j.intfin.2013.07.009
109. Ullah, S., Ullah, A., & Zaman, M. (2024). Nexus of governance, macroeconomic conditions, and financial stability of banks: a comparison of developed and emerging countries. Financial Innovation, 10(1), 30.,
110. Yarso Sarpong, J., & Adu-Asare Idun, A. (2024). Information sharing in bank diversification channels of bank stability in Ghana. Cogent Business & Management, 11(1), 2310310.

111. Gondwe, S., Gwatidzo, T., & Mahonye, N. (2025). Cross-border banking and bank stability: evidence from Sub-Saharan Africa: S. Gondwe wt al. Journal of Banking Regulation, 26(2), 196-213. https://doi.org/10.1057/s41261-024-00254-x
112. Cuadros-Solas, P. J., Cubillas, E., Salvador, C., & Suárez, N. (2024). Digital disruptors at the gate. Does FinTech lending affect bank market power and stability? Journal of International Financial Markets, Institutions and Money, 92, 101964.
113. Chan, K. K., Davis, E. P., & Karim, D. (2024). Macroprudential policy, bank competition and bank risk in East Asia. Journal of Banking Regulation, 25(3), 326-358.
114. International Monetary Fund. (2019). Financial soundness indicators compilation guide. International Monetary Fund. https://www.elibrary.imf.org/display/book/9781484396209/9781484396209.xml?utm_source=chatgpt.com
115. World Bank. (n.d.a). Bank nonperforming loans to total gross loans (%). World Development Indicators. https://databank.worldbank.org/metadataglossary/world-development-indicators/series/FB.AST.NPER.ZS?utm_source=chatgpt.com
116. Salas, M.B., Lamothe, P., Delgado, E., Fernández-Miguélez, A.L., & Valcarce, L. (2024). Determinants of Nonperforming Loans: A Global Data Analysis. Computational Economics, 64, 2695 - 2716.
117. Umar, G., Tijjani, M. S., & Salisu, A. (2022). Effect of credit risk on financial performance of listed deposit money banks in Nigeria. Gusau International Journal of Management and Social Sciences, 5(1), 49-65.
118. Mahyoub, M., & Saıd, R. M. (2021). Factors influencing non-performing loans: Empirical evidence from commercial banks in Malaysia. Research Journal of Business and Management, 8(3), 160-166.
119. Sally, I. M. (2021). The Relationship Between Credit Risk Management and Financial Performance of Commercial Banks Listed at the Nairobi Securities Exchange, Kenya.
120. World Bank. (n.d.). Depth of credit information index. World Development Indicators. https://databank.worldbank.org/metadataglossary/world-development-indicators/series/IC.CRD.INF1.
121. World Bank. (2021). World Development Indicators: Strength of legal rights index (0 = weak to 12 = strong). World Bank DataBank.
122. World Bank. (n.d.). Bank cost to income ratio (%): GFDD.EI.07. Global Financial Development Database. https://databank.worldbank.org/metadataglossary/global-financial-development/series/GFDD.EI.07?utm_source=chatgpt.com
123. Öztürk, Z., Pekkaya, M., & Temli, M. (2019). Evaluation of Cybercrime Economy via MCDM and Decision Tree Approaches: The Case of Zonguldak. In Digital Business Strategies in Blockchain Ecosystems: Transformational Design and Future of Global Business (pp. 521-554). Cham: Springer International Publishing.
124. Podviezko, A. (2011, October). Augmenting multicriteria decision aid methods by graphical and analytical reporting tools. In International Conference on Business Informatics Research (pp. 236-251). Berlin, Heidelberg: Springer Berlin Heidelberg.
125. Saragih, M., Nova, W., & Nusantara, B. C. (2024). Comparative analysis of QUEST and CHAID decision tree methods in assessing the performance of conventional commercial banks. Songklanakarin Journal of Science & Technology, 46(3), 279.
126. Rabby, S. M., Rahaman, M. M., Tanim, G. M. S., & Bushra Chowdhury, A. R. (2026). Refurbished institutional quality and good governance for bank stability: A meta-analysis of emerging economies. Journal of Risk and Financial Management, 19(2), 144.
127. Bouheni, F. B., & Hasnaoui, A. (2017). Cyclical behavior of the financial stability of eurozone commercial banks. Economic Modelling, 67, 392-408.
128. Assous, H. F. (2022). Prediction of banks efficiency using feature selection method: comparison between selected machine learning models. Complexity, 2022(1), 3374489.

129. Phan, D. H. B., Tran, V. T., & Iyke, B. N. (2022). Geopolitical risk and bank stability. Finance Research Letters, 46, 102453.
130. Khan, M.A., Siddique, A., Sarwar, Z. (2020) Determinants of non-performing loans in the banking sector in developing state. Asian Journal of Accounting Research. https://doi.org/10.1108/AJAR-10-2019-0080
131. Oro, O. U., & Ekpo, A. H. (2020). The value of the financial structure to economic performance in oil-producing countries. OPEC Energy Review, 44(1), 43-58.
132. Alim, W., Khan, N. U., Zhang, V. W., Cai, H. H., Mikhaylov, A., & Yuan, Q. (2024). Influence of political stability on the stock market returns and volatility: GARCH and EGARCH approach. Financial Innovation, 10(1), 139.
133. Berger, A. N., & DeYoung, R. (1997). Problem loans and cost efficiency in commercial banks. Journal of banking & finance, 21(6), 849-870.
134. Arslan, Y., & Taskin, T. (2014). International evidence on the interaction between cross-border capital flows and domestic credit growth. İktisat İşletme ve Finans, 29(341), 37-56.
135. Perrodo, P. (1993). Improving scoring techniques in banking applications. Applied stochastic models and data analysis, 9(3), 231-244.
136. Yobas, M. B., Crook, J. N., & Ross, P. (2000). Credit scoring using neural and evolutionary techniques. IMA Journal of Management Mathematics, 11(2), 111-125.
137. Donninelli, G. E., & Lovaglio, P. G. (2026). An Integrated Gradient Boosting Machine Approach with Fisher's Discriminant Analysis: Empirical Assessment on Five Benchmark Datasets and Simulations. Statistical Analysis and Data Mining: An ASA Data Science Journal, 19(5), e70114.
138. Zuccaro, C. (2010). Classification and prediction in customer scoring. Journal of Modelling in Management, 5(1), 38-53.
139. Wang, Y., Ni, X. S., & Stone, B. (2018, November). An automatic interaction detection hybrid model for bankcard response classification. In 2018 5th International Conference on Systems and Informatics (ICSAI) (pp. 1111-1119). IEEE.
140. Başarır, Ç., & Sarıhan, A. Y. (2017). The relationship between profitability of banking sector and macroeconomic and financial variables: Panel ARDL application. İşletme Araştırmaları Dergisi, 9(3), 16-24.
141. Gebril, R. S., (2019): Data Analysis Step by Step in SPSS, Al-Jaber Publications, Benghazi, Libya.
142. Gebril, R. S., (2020): Applied Data Mining Using SPSS, Statistica, and R, Al-Jaber Publications, Benghazi, Libya.
143. Gebril, R. S., (2021): Applications of Statistical Methods Using Excel, Al-Jaber Publications, Benghazi, Libya.