ERF 31ST Annual Conference

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2025

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Does High Liquidity Creation Reduce the Efficiency of GCC Islamic Banks?

The Role of Sustainable and Governance Factors

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Does high liquidity creation reduce the efficiency of GCC Islamic banks? The Role of sustainable and governance factors

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Abstract: This paper adds to the banking literature by investigating the non-linear relationship between liquidity creation and Islamic banking efficiency in one of the transition economies: the Gulf Cooperation Council (GCC) countries, thereby adding to the literature on banking. The sample contains data of 34 Islamic banks from the GCC countries for a period of 2012-2020 comprising 306 firm-year observations. This study has used the SGMM technique to address issues of endogeneity. The empirical results show the existence of a nonlinear-inverted U-shaped nexus between liquidity creation and Islamic bank efficiency, signaling the risk of excess liquidity. Besides, CSR disclosure, audit quality, SSB, and institutional quality act as powerful levers, hence curbing excess liquidity. The results are robust to alternative measures of liquidity creation and banking efficiency. To the best of my knowledge, my study is the first to investigate the nonlinear nexus between liquidity creation and Islamic bank efficiency in the specific situation of transition economies. It also provides empirical evidence to bridge the gaps in existing research. Finally, this study lists the implications for Islamic bankers and policy makers in managing excess liquidity risk and achieving best Islamic bank efficiency.

Keywords: liquidity creation, efficiency, corporate social responsibility, Governance, GCC countries, SGMM

1. Introduction

The GCC countries maintain a leading position in the world economy due to both the wealth of their natural resources, especially hydrocarbon deposits, and their continued endeavors to diversify their economies. This transition process is characterized by GDP growth and the rapid development of sectors unrelated to oil processing, which is, in turn, a source of new opportunities and challenges. High oil revenues have provided great scope for investment in infrastructure and human capital, although dependence on natural resources will remain a risk to sustainable growth if diversification is not successful. These dynamics are especially influencing the banking industry, within which Islamic banks have emerged as major contributors to the region's financing and economic development (Ben Mim & Ali, 2020).

By offering financial products that comply with Sharia law and are in line with the cultural values of the region, Islamic banks play an important role in financing initiatives that support economic diversification. These banks facilitate economic stability by encouraging investment in other sectors apart from oil and gas, making it resilience to the changeability in the commodity prices (Sturm et al., 2008; Alharthi et al., 2024). In particular, Islamic banks display their uniqueness in terms of conformity with the principles of Islamic finance,

especially regarding the prohibition of interest taking, and assuming risk. They also operate, however, in an environment marked by specific regulatory constraints and high expectations in terms of compliance with Sharia standards. Within the GCC countries, these banks have become the linchpin and a substantial proportion of the financial sector. One of the striking features of Islamic banks is the high degree of liquidity creation, which brings in some opportunities and threats regarding their efficiency and resilience.

The liquidity creation in Islamic banks has several causes, such as the use of certain financial instruments within Islamic banks, including Sukuk, Murabaha and Ijarah, which allow them to provide liquidity in accordance with Islamic regulations. However, it could be another source of imbalance. However, all this excessive liquidity would lead to operational inefficiencies and increasing risks to banking stability at a time of volatile hydrocarbon prices and growing integration with global markets. (Karatas, 2017; Ali et al., 2019 ; Mabrouk & Farah, 2021).

Various solutions are emerging. One of the promising avenues has to do with strengthening bank governance and supervision, particularly through quality external audits and the role of SSBs. Such mechanisms not only enhance banks' compliance with Islamic standards, but also boost transparency and stakeholder confidence (Khémiri & Alsulami, 2023). In addition, the integration of corporate social responsibility into the strategy of Islamic banks can modulate the alignment of their activities with stakeholder expectations and the facilitation of sustainable development goals (Haniffa & Hudaib, 2007). Finally, institutional quality, which refers to contextual characteristics of GCC countries such as political stability, regulatory transparency and regulatory effectiveness, may enhance the potential of the positive impact of liquidity management on bank efficiency (Khémiri & Alsulami, 2023).

The current research, therefore, will analyze the nonlinear effect of liquidity creation on the efficiency of Islamic banks in GCC countries with a view to assessing the role of CSR, audit quality, SSB, and institutional quality as moderators. The study contributes significantly to the thinning existing literature on these dynamics and, hence, would guide policymakers in framing the appropriate policies for enhancing resilience and efficiency in Islamic banks against a dramatically changing backdrop.

This research gives empirical evidence on the non-linear nexus between liquidity creation and Islamic bank efficiency in GCC countries. First, our results underline an inverted-U nexus, which indicates that liquidity creation improves bank efficiency up to a critical threshold equal to 31.6%, beyond which the effect becomes negative, thus constituting a warning signal of excess liquidity risk. More interestingly, my findings support the non-linear effect of liquidity on efficiency from Sidhu et al. (2023) that efficiency starts falling beyond the optimal threshold due to high opportunity costs of funds, inefficient allocation of funds, and over-risk-taking behavior. The phenomenon of inefficiency in a high-liquidity situation becomes particularly visible when there is substantial institutional ownership of banks and technology advancement in them.

Interestingly, the non-linear nexus between liquidity creation and banking efficiency was found to be moderated by some factors. In particular, disclosure of CSR practices will be essential in increasing transparency and confidence among stakeholders. To Islamic

banks, investment of surplus funds in socially responsible activities would reduce the risk of undue liquidity and keep their operations within the ethical principles guiding Islamic finance. Through those initiatives focused on projects that offer good economic and social yield, it leverages liquidity while improving its operational efficiency, making these companies more appealing to clients sensitive to issues of sustainability. Furthermore, enhancement of audit quality bears relevance to the dampening of negative impact factors of excessive liquidity creation on the efficiency of Islamic banks in GCC countries by reinforcing governance and supervision, enabling an optimum utilization of excess liquidity into high value-added projects that correspond to the ethical values represented by Islamic finance. It consequently limits inefficiencies, reduces opportunity costs, and enhances overall returns. Besides, a quality audit creates an atmosphere of confidence, consolidates financial stability, and contributes to economic diversification through the reallocation of surplus money into strategic sectors.

These findings undoubtedly underscore the fact that CSR disclosure, audit quality, SSBs and institutional quality have played a fundamental role in shifting the liquidity-efficiency nexus to a more U-shaped curve. Their contribution is all the more significant because they will also be powerful levers for regulating excessive liquidity while promoting more balanced management for sustainability in the efficiency of Islamic banks in the GCC. Taken together, these factors would lead Islamic managers to be more balanced and prudent in their strategies, ensuring liquidity management that supports both long-term economic growth and financial stability. These factors help maintain a balance between excess liquidity and performance, minimizing risk while optimizing banking efficiency, with a profound change in the behavior of managers in the region.

Based on the empirical findings of this study, managers therefore need to adapt their liquidity management by integrating governance and control mechanisms that can help maximize returns while minimizing risks. Regulators need to promote risk management and transparency practices, improve the quality of audits and boards, and ensure that excess liquidity is used strategically in a way that contributes to sector stability and sustainable development.

This paper is organized into five sections. Section two summarizes the literature review with regard to liquidity creation-bank efficiency nexus, as well as the moderating factors (CSR disclosure, audit quality, SSB and institutional quality) that influence this nexus. Section 3 presents the empirical models and methodology. The estimated results and section 4 discusses the robust tests, while conclusions and recommendations are made in section 5.

2. Literature review and hypotheses development
2.1. Liquidity creation and bank efficiency

Research into the nexus between liquidity creation and bank performance remains a key area of inquiry within financial economics. In this line, two seminal studies by Allen & Gale (1998), Diamond & Dybvig (1983) have gone a long way in enhancing our understanding of the relationship. The relationship between liquidity creation and bank performance could be

understood by drawing on the literature on liquidity creation and bank stability. In the context of this, the existing literature underlines two main opposing hypotheses: the one about liquidity creation-stability and the one about liquidity creation-fragility, focusing more on bank performance.

More specifically, the liquidity creation-stability hypothesis states that procedures for the proper management of bank liquidity lead to a stable and sound financial system (Allen and Gale, 1998). More specifically, if banks aim for the necessary level of liquidity, they will be able to cope with credit fluctuations. This, in turn, optimizes the fluidity of financial markets. Moreover, good liquidity management by banks helps to avoid certain types of risk, such as financial crises and banking panics. It attracts more investors and encourages people to put their money in banks. This good management strengthens the confidence of lenders and depositors in the continuity of the financial system and the stability of banks. In addition, liquidity creation-stability hypothesis suggests that one of the main functions of banks is to create liquidity, which tends to have a positive impact on their performance. Specifically, banks create liquidity by transforming the deposited short-term liabilities into the long-term illiquid assets and give impetus to economic activities to develop income through interest rate spread (Berger & Bouwman, 2009). It suggests that the process improves profitability by allocating bank resources efficiently, especially in economies with limited access to credit. Efficient financial intermediation further reduces information asymmetries and transaction costs, thereby increasing a bank's competitive advantage and overall performance (Diamond & Dybvig, 1983). In return, they convert deposits into loans, generating a certain amount of liquidity, which generally contributes to economic growth. According to Berger & Bouwman (2016), they create liquidity on and off balance sheets; therefore, they are crucial for their operational efficiency and profit making. Furthermore, strong governance structures by the banks can further optimize this concept of liquidity creation and keep it focused on the pathways of long-term strategies of value maximization (Boot &Thakor, 2000).

However, the liquidity creation-fragility hypothesis (Diamond & Dybvig, 1983) has stated that undue bank liquidity mismanagement-especially from unnecessary balance sheet expansion and lending to high-risk consumers-significantly raises vulnerability to financial crisis. More importantly, too much cash reserves mask many serious risks and encourage managers to pursue activities destructive to stability itself (Rajan, 2006). Lenders to underperforming banks may take higher risks because of information asymmetries and conflicts of interest (Stiglitz and Weiss, 1981; Jeitschko and Jeung, 2005). The higher the coverage ratio, the lower share market prices and the higher the risk of bank failure (Fama, 1965). The asymmetric information and moral hazard between bankers and borrowers are also sources of inefficient liquidity management. Moral hazard worsens because excess liquidity encourages the bankers to commit poor lending and risk taking. Bankers with excess liquidity are tempted to aggressively lend to the risky borrowers so that loan volume and bonus-based compensation go up. Consequently, lenders would have reduced collateral requirements due to deterioration in loan quality. The outcome of this kind of risky operation is mammoth-scale defaults that shake the individual banks and also the system. During economic shocks such as recessions or financial crises, banks' risky assets can rapidly lose value, threatening financial stability.

Furthermore, when banks issue risky loans to generate liquidity, they risk repayment issues if borrowers default, causing financial distress and hindering their ability to manage financial stress. Banks may fail to meet liquidity demands during massive deposit withdrawals or market disruptions, potentially leading to banking crises and systemic shocks. As a result, moral hazard and excessive risk-taking amplify default and financial instability accordingly. According to Agénor and El Aynaoui, (2010); Acharya and Naqvi, (2012), the liquidity fragility hypothesis postulates that liquidity undermines bank stability.

In practice, few studies have ascertained the linear nexus between liquidity creation and bank efficiency. In fact, most previous studies have appraised the effect of liquidity creation on performance or stability, with mixed results (Tran et al., 2016; Veeramoothoo & Hammoudeh 2022; Dua & Niu, 2020; El-Chaarani et al., 2023; Mahawiya et al., 2023; Niu, 2024). For instance, Veeramoothoo & Hammoudeh (2022) find that liquidity creation and stable net funding positively impact profitability in a study of US banks. The authors conclude that the liquidity constraints imposed by Basel III have a quantitatively small but positive effect on bank profitability. However, this varies with profitability level. Low and high profitability banks are affected differently. Smaller banks gain more resilience, given that the management of short-term liquidity risk is improved, while larger ones gain more stability against medium- and long-term risk. This, therefore, shows that regulation should be adapted to the size and profitability of the banks. In particular, Basel III adoption is a basic pillar in limiting the negative impact on banks' profitability while reducing the risk of liquidity crises and strengthening financial stability. The same result is supported by Dua & Niu, 2020, who evidence that liquidity creation improves bank performance. Moreover, El-Chaarani et al., (2023) conclude that liquidity creation enhances the economic and financial performance of banks operating in the GCC region and during times of crisis. Niu (2024) shows that at low levels of economic policy uncertainty, liquidity hoarding has a negative impact on US banks' profitability. However, at high levels of political uncertainty, liquidity hoarding exerts a positive effect. The author demonstrates that these results are consistent for banks of different sizes, both in normal times and in times of Covid 19 crisis. In a sample of 55 banks over the period 2010-2020, Jian et al., (2023) develop an econometric study to examine how the liquidity and capital of the bank influence sustainable bank lending in the MENA region. Their estimations show that higher capital and liquidity ratios constrain the possibility for banks to engage in sustainable lending, while funding liquidity has a positive and statistically significant effect on their growth. This effect remains positive for all levels of bank capital, thus highlighting that capital strengthens the relationship between funding liquidity and sustainable lending capacity. This effect remains positive for all levels of bank capital, thus highlighting that capital strengthens the relationship between funding liquidity and sustainable lending capacity. In addition, for large banks, high capital ratios increase their sustainable lending capacity.

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However, at high levels of political uncertainty, liquidity hoarding has a positive effect. The authors demonstrate the consistency of these results for banks of different sizes, both in normal times and in times of Covid 19 crisis. Using a sample of 55 banks in the period 2010-2020, Jian et al., (2023) conducted an econometric study on bank liquidity and capital in determining sustainable bank lending in the MENA region. The study finds that higher capital and liquidity ratios are associated with constraining banks' abilities to go into sustainable lending, whereas funding liquidity is positive and significant in promoting their growth. This effect remains positive for all levels of bank capital and thus highlights that capital strengthens the relationship between funding liquidity and sustainable lending capacity. More precisely, this effect remains positive for all levels of bank capital, emphasizing the fact that capital strengthens the relationship between funding liquidity and the capacity for sustainable lending. Moreover, for large banks, high capital ratios increase their sustainable lending capacity. In a recent study, Cobbinah et al., (2024) depict that credit risk increases the financial performance of Ghanaian banks, meaning that prudent credit management propels profitability. However, liquidity risk diminishes financial performance, meaning that liquidity management is key. Market risk, on the other hand, maximizes financial performance, meaning that strategic exposure to the market can enhance shareholder wealth. The implication of the study is a call for balance in risk management, fusing proactive credit risk control with a focus on liquidity, while making strategic linkages to stand resilient and profitable.

However, other studies suggest that the creation of excessive liquidity could deteriorate bank performance. In this context, Fungacova et al., (2021) find that high liquidity creation decreases bank performance, especially for the context of Russian bank failures. His study confirms a high liquidity creation hypothesis, which means a rise in liquidity creation notably raises the possibility of bank failure. Yahaya et al., (2022) portray that liquidity risk negatively impacts the performance of banks operating in sub-Saharan Africa in terms of their non-performing loans. This implies that too aggressive a creation of liquidity may be highly risky, further debilitating the profitability aspect. Besides, Luck & Schempp (2023) show that very market-based intermediation tends to create inefficient liquidity. Accordingly, they find that surplus creation of liquidity can lead to a sub-optimality in the debt securities level, which actually uncovers a systemic inefficiency in liquidity management. Vuong et al., (2024) conduct an econometric study to analyze the effects of liquidity creation on bank performance. The authors use panel data from 28 Vietnamese commercial banks over the period 2012-2022. According to them, it was found that liquidity creation diminishes profitability. The authors attribute this finding to the existence of particular detriments that were observed on the asset, liability and equity sides, as well as in off-balance sheet activities.

The same findings were reported for Islamic banks. More precisely, Sahyouni & Wang (2019) make an econometric analysis to judge the effect of liquidity on bank performance. In this respect, the authors construct a sample of 491 commercial banks in 18 MENA countries over the period 2011-2016. Panel data results indicate the presence of a negative nexus between liquidity creation and bank financial performance, which suggests that greater creation of

liquidity raises the odds of being in an illiquid condition and consequently diminishes profitability and increases the likelihood of banks failing. The authors also find no difference between Islamic and conventional banks in the relationship between liquidity creation and bank performance. Indeed, their study supports the cost of failure hypothesis.

Other studies have investigated the impact of liquidity creation on the stability of conventional and/or Islamic banks. Some studies indicate that liquidity creation increases banking stability. Some studies indicate that liquidity creation enhances banking stability (e.g, Garg et al., 2024; Gupta & Kashiramka, (2024)). For example, Garg et al., (2024) demonstrate that the higher the Tier 1 capital ratios of Canadian banks are, the more this enables liquidity creation to take place by absorbing risks associated with illiquidity. Equally, Gupta & Kashiramka (2024) demonstrate that better stability is positively linked to higher levels of liquidity creation, especially for banks with high ESG disclosure in the Asia-Pacific region. Others demonstrate the contrary. For instance, Garg et al., (2024) posit that liquidity creation contributes negatively to stability in times of crisis. Tran & Nguyen, (2023) note that high liquidity creation may further create fragility, especially in poorly capitalized banks, implying a fine-tuned regulatory system that balances stability and discourages liquidity creation. In addition, Berger et al., (2019) establish that Islamic banks create more liquidity per unit of assets, mainly via their balance sheet assets. These results are economically significant and robust from an econometric point of view in both high and low-income countries and valid during the stable period and during the global financial crisis. Furthermore, the increase in liquidity creation by conventional banks tends to reduce financial stability, especially in high-income countries, but this does not hold true for Islamic banks, reflecting greater resilience. Javid et al., (2024) indicate that liquidity creation reduces profitability but increases the stability of conventional and Islamic banks in Pakistan.

However, this area of research has never ceased evolving. Other recent studies have concentrated on nonlinear nexus between some factors and banking efficiency. For instance, Hojer & Mataigne (2024) find a U-shaped relationship between ESG and financial performance, and an inverted U-shaped relationship between ESG and risk for Swiss banks. López-Penabad et al., (2023) show that the relationship between CSR and efficiency is non-linear (U-shaped), indicating that European banks with high levels of Corporate Social Performance are the most efficient. In Islamic banks, Khémiri et al. (2023) prove that there is a quadratic relationship (U shape) between CSR and the stability of Islamic banks of GCC countries. Sidhu et al., (2023) observe that liquidity improves the efficiency of Indian banks. However, they also highlight a non-linear relationship between liquidity and banking efficiency. This relationship suggests that, although liquidity initially enhances efficiency, efficiency begins to decline once an optimal level of liquidity is reached, particularly in banks benefiting from institutional investors and advanced technologies. Neves et al, (2020) demonstrate a non-linear relationship between bank size and performance, with contrasting effects: a positive relationship with profitability and a negative relationship with efficiency for Portuguese and Spanish banks.

While several previous studies were conducted on different determinants, the non-linear nexus of the impact of liquidity creation on Islamic bank efficiency has been disregarded in

previous literature. Against this backdrop, my study aims at filling the gap in literature by investigating whether there is any nonlinear relation among them. Therefore, our first hypothesis will be:

Hypothesis 1. *There exists a nonlinear nexus between liquidity creation and Islamic bank efficiency.*

H1(a). *According to liquidity creation-stability hypothesis, liquidity creation significantly increases Islamic bank efficiency.*
H1(b). *Based on liquidity creation-fragility hypothesis, liquidity creation significantly reduces Islamic bank efficiency.*

2.2. Liquidity creation and bank efficiency : Moderating effects
2.2.1. CSR disclosure

CSR is found to be positively and negatively related to both liquidity creation and bank efficiency, as observed by many, for different reasons. Researchers suggest that well-performing CSR banks may reduce their liquidity creation during periods of financial crisis as a way to mitigate risks to protect their stakeholders during unpleasant economic times, as suggested Chen & Chen 2024. On the other hand, good CSR practices may increase liquidity creation by increasing deposits and loans, thus improving banks' liquidity position. However, the impact of CSR on liquidity creation varies according to bank size, capital and the nature of financial crises (Zheng et al., 2023).

Thus, the moderating effect of CSR on liquidity creation- bank efficiency-has rarely been discussed in the existing banking literature. It seems that most of the previous researches have generally focused on the direct effect of CSR on conventional and Islamic banks in terms of financial performance or stability, and thus have produced different results. In conventional banking industry, Belasri et al. (2020) claim that CSR improves the efficiency of banks, but only in developed countries with strong investor protection and high stakeholder orientation. It was concluded that some institutional features are very necessary for CSR to significantly improve the efficiency of banks. Furthermore, George et al., (2023) conclude that CSR expenditure maximizes the performance of Indian banks. Forgione et al., (2020) suggest that the efficiency of banks in common law countries and in countries with effective stakeholder, protection can be boosted by investing in CSR activities. In the same vein, Wu & Chen (2024) and Cao et al. (2024) indicate that the increasing trend in ESG investment tends to be associated with improvements in banks' efficiency, particularly in environmental and governance issues. More specifically, Cao et al., (2024) observe that ESG investments have a positive impact on bank efficiency. It is observed that environmental and governance aspects increase efficiency, while social factors decrease efficiency. Moreover, this association is further strengthened by fintech, so that efficiency increases more with higher ESG investment. However, Shaddady & Alnori (2024) demonstrate that ESG practices lead to lower efficiency, which means that not all ESG initiatives ensure an immediate increase in efficiency. Shahwan et al., (2023) also prove that my aggregate CSR practices have a positive effect on the technical efficiency of Egyptian banks in Islamic and conventional industries. Alam et al, (2023), demonstrate that ESG activities have a positive effect on the overall efficiency of banks, especially for conventional

banks. However, the effect is negligible for Islamic banks, indicating a lack of adequate investment in ESG practices.

More recently, studies have progressed by testing the moderating effect of CSR on the relationship between some factors (CSR reporting, culture…etc.) and banking efficiency or performance and stability. For instance, Elbardan et al., (2023) conclude that CSR committees positively moderate the relationship between CSR reporting and external assurance and firm value. Similarly, Hojer & Mataigne (2024) find that CSR investments increase the performance of European banks. In addition, Persakis & Al-Jallad (2024) confirm the fact that CSR is effective when the environment, specifically economic conditions and social values, acts as either a reinforcing or moderating factor in its impact on bank performance. In addition, Xie & Zhang (2023) show that media attention positively moderates the nexus between CSR and efficiency of foreign direct investment by Chinese firms. Nevertheless, Zhang et al., (2024) exhibit that CSR has a negative moderating effect on culture, religion and firm financing choices nexus. In other words, Elkilany & Kortam (2024), from an Islamic perspective, find that the correlation between Islamic business approach and expertise is moderated by CSR practices. Khémiri & Alsulami 2023 show that governance practice moderates the nexus between CSR and stability of Islamic banks in GCC countries. Khémiri et al. (2024) conclude that in the context of financial inclusion, CSR moderates the nexus with bank stability; therefore, a balanced approach could achieve an optimal trade-off between stability and risk.

Generally, the previous literature suggests that the moderating role of CSR on the relationship between liquidity creation and Islamic bank efficiency has not been examined or even explored. A very good exploration of such a relationship would be considered a real contribution to the body of literature on Islamic banking. Figure 2 illustrates this conceptual model. The second hypothesis is thus as follows:

Hypothesis 2. CSR disclosure moderates the relationship between liquidity creation and Islamic bank efficiency.

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2.2.2. Audit quality

These governance structures strongly influence the relationship between liquidity creation and bank efficiency, especially in Islamic banks. Previous studies indicate that corporate governance plays an important role in managing liquidity and improving bank efficiency and performance. This effect is more pronounced in Islamic banks due to the difference in governance practices from conventional banks and its direct impact on liquidity risk management and efficiency. Islamic banks tend to have higher total factor productivity than conventional banks, suggesting that good governance structures are beneficial in enhancing their efficiency. Moreover, corporate governance works to enhance the efficiency of both Islamic and conventional banks through mechanisms such as voice and accountability in terms of optimizing resources, minimizing costs and enhancing liquidity creation (Sufian et al., 2017; Kamarudin et al., 2020).

Given its placement in the governance structure, audit would be a critical lever for better transparency, application of standards and strategic decision making in improving the stability and performance of banks (Khémiri & Alsulami, 2023). In this regard, Haddad et al., (2021) note that audit quality enhances liquidity and financial performance of conventional banks, but its effect on liquidity creation in Islamic banks is still ambiguous, indicating that other factors have the dominant influence. Other recent studies (Haddad, 2022; Haddad, 2024) suggest that audit quality is a determinant of bank performance and stability. Other recent studies indicate that audit quality is one of the determinants of bank performance and stability, as found by Haddad, 2022; Haddad, 2024.

However, the moderating role of audit quality is not sufficiently explored in the study of the relationship between liquidity creation and efficiency in Islamic banks. Only a few studies present the role of audit quality as a moderating variable in liquidity and efficiency of Islamic banks. For example, Darlis & Utary, (2022) demonstrate that profitability negatively moderates the relationship between liquidity and efficiency in Islamic banks. Moreover, Khémiri & Alsulami (2023) argue that governance structure has a moderating effect on the relationship between CSR and the stability of Islamic banks in the GCC region. On the other hand, some researches assessed the moderating role of information quality in the relationship between information asymmetry and earnings management in Jordanian industrial firms (Makhlouf et al., 2022). In addition, Chafai et al., (2024) provide evidence that audit quality (internal and external) moderates the relationship between financial inclusion and investment efficiency of non-financial firms operating in the MENA region. They show that the implementation of appropriate financial inclusion policies needs to combine the choice of inclusive financial services with high quality auditing. This can avoid agency costs and thus improve financial efficiency. Zahid et al., (2022) report that audit quality (especially Big 4) positively and negatively moderates the relationship between ESG and financial performance for firms operating in Western European countries.

In sum, the role of audit quality as a moderator of the nexus between liquidity creation and efficiency in Islamic banking has not yet been identified. This makes the analysis of this dynamic an important contribution to the banking literature. Therefore, the third hypothesis is as follows:

Hypothesis 3. Audit quality moderates the relationship between liquidity creation and Islamic Bank efficiency.

2.2.3. Shariah supervisory board

This raises a multidimensional topic touching on the specificity of the governance structure: the Sharia Supervisory Board's moderating role in the nexus between liquidity creation and Islamic banks' efficiency. The SSB plays a pivotal role of ensuring compliance with the Shariah principles, which might have an effect on the liquidity management and overall performance of these banking institutions. SSB reinforces Islamic banks' liquidity by confirming the Islamic banks' conformity with Shariah principles; in turn, this attracts more clientele to deposit their money with banks. In addition to enhancing liquidity, good governance over SSB enhances

market disciplines optimally for better control over assets and liabilities to gain improvement in liquidity (Khomsatun et al. (2021); Khémiri & Alsulami (2023)).

Previous studies have highlighted the importance of SSB in determining the efficiency and financial performance of Islamic banks, while optimizing strategic decisions (Mollah & Zaman (2015); Mim & Mbarki, (2021); Baklouti (2022)). For instance, Mollah & Zaman (2015) illustrate that SSB enhances the performance of Islamic banks. An econometric study was conducted by Baklouti (2022), in which he examines the effect of SSB characteristics on the financial performance of 42 Islamic banks operating in the Middle East and North Africa (outside the Gulf Cooperation Council), in addition to non-Islamic countries, between 2011 and 2018. The results indicate that board size and number of meetings significantly enhance banking performance, whereas multiple directorships diminish it. In contrast, competence and reputation of board members, as well as the proportion of women on the board, are not significantly related to financial performance.

Other research has focused on the moderation of SSB in terms of the nexus between some factors and bank performance/stability. Subsequently, Neifar et al. (2020) prove that in this respect, the quality of the SSB positively moderates the nexus among financial performance, operational risk disclosure, and board efficiency. The authors establish that high quality maintains the GCC Islamic banks commitment to disclosing such risks even in times of improved performance for enhanced stakeholders' transparency. Khomsatun et al., (2021) establish that the SSB moderates the influence of Sharia disclosure on Islamic bank soundness, especially on the management efficiency and liquidity of Islamic banks in 16 countries. However, this effect is dependent on the regulatory framework in place. Eldaia (2022) states that the quality of the Sharia committee has a moderating effect on the nexus between the characteristics of the audit committee and the performance of Takaful companies in Malaysia. More interestingly, Khémiri et al. (2023) find that SSB moderates the non-linear relationship of CSR with Islamic banks stability, but such a curvilinear link changes into an inverted-U shape. Precisely, in their study, reinforcement of Islamic governance-that is SSB-exercised a positive moderating effect on linking CSR and banking stability until reaching its threshold limit. However, this has, beyond the critical threshold limits, negative signs that moderate it. Lastly, Salsabila & Widyastuti (2024) establish that the association of varied performance indicators with financial performance, such as intellectual capital and the Islamicity index, is moderated by SSB. This would have a consequence on the overall efficiency of Islamic banks.

The preceding literature would generally indicate that the literature has not been fully explored in respect of the SSB as a moderating variable on the nexus between liquidity creation and efficiency within an Islamic bank. A good investigation into such a relationship will indeed be a contribution to knowledge in the field of Islamic banking. Thus, the fourth hypothesis is:

Hypothesis 4. SSB moderates the relationship between liquidity creation and Islamic bank efficiency.

2.2.4. Institutional quality

Due to the limited number of studies focusing on this issue, whether institutional quality moderates liquidity creation and banking efficiency is still ambiguous. Despite a few studies, they mostly focus on the role of institutional quality in moderating either liquidity creation or other factors in bank performance or stability. Some researchers have pinpointed that, in a conventional banking setting, institutional quality plays a decisive role in liquidity creation and enhancing banking efficiency. For example, Baradwaj (2016) demonstrate how strong institutional quality significantly enhances the ability of banks to create liquidity, leading to an increase in performance. This effect is dynamic and promotes liquidity creation during the boom period and recessions, which dampens the nexus between institutional quality and bank efficiency. Javid et al., 2024 also indicate that corruption positively moderates liquidity creation-bank stability nexus. Bawuah (2024) depicts that institutional quality strengthens the positive impact of bank capital on liquidity creation in sub-Saharan Africa and infers that strong institutions complement the role of bank capital by improving liquidity creation and, thereby, overall bank performance.

A similar finding has also been reported in the Islamic banking sector. In this context, Khémiri & Alsulami (2023) argue that CSR-Islamic bank stability can be moderated by institutional quality. Furthermore, Akmal et al., (2024) establish that the findings depict differential effects of corporate governance on the performance of both Islamic and conventional financial institutions within the economy of Pakistan. The authors go on to establish that high quality of institutions significantly moderates or shapes the influence of corporate governance toward ensuring improved performance for both financial institutions. This paper suggests that the quality of institutions is a good element in enhancing the contributions of corporate governance in the improvement of the performance of financial institutions. Mortaza et al., (2024) report a non-linear relationship between institutional quality, banking efficiency, and financial stability in Malaysian Islamic banks. Government efficiency and regulatory quality negatively affect financial stability, as measured by Z-scores based on returns on assets, while this impact is positive on nonperforming loans. In addition, an environment with the rule of law strictly in place accommodates inefficient Islamic banks operating under high financial stability. These results put forward the differential effects of institutional dimensions on financial stability, considering the kind of indicators used and the efficiency level of the banks.

From the foregoing literature, it can be argued that the literature has not been well exploited when it comes to the level of institutional quality as a moderator variable on the relationship between liquidity creation and efficiency of an Islamic bank. A good investigation of such a link will contribute to knowledge in the field of Islamic banking. Figure 1 depicts this conceptual model. For this situation, the fifth hypothesis is as follows:

Hypothesis 5: Institutional quality moderates the relationship between liquidity creation and Islamic bank efficiency.
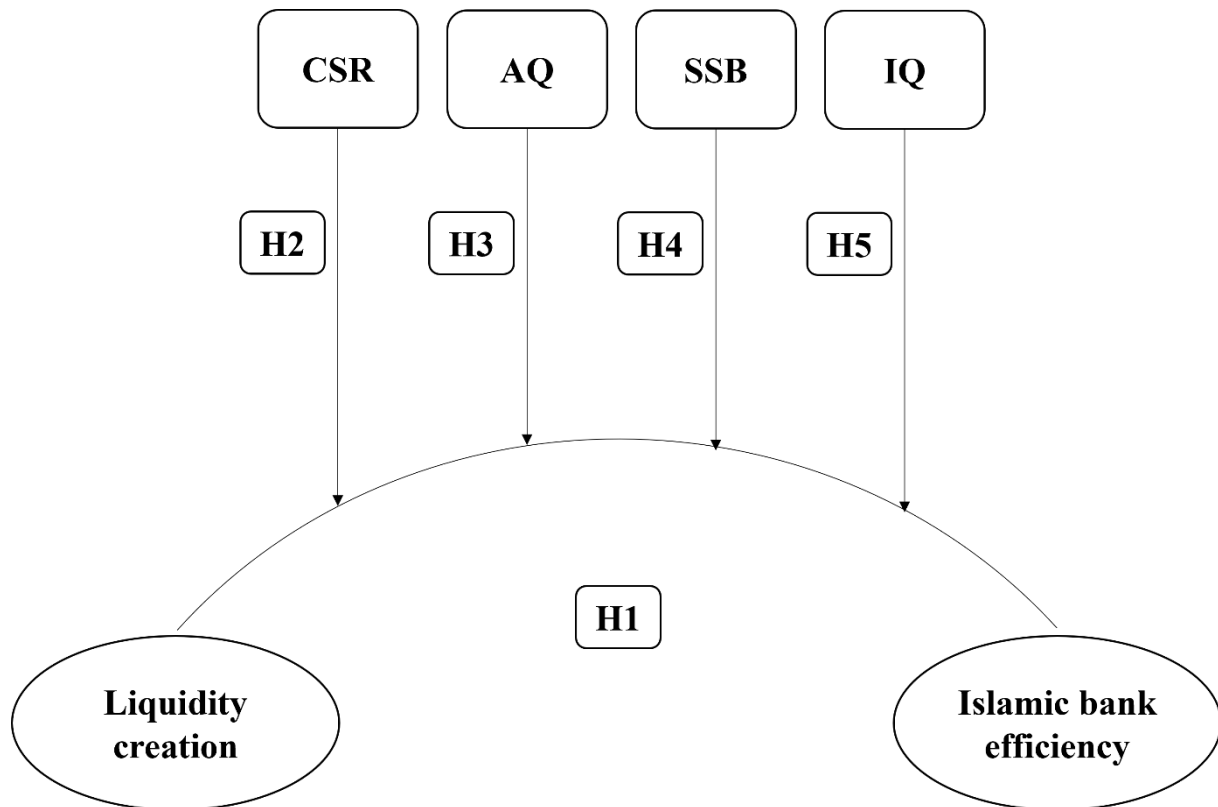
Figure 1. Conceptual framework

3. Research methodology
3.1. Sample and Data

This research considers, for the period 2012-2020, all commercial banks operating in the GCC countries. I excluded investment banks, savings banks, and cooperative banks due to the dissimilarity in operational goals that these types of banks have from our study. Also, banks for which at least two consecutive years of continuous data are not available have been left out of this study. I constructed a balanced panel data set that consists of 34 commercial Islamic banks from six GCC economies: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates. The final dataset contains 306 bank-year observations. The data are collected from several sources. The bank level data are gathered from Bankscope database while the macroeconomic data is collected from the World Development Indicators (WDI) from the World Bank.

3.2. Variables
3.2.1. Dependent variable

Following recent previous studies (e.g., Lee et al., 2023), I use the Malmquist index of the DEA approach to compute the Islamic bank efficiency (IBE) which represented by total factor productivity. To calculate the IBE, I follow Lee et al. (2023) adopting the intermediation approach utilizing two inputs and tow outputs. For inputs, I use two indicators: (i) deposits, measured by resident deposits plus interbank deposits, and (ii) labor force. For outputs, I also use two indicators: (i) total loans and (ii) net interest income measured by interest income minus interest expense. To compute the IBE values, I employ the deap2.1 software was to compute the IBE values of 34 Islamic banks in GCC countries (**see table A1**).

3.2.2. Main independent variable

Following the approach in Berger et al., (2019), to measure the liquidity creation, I apply the three steps to the so-called "cat fat" procedure of Berger and Bouwman (2009). The first step is classifying all bank activities (assets, liabilities and equity, and offbalance sheet) into three categories liquid, semi-liquid, and illiquid. Table A1 sums up all bank activities with their classification into liquidity classes. In the second step, all banking activities classified in step 1 are assigned weights: 0.5 for liquid, 0 for semi-liquid and -0.5 for illiquid activities. Third, the measure of liquidity creation - cat fat - is computed by aggregating the activities classified in step 1 and weighted in step 2, all normalized to total gross assets. Finally, following Berger et al., (2019), I remove loans and other consumer/retail loans because they are regarded as semi-liquid assets in high-income countries. The liquidity creation of bank i at time t is calculated as follows:

$$Lc_{it} = \left(\begin{array}{c} +0.5 \times \left(illiquid\ assets + illiquid\ liabilities + illiquid\ guarantees \right) \\ -0.5 \times \left(liquid\ assets + liquid\ liabilities + equity + liquid\ guarantees \right) \end{array} \right) \Big/ gross\ total\ assets \quad (1)$$

3.2.3. Moderator variables

I evaluate CSR disclosure based on the methodology from Mallin et al. (2014), Khémiri and Alsulami (2023), and Khémiri et al. (2024) since it proposes an index of disclosure CSR integrating a range of elements, as per the suggestions by Haniffa & Hudaib (2007). I have chosen 10 dimensions that consist of 84 elements, including the criteria from AAOFI Standard No. 7. Each element was considered as a binary variable; if the element was mentioned in the annual reports or websites of the firms, it would be valued at 1, and otherwise, 0. This method has the advantage of fairly weighting the index, thus minimizing potential biases regarding the rating and the scale, as presented in equation (2).

$$CSR_i = \frac{\sum_{i=1}^{n} X_i}{n} \quad (2)$$

where CSR_i is corporate social responsibility index, n is the number of items expected for bank i, and X_i is a dummy variable that takes the value of 1 if the item is disclosed and 0 if not.

To control governance practices (firm and country levels), we use tow variables. First, we use the Shariah Supervisory Board (SsB) score. This score is composed of 5 items using principal component analysis (PCA) method. Second, I use the audit quality measured by the total number of members on the audit committee (AUQ) and I included in my model institutional quality.

3.2.4. Control variables

I follow prior literature (e.g., Sahyouni & Wang, 2019 ; Lee et al., 2024; Khémiri et al., 2024) that has controlled for a set of bank- and country-level variables. I control for asset quality using the ratio of loan loss provisions to gross loans, AQy. Additionally, we use the log of total assets

to control for size, SIZE. Moreover, I introduce in the model some economic variables, such as inflation rate and GDP growth as control variables, in order to account for the effect of the macro-economic conditions on Islamic bank efficiency; this allows isolating the particular impact of liquidity. Inflation may affect bank efficiency by its effects on real interest rates and operating costs. Likewise, the GDP growth rate is considered one of the main determinants of economic health, which will influence demand for banking services and asset quality of banks.

Table 1. Definition of variables.

Variables	Acronyms	Measurements	Sources
Bank efficiency	IBE	Total factor productivity index measured by Malmquist index of the DEA approach	Bankscope and authors' own calculation
	Inputs	Total deposits: Resident deposits + interbank deposit Labor force Total loans	
	Outputs	Net interest income: Interest income–interest expense	
Liquidity creation	LC	The approach of Berger et al. (2019) which calculated in the three step "*cat fat*" procedure.	Bankscope and authors' own calculation
Corporate social responsibility disclosure	CSR	The CSRD Index includes items from AAOFI Standard No. 7 and consists of 10 dimensions comprising 84 items.	Authors' own calculation
Audit quality	AUQ	The total number of members on the audit committee	Bankscope and authors' own calculation
Shariah supervisory board	SSB	SSB score (comprising 5 item) using PCA	
Institutional quality	IQ		
Bank size	SIZE	The natural logarithm of total assets	Bankscope and authors' own calculation
cost			
Asset quality	AQR	The ratio of loan loss provisions to gross loans	Bankscope and authors' own calculation
Inflation rate	INFL	Consumer prices index (annual %)	WDI, World Bank
Economic growth	GDP	GDP growth rate (annual %) (Gross domestic product growth rate (at constant 2015 prices)	WDI, World Bank

3.2. Empirical model

In the present research, I delve into the non-linear relationship between LC and IBE, as well as how the moderating effect of IBE moderates the nexus between LC and IBE. Specifically, I test the five hypotheses mentioned above. To evaluate the first hypothesis, the baseline model tests the inverted curvilinear relationship between LC and IBE. To this end, I estimate the model, which can be written as follows:

$$ibe_{cit} = \beta_i + \beta_1 ibe_{cit-1} + \beta_2 lc_{cit} + \beta_3 lc_{cit}^2 + \sum_{n=4}^{6} \beta_n cv_{cit} + \sum_{m=7}^{8} \beta_m mv_{ct} + \varepsilon_{it} \qquad (1)$$

Where:

Various studies, including those by Cobbinah et al., (2024), have employed the systemic GMM estimation method of Blundell and Bond (1998) in order to analyze bank efficiency and thereby overcome both heterogeneity and endogeneity in dynamic panels. This approach will be effective in instances where the time dimension of the panel is smaller than its cross-sectional dimension. In order to control for unobserved heterogeneity, we took the first difference of all variables, and a first-order autocorrelation was seen in the residuals, with AR (1) tests refusing the null hypothesis of no autocorrelation. For its part, AR (2) tests did not reject this hypothesis, so second-order autocorrelation is ruled out, which means the dynamic structure of the models has been proved valid. The use of valid instruments is crucial for dynamic GMM estimation, so I applied J-Hansen test, which confirmed the validity of the instruments in our models (Arellano and Bond, 1991).

The Baseline model is modified here in order to test for the second hypothesis, which considers moderating effects of CSR between the nexus of LC-IBE. Adding the following interaction terms into equation (2):

$$ibe_{cit} = \beta_i + \beta_1 ibe_{cit-1} + \beta_2 lc_{cit} + \beta_3 lc_{cit}^2$$
$$+ \beta_4 CSR_{cit} + \beta_5 lc_{cit} \times CSR_{cit} + \beta_6 lc_{cit}^2 \times CSR_{cit} \qquad (2)$$
$$+ \sum_{n=7}^{9} \beta_n cv_{cit} + \sum_{m=10}^{11} \beta_m mv_{ct} + \varepsilon_{it}$$

Where:

Second, in testing for the third hypothesis, it is essential to modify this baseline model by considering moderating effects of AQ that exist between the nexus LC-IBE. Thus, adding the following interaction terms in equation (3):

$$ibe_{cit} = \beta_i + \beta_1 ibe_{cit-1} + \beta_2 lc_{cit} + \beta_3 lc_{cit}^2$$
$$+ \beta_4 AQ_{cit} + \beta_5 lc_{cit} \times AQ_{cit} + \beta_6 lc_{cit}^2 \times AQ_{cit} \qquad (3)$$
$$+ \sum_{n=7}^{9} \beta_n cv_{cit} + \sum_{m=10}^{11} \beta_m mv_{ct} + \varepsilon_{it}$$

Where:

Third, to test the fourth hypothesis, I modify the baseline model by introducing the moderating role of SSB between the nexus LC-IBE. Thus, in the equation (4), there have been included the following interaction terms:

$$
\begin{aligned}
ibe_{cit} = \beta_i &+ \beta_1 ibe_{cit-1} + \beta_2 lc_{cit} + \beta_3 lc_{cit}^2 \\
&+ \beta_4 SSB_{cit} + \beta_5 lc_{cit} \times SSB_{cit} + \beta_6 lc_{cit}^2 \times SSB_{cit} \\
&+ \sum_{n=7}^{9} \beta_n cv_{cit} + \sum_{m=10}^{11} \beta_m mv_{ct} + \varepsilon_{it}
\end{aligned}
\tag{4}
$$

Where:

Finally, to test the five hypotheses, I modify the basic model by introducing the moderation roles of IQ between the LC and IBE nexus. Consequently, in equation 3, there have been inserted the following interaction terms:

$$
\begin{aligned}
ibe_{cit} = \beta_i &+ \beta_1 ibe_{cit-1} + \beta_2 lc_{cit} + \beta_3 lc_{cit}^2 \\
&+ \beta_4 IQ_{cit} + \beta_5 lc_{cit} \times IQ_{cit} + \beta_6 lc_{cit}^2 \times IQ_{cit} \\
&+ \sum_{n=7}^{9} \beta_n cv_{cit} + \sum_{m=10}^{11} \beta_m mv_{ct} + \varepsilon_{it}
\end{aligned}
\tag{5}
$$

Where:

4. Findings and discussions
4.1. Statistical analysis

Table 1 summarizes the descriptive statistics of all the variables used in this study. The descriptive statistics show that the average efficiency of Islamic banks in the sample for the period 2012-2020 is 0.975. Reflecting the effective use of resources, sound management and strong adherence to Sharia principles, the sample shows a high average efficiency of Islamic banks (0.975). In addition, the average liquidity creation (LC) is 0.398, with a minimum of -0.082 and a maximum of 0.816. Liquidity creation averages 0.398, indicating active liquidity creation, although the variation across banks highlights differences in management practices influenced by institutional and regulatory factors. In addition, CSR disclosure, audit quality (AQ), SSB and IQ average 0.109, 0.604, 0.286 and 0.442 respectively. CSR disclosure is low at 0.109, indicating a need for improved transparency, while audit quality is moderate at 0.604,

indicating that the standard of financial reporting can be improved. The low average of SSB effectiveness, at 0.286, underlines the need for stronger governance, while the moderate institutional quality of 0.442 indicates that the institutional structure can be further developed to ensure greater stability and efficiency in banking.

Table. Descriptive statistics.

Variable	Obs	Mean	Std. Dev.	Min	Max
IBE	387	0.975	0.034	0.869	1
LC	387	0.398	0.244	-0.082	0.816
CSR	387	0.109	0.16	0	1
AQ	387	0.604	0.201	0	1
SSB	387	0.286	0.197	0	1
IQ	387	0.442	0.355	0	1
Size	387	3.638	0.87	1.124	5.097
Cost	387	0.703	1.195	0.109	0.953
AQy	387	0.017	0.043	0.059	0.456
Inf	387	1.577	1.68	-2.54	4.07
GDP	387	0.023	0.029	-0.058	0.09

As shown in Table 2, the Pearson correlation matrix testifies that no multicollinearity problem exists among the variables since all the estimated coefficients are less than 0.80. Besides, no VIF is greater than 10. Besides, there is no VIF value greater than 10, indicating that there is no collinearity between the explanatory variables.

Table. Matrix correlation

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) IBE	1.000										
(2) LC	0.040*	1.000									
(3) CSR	0.028*	0.206*	1.000								
(4) AQ	-0.062*	0.030	-0.114	1.000							
(5) SSB	0.005*	0.220*	0.428*	0.005	1.000						
(6) IQ	0.079*	0.028	0.004	0.049	0.006	1.000					
(7) Size	0.015	0.054	0.296*	-0.077	-0.052	-0.229*	1.000				
(8) Cost	0.013*	-0.084	-0.082	-0.019	0.024	0.037	-0.256*	1.000			
(9) AQy	0.097*	0.048	-0.062	0.035	0.110	0.154*	-0.221*	0.036	1.000		
(10) Inf	0.059	-0.106	0.029	0.095	-0.034	0.116	-0.053	0.006	-0.023	1.000	
(11) GDPG	0.020*	-0.251*	-0.162*	0.109	-0.188*	0.022	-0.039	0.032	-0.009	0.587*	1.000

Note: * denotes the significant at 5% level.

4.2.Main results

4.2.1 The curvilinear nexus between liquidity creation and Islamic bank efficiency

In this subsection, I would present the results of the curvilinear association between liquidity creation and Islamic Bank efficiency. Table 3 presents results under various estimations. The results in models 1 and 2 indicate that GMM estimators are appropriate for the current study because the J-Hansen test confirms that Instrumental variables are significantly different from one another. Moreover, the outcomes of the AR (1) and AR (2) tests also support the null hypothesis of first and second order correlation ((see table 3, Panel A).

More specifically, the coefficients on the lagged bank efficiency variable (IBE t-1) are positive and significant at the 1% level in both models. This positive significance highlights the dynamic and persistent nature of Islamic banking efficiency in the GCC region. In other words, the past performance of Islamic banks positively influences their current efficiency, reflecting a spillover effect related to the accumulation of experience, the strengthening of their reputation and the organizational learning effect. This persistence may also indicate structural inertia, whereby efficient banks maintain their advantage through better resources. These findings underscore the importance for GCC policymakers to provide an environment conducive to further efficiency gains, such as technology innovation, diversification of Islamic financial services and an incentive-based regulatory regime.

In the case of our variable of interest, column 1 from model 1 reveals that LC significantly decreases the efficiency of Islamic banks. The finding supports *liquidity creation-fragility hypothesis,* which suggests that bankers often favor strategic choices that involve low risks to protect their institutional stability, at the expense of bank efficiency. This means that a negative and significant effect of liquidity on efficiency in Islamic banking may mirror a proclivity towards high liquidity retention by banks with the hope of coping with uncertainties at the expense of an optimum allocation of available resources. The fact that Islamic banks within the GCC economies have gained less from efficiency might also be explained by specific structural features and regulatory natures characterizing their respective Islamic banking sectors: Shariah compliance requirements, while combined with high liquidity buffers, lower high-yield investment opportunities. Besides, in economies heavily dependent on hydrocarbon, economic cycles tend to incline Islamic banks to assume a non-aggressive operational approach, which concurrently reduces their efficiencies. This finding is quite similar to that of Sahyouni & Wang (2019) and Javid et al., (2024).

Nevertheless, this result can be better understood in terms of the inverse correlation between liquidity creation and Islamic banking efficiency. In this line of analysis, I follow Khémiri & Alsulami (2023). In addition, I use Lind & Mehlum (2010) test for the presence of an inverted-U correlation. The results in Table 3 show that the relationship between liquidity creation and Islamic banking efficiency is curvilinear. ***This takes the form of an inverted U, thus corroborating Hypothesis 1.***

These suggest the possibility of a curvilinear correlation between liquidity creation and bank efficiency, with the sign changing from positive (left-hand side) to negative (right-hand side), indicating that there are two diverging sides, as shown in **Figure 2**. On the left-hand side, it shows the result that increased liquidity creation increases bank efficiency. In fact, the beneficial effect of liquidity creation on the efficiency of Islamic banks can be interpreted *liquidity*

creation-stability hypothesis. Based on liquidity creation-fragility hypothesis, liquidity creation significantly reduces Islamic bank efficiency, as discussed above. **Economically,** this result highlights the existence of a curvilinear nexus between liquidity creation and the efficiency of Islamic banks, with the sign of the correlation changing from positive to negative, thus showing two divergent effects. On the positive side, the left-hand side of the equation shows that an increase in liquidity creation improves the efficiency of Islamic banks. This can be supported by *liquidity creation-stability hypothesis*, which states that the mobilization of more liquid resources to finance investment in productive activities and to meet the needs of depositors would lead to a better allocation and efficiency of resources. Liquidity creation therefore helps to diversify Shariah-compliant financial products, which helps Islamic banks to compete in their markets.

Beyond the threshold (equal to 0.316), however, on the right-hand side, the effect is reversed, reflecting the constraints imposed by excessive liquidity creation. If banks hold too much liquidity, this could be interpreted as a sign of excessive risk aversion or inefficient allocation of resources due to missed opportunities for better returns. In addition, this tied up excess liquidity may further indicate a reliance on low-risk but low-return financial instruments, often constrained by Shariah. This in turn reduces the overall operational efficiency of Islamic banks (see table 3, Panel B). Therefore, these findings underscore the importance of striking an optimal balance between liquidity generation and prudent risk management in order to maximize the efficiency benefits of Islamic banking. The positive result is in line with some previous studies Veeramoothoo & Hammoudeh (2022); El-Chaarani et al. (2023) and Mahawiya et al., (2023), where the authors found that liquidity creation maximizes bank performance.

Therefore, the results suggest that Islamic banks should aim for an optimal level of liquidity creation, above which the management and opportunity costs become exceptionally high. As a result, there is a curvilinear relationship between liquidity creation and Islamic banking efficiency, with a concave curve. Several factors serve to explain the above reasoning. First, moderate liquidity creation allows banks to optimally utilize their resources, meet depositors needs and diversify their financial products, thereby increasing their efficiency. Beyond a certain threshold, however, banks face increasing costs in managing excess liquidity, such as the loss of more profitable investment opportunities or diminishing returns on Sharia-compliant investments. This excess liquidity may reflect a prudent-even defensive-risk management approach that reduces their ability to innovate and finance higher value-added projects. These findings have interesting implications for Islamic banks in their ability to balance liquidity creation with efficiency in resource allocation to maximize performance within religious and economic constraints.

Other control variables are also important. From columns ((1) and (2)) of Table 3, I can see that the coefficient of the bank size variable is positive and statistically significant at 1%. Bank size positively affects the efficiency of Islamic banks due to a number of economic factors. Large banks tend to enjoy economies of scale: as the number of units increases, the cost per unit decreases; they are in a better position to generate diversified revenue streams and manage risks optimally. They also have more resources to invest in sophisticated technology, improve

liquidity management and strengthen their funding capabilities, thereby improving operational efficiency. In addition, the larger size of Islamic banks enables them to manage the requirements of Shariah compliance in a more comprehensive manner and to offer a wider range of attractive financial products. In this regard, scale fosters the long-term competitiveness and stability of the Islamic banking sector.

In addition, the signs of the coefficients of cost can be observed to be negative and statistically significant at 1% level, reflecting specific challenges relating to their structure and obligations. A high cost is generally linked with inherent intricacy of Sharia-compliant financial products, need to monitor their operations through Sharia Boards and investment in technology and specialized training. Besides, the lack of economies of scale and the absence of well-developed secondary markets for Islamic instruments, such as Sukuk, further add to these costs. While intrinsically part of the nature of Islamic banks, these added costs limit their ability to deploy their resources with efficacy and raise the need for reforms that would enhance their competitiveness and efficiency.

Similarly, the coefficients of asset quality appear positive and significant at 1% levels from column ((1) and (2)). This suggests that asset quality is one of the most important determinants of Islamic banking efficiency. Indeed, higher quality assets, i.e., loans and investment with low default risk, allow banks to maintain higher levels of profitability while reducing bad debt costs. Therefore, this enhances their efficiency as it reduces the provisions a bank needs to make on credit losses and optimizes the use of their resource utilization. In addition, it requires reduced additions for liquidity to meet contingencies, which allows banks to devote more resources to worthwhile investments or innovations, thus making banks highly competitive in the market. Moreover, high-quality asset banks are perceived to be more solid, which permits them to decrease their financing costs and raise investors cheaper. This enhancement in risk management and profitability directly translates into more significant operational efficiency.

I also notice that Islamic Bank efficiency is as well affected by macro-economic variables. The INFL has negative in columns ((1) and (2)) effects on IBE. In such a case, inflation diminishes the real value of assets underlying the financial contracts such as Murabaha or Ijara, which in turn reduces the net profit margin in Islamic banking in GCC nations. This also enhances the probability of default, as Islamic banks cannot charge interest on arrears. It reduces their ability to compensate for losses. Inflation raises operating costs and induces volatility in asset markets, disturbing investments by Islamic banks, which rely on the real economy. All these factors combined reduce their efficiency in financial resource allocation and maintaining stable intermediation.

The GDP has positive influences on IBS (column 1). Indeed, the increase in GDP has fueled economic activities and increased the need for Islamic financial instruments like participatory finance and real asset-based investments, leading to the improved efficiency of Islamic banking in GCC countries. The increase in the economy enhances the borrowers' creditworthiness, decreasing default risks and increasing the banks' stability. Moreover, economic growth boosts investment opportunities in the productive sectors and thereby enables Islamic banks to enhance

their profitability without compromising on the principles of Islamic finance. This then enhances resource allocation and financial intermediation.

Table.3. Main outcomes

VARIABLES	(1) IBS	(2) IBS
Panel A: main results		
IBS_{t-1}	0.487***	0.394***
	(0.042)	(0.054)
lc	-0.016***	0.094***
	(0.005)	(0.031)
lc2		-0.148***
		(0.039)
lnsize	0.112***	0.118***
	(0.007)	(0.004)
cost	-0.017	-0.013
	(0.015)	(0.011)
aq	0.054***	0.074***
	(0.017)	(0.016)
inf	-0.198**	-0.091*
	(0.001)	(0.001)
gdpg	0.059*	0.021
	(0.033)	(0.034)
Constant	0.505***	0.585***
	(0.039)	(0.053)
Observations	344	344
Number of banks	43	43
Number of instruments	34	34
AR (1) p-value	0.000	0.000
AR (2) p-value	0.135	0.385
Hansen test p-value	0.183	0.115
Endogeneity test	0.000	0.000
Panel B: Test for the U-shaped curve		
Group	Lower bound	Upper bound
Interval	-0.082	0.816
Slope	0.118***	-0.148***
	(3.180)	(-4.327)
Overall test		
t-value		3.18***
p-value		0.001
Extreme point		0.316

Notes: Standard errors are displayed in brackets. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. T-values are shown in brackets.
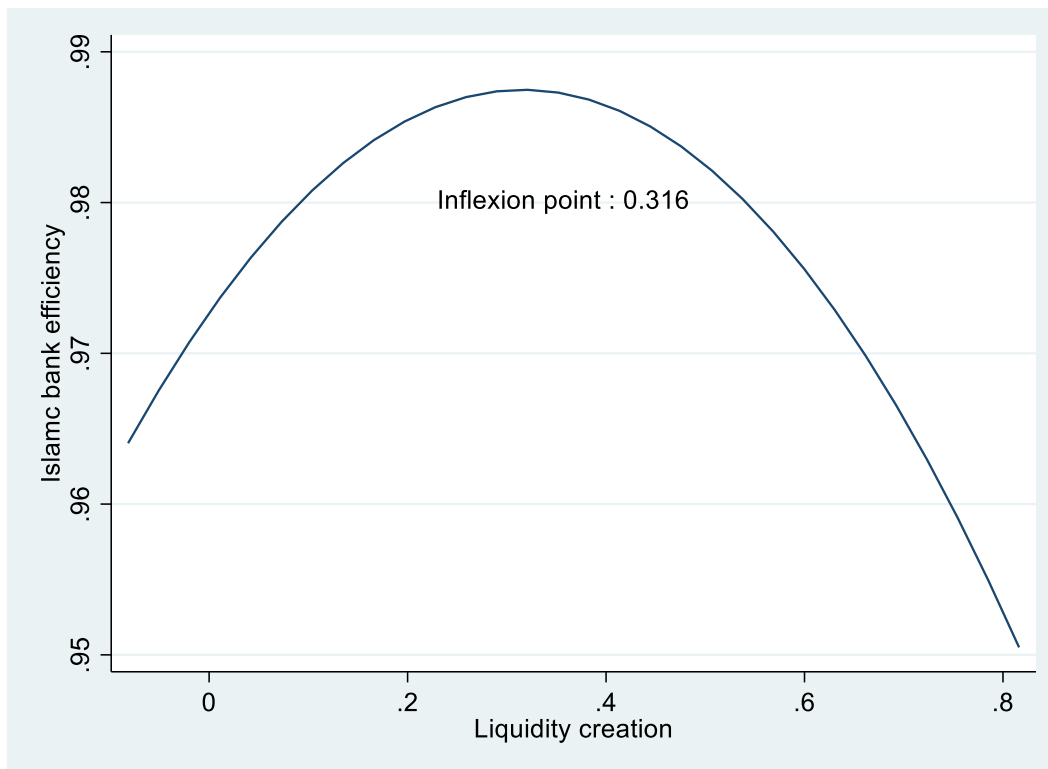
Figure 2. The inverted U-shaped nexus between Liquidity creation and Islamic bank efficiency

4.3. Moderating effects

In this subsection, I discuss the results of the moderating effects of CSR, audit quality, SSB and institutional quality on liquidity creation and Islamic Bank efficiency nexus. Results in table 4 also show that the direct impact of CSR on Islamic bank efficiency is positive and statistically significant (column (1)). A 1% increase in CSR results in a high increase of 30.1% in the bank efficiency of Islamic banks, as evident from column (1). Corporate Social Responsibility enhances the efficiency of Islamic banks in GCC countries by making them more aligned with the ethical and social tenets of Islamic finance. Through responsible investments, supporting local communities, education, and the environment, for example, Islamic banks further improve their image and increase more value-susceptible customer bases. It will develop increased loyalty from depositors and partners, reduce risk in controversial practices, and create avenues for socially responsible investment that increases efficient resource allocation and better overall performance.

Specifically, while it was expected that the interaction term of CSR disclosure and LC would affect IBE nonlinearly, its curvilinear shape has actually reversed from concave to convex compared to the earlier result, as shown in column 1. Economically, the nonlinear impact of the interaction between CSR and liquidity creation on the efficiency of Islamic banking in GCC countries reflects the ever-evolving relationship influenced by the increasing complexity of the way financial and social resources are managed. At a first stage, for a simultaneous increase of both liquidity and CSR investments, the banking efficiency is diminished. This is partly because the initial costs of CSR initiatives are high, while the accompanying liquidity creation can lead

to misallocation of funds or unproductive excess liquidity. With better strategic integration, however, these resources have started to be mobilized in financing projects that conform to Islamic finance principles, such as investment in real assets and socially responsible investment initiatives. It is at this stage that the impact of the interaction between CSR and liquidity becomes positive. Improving the reputation of banks, attracting ethically sensitive customers, and better use of liquidity for revenue-generating projects turn these factors into efficiency drivers. First, this positive effect accumulates up to a certain threshold after which excessive liquidity, as captured by the squared term, might again lead to inefficiencies because of higher management costs or resources-investment opportunity mismatches. This underlines that optimal creation and use of liquidity should balance with respect to their creation and use, thereby maximizing efficiency in the framework of CSR.

Moreover, the results also indicate that the direct impact of audit quality on Islamic bank efficiency is significantly positive, as shown in column (2). Economically, a 5% increase in audit quality is associated with a significant rise of about 0.4 % in the bank efficiency of Islamic banks, as depicted in column (2). While the interaction term of LC and audit quality (CSR*AQ) has non-linear effects on IBE, the shape of the curve turns out to be convex unlike the previously obtained results (see Column 2). The nonlinear effect of the interaction between audit quality and liquidity creation on Islamic banking efficiency in GCC countries reflects an evolving relationship between supervision, financial transparency, and resource management. Initially, the simultaneous increase in audit quality and liquidity creation could reduce banking efficiency. High-quality audits are costly because most of the resources are used, plus the creation of liquidity that has not attained its full exploitation in projects that are productive. Over time, as the quality of the audit improves to allow for better supervision and increased transparency, it enhances the Islamic banks' ability to manage their liquidity effectively. Liquid resources are then invested in accordance with the principles of Islamic finance, reducing waste and increasing stakeholder confidence. In this way, this interaction affects banking efficiency increasingly positively. However, this interaction's positive effect reaches an optimal threshold. Too much liquidity can become inefficient, as it can be difficult to allocate the liquidity or projects that are over-financed without commensurate returns. This again indicates that Islamic banks need to maintain a balanced synergy between rigorous audit quality and prudent liquidity management in order to maximize efficiency.

Furthermore, the results also reveal that the direct impact of SSB on Islamic bank efficiency is positive and significant, as seen in column (3). Economically, a 5% increase in SSB significantly raises bank efficiency in Islamic banks by 8.5%, as reported in column (3). While the interaction between SSB and LC-CSR*LC-non-linearly influences IBE, in contrast to what was witnessed above, the shape has changed from concave to convex, as indicated in column 3. This means that the non-linear impact of the interaction between SSB and liquidity creation on Islamic banking efficiency in the GCC nations is a complex and time-changing relationship, together with liquidity intensity. In the initial phase, where liquidity creation is low, and the role of the SSB is accentuated, it can be observed to be negative. This could be in view of the high costs of instituting Shariah compliance controls and audits coupled with excess liquidity not being deployed optimally to achieve efficiency. However, it becomes positive when the creation

of liquidity increases and Islamic banks optimize the use of this liquidity, especially to finance projects that are in line with the principles of Islamic finance. The role of SSBs is vital in this regard, as it ensures that the generated liquidity is invested in Sharia-compliant activities, hence enhancing transparency, strengthening stakeholder confidence, and improving profitability. Therefore, SSB-liquidity interaction will have positive effects on increasing banking efficiency. This positive impact could be further strengthened in a situation when the excess liquidity starts to be used more productively and is under stricter control of the SSB. In case there is too much liquidity increase, potentially positive, beyond an optimum level, it might start bringing inefficiencies if it cannot be well allocated to profitable projects or Sharia-compliant projects. This underlines the need for an optimal balance between liquidity management and involvement in SSBs to attain maximum Islamic banking efficiency.

Furthermore, the results also reveal that the direct effect of IQ on the efficiency of Islamic banks is positive and statistically significant, as evidenced in column (4). Economically, this implies that a 1% increase in IQ significantly leads to an increase of 11.0% in the bank efficiency of Islamic banks, as seen in column (4). The interaction term between IQ and LC, CSR*LC, has a nonlinear effect on IBE. However, unlike the previous results, the shape of the curve has changed from concave to convex (see column 3). The non-linear interaction effect between institutional quality and liquidity creation on Islamic banking efficiency in the GCC nations may be interpreted as follows: first, when institutional quality is at a relatively low level, accompanied by excess liquidity, banking efficiency will be hurt. This is because, under conditions of institutional instability or lack of transparency, liquidity creation will not be effectively allocated and, hence, will lead to inefficiencies. This liquidity may be difficult for banks to invest in profitable and Sharia-compliant projects, which will impede their profitability and performance. However, as institutional quality improves-for instance, through better governance, more transparent regulations, and better law enforcement-excess liquidity starts to be optimally allocated, thereby improving banking efficiency. In this context, institutional quality plays a catalytic role in better managing and exploiting excess liquidity, hence reducing the risks of misallocation and promoting efficiency in resource management. In this respect, improving the quality of institutions allows maximizing the return on available liquidity, and it is here that the interaction between the two factors becomes essential.

Table. Moderating effect results

VARIABLES	(1) ibe	(2) ibe	(2) ibe	(2) ibe
IBS_{t-1}	0.385***	0.818***	0.684***	0.465***
	(0.041)	(0.053)	(0.068)	(0.029)
lc	0.458***	0.357***	0.276***	0.338***
	(0.078)	(0.090)	(0.069)	(0.044)
lc^2	-0.580***	-0.566***	-0.416***	-0.471***
	(0.091)	(0.127)	(0.068)	(0.066)
csr	0.301***			
	(0.094)			
lc x csr	-1.747***			
	(0.430)			
lc^2 x csr	2.160***			

		(0.482)		
gs		0.004**		
		(0.003)		
lc x gs		-0.506***		
		(0.137)		
lc² x gs		0.796***		
		(0.192)		
ssb			0.085**	
			(0.077)	
lc x ssb			-0.711**	
			(0.312)	
lc² x ssb			1.044***	
			(0.300)	
iq				0.110***
				(0.022)
lc x iq				-0.775***
				(0.133)
lc² x iq				1.028***
				(0.187)
size	0.001	0.001	0.002**	0.005***
	(0.003)	(0.001)	(0.001)	(0.002)
depot	0.001	0.000	-0.000	0.003***
	(0.001)	(0.000)	(0.001)	(0.001)
aq	0.094***	0.048	-0.005	0.051***
	(0.022)	(0.038)	(0.012)	(0.017)
inf	-0.002	-0.002*	-0.004***	-0.002**
	(0.001)	(0.001)	(0.001)	(0.001)
gdpg	0.177***	0.076	0.169***	0.070*
	(0.064)	(0.073)	(0.042)	(0.041)
Constant	0.522***	0.171***	0.277***	0.463***
	(0.043)	(0.063)	(0.078)	(0.030)
Observations	344	344	344	344
Number of banks	43	43	43	43
Number of instruments	33	26	24	33
AR (1) p-value	0.000	0.000	0.000	0.000
AR (2) p-value	0.603	0.640	0.121	0.602
Hansen test p-value	0.189	0.196	0.173	0.112

4.4. Robustness check

4.4.1. Change in Dependent variable (**Alternative measure of Islamic Bank Efficiency**)

To safeguard the strength of the empirical results, I adopted alternative measure of Islamic bank efficiency. Following Lee et al. (2023), I measure the cost efficiency of Islamic banks using the stochastic frontier approach (SFA). The transcendental logarithm production function is written as follow:

$$
Ln\left(\frac{ATC}{W_2}\right) = \alpha + \beta Ln(K) + \sum_{i=1}^{3} C_i \times Ln(Y_i) + D \times Ln(K)^2
$$

$$
+ \sum_{i=1}^{3} Ln(Y_i)^2 + E_{12} \times Ln(Y_1) Ln(Y_2) + E_{13} \times Ln(Y_1) Ln(Y_3) \qquad (5)
$$

$$
+ E_{23} \times Ln(Y_2) Ln(Y_3) + \sum_{i=1}^{3} F_i Ln(K) Ln(Y_i) + \varepsilon_{it} + \mu_{it}
$$

where,

ATC	Actual total cost equal to interest expense plus operating expenses.
Inputs	
W_1	Price of loanable funds measured by the interest expense to loanable funds.
W_2	Operating input price measured by the operating expenses to total assets.
K	Ratio of price of loanable funds to operating input price (W_1/W_2)
Outputs	
Y_1	Loan balances
Y_2	Non-interest income
Y_3	Investment and securities
ε_{it}	random interference term, subject to $N(0,\sigma_\varepsilon^2)$
μ_{it}	Non-negative non-efficiency term subject to $N^+(0,\sigma_\varepsilon^2)$.

Table 5 summarizes the different results, which are like those obtained from the main results.

Table. Changing dependent variables

VARIABLES	(1) sfa	(2) sfa	(3) sfa	(4) sfa	(5) sfa
sfa_{t-1}	0.645***	0.981***	0.703***	0.649***	0.510***
	(0.027)	(0.013)	(0.030)	(0.04695)	(0.032)
lc	-0.101**	0.222**	0.749***	-0.139***	-0.248**
	(0.046)	(0.086)	(0.275)	(0.042)	(0.114)
lc^2	0.185***	-0.261**	-0.567**	0.183***	0.321***
	(0.059)	(0.102)	(0.277)	(0.052)	(0.089)
csr		0.251***			
		(0.064)			
lc x csr		-0.135***			
		(0.031)			
lc^2 x csr		0.144***			
		(0.040)			
gs			0.377***		
			(0.102)		
lc x gs			-0.130***		
			(0.042)		
lc^2 x gs			0.103**		
			(0.043)		

	(1)	(2)	(3)	(4)	(5)
ssb				-0.068*	
				(0.035)	
lc x ssb				-0.687***	
				(0.209)	
lc^2 x ssb				0.545***	
				(0.174)	
iq					-0.031
					(0.067)
lc x iq					-0.649***
					(0.203)
lc^2 x iq					0.535*
					(0.269)
size	-0.072*	-0.027	-0.079**	-0.018***	-0.072
	(0.035)	(0.024)	(0.031)	(0.007)	(0.044)
depot	0.091	0.064	-0.057	0.012	-0.023
	(0.103)	(0.200)	(0.102)	(0.014)	(0.061)
aq	-0.053	0.011	-0.038	0.033	-0.093**
	(0.037)	(0.016)	(0.029)	(0.064)	(0.037)
inf	0.057**	-0.019	0.036*	0.038**	0.039***
	(0.022)	(0.039)	(0.019)	(0.017)	(0.012)
gdpg	0.047	0.066**	0.020	-0.162	-0.047
	(0.096)	(0.029)	(0.010)	(0.098)	(0.078)
Constant	0.282***	-0.012	0.020	0.465***	0.390***
	(0.025)	(0.020)	(0.071)	(0.107)	(0.030)
Observations	344	344	344	344	344
Number of banks	43	43	43	43	43
Number of instruments	33	26	24	33	33
AR (1) p-value	0.012	0.024	0.005	0.003	0.008
AR (2) p-value	0.131	0.152	0.283	0.116	0.423
Hansen test p-value	0.176	0.165	0.176	0.140	0.179

4.4.2. Change in independent variable (Alternative measure of LC)
Following Berger et al. (2019), we use three other measures of liquidity creation:
(i)   *Lc_A*: asset components of liquidity creation divided by corresponding gross total assets.
(ii)   *Lc_L*: liability components of liquidity creation divided by gross total assets.
(iii)   *Lc_O*: off-balance sheet components of liquidity creation divided by gross total assets.

The inverted U-shaped nexus between liquidity creation and Islamic bank efficiency is confirmed by the results, as in the previous regressions (Table 6). The moderating effects of CSR, Audit quality, SSB and institutional effect on liquidity creation-Islamic bank efficiency and the other control variables are also significant. They are consistent with those observed in the previous results (Table 6).

Table. Changing in independent variables

Dependent variable: ibe VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
			Lc_a					Lc_l					Lc_o		
	curvlinear	csr	gs	ssb	iq	curvlinear	csr	gs	ssb	iq	curvlinear	csr	gs	ssb	iq
ibe_{t-1}	0.936***	0.953***	0.857***	0.834***	0.848***	0.941***	0.859***	0.862***	0.852***	0.754***	0.926***	0.863***	0.874***	0.822***	0.446***
	(0.035)	(0.036)	(0.032)	(0.072)	(0.030)	(0.027)	(0.024)	(0.020)	(0.025)	(0.017)	(0.028)	(0.029)	(0.029)	(0.031)	(0.054)
lc	0.061***	0.122**	0.156**	0.352**	0.088***	0.191***	0.322***	-0.024***	-0.016***	-0.028***	0.022***	-0.071**	0.054***	-0.115***	-0.029***
	(0.001)	(0.046)	(0.060)	(0.137)	(0.025)	(0.047)	(0.001)	(0.002)	(0.006)	(0.002)	(0.004)	(0.030)	(0.007)	(0.024)	(0.010)
lc^2	-0.087**	-0.163***	-0.160**	-0.417***	-0.089***	-0.369***	-0.736***	0.081***	0.012***	0.036***	-0.263***	0.049***	-0.085***	0.096**	0.053**
	(0.003)	(0.045)	(0.067)	(0.143)	(0.025)	(0.085)	(0.004)	(0.013)	(0.001)	(0.004)	(0.073)	(0.017)	(0.001)	(0.038)	(0.019)
me		0.055	0.030*	0.113*	0.001		0.931*	-0.034	0.080	0.029		-0.075	-0.017	-0.036*	0.138
		(0.056)	(0.015)	(0.065)	(0.002)		(0.005)	(0.033)	(0.078)	(0.026)		(0.130)	(0.068)	(0.018)	(0.461)
lc x me		-0.357*	-0.165**	-0.720**	0.101***		-0.014***	-0.490***	0.726***	0.277***		0.297***	-0.097***	0.511***	0.979**
		(0.194)	(0.080)	(0.322)	(0.012)		(0.005)	(0.044)	(0.022)	(0.034)		(0.108)	(0.011)	(0.099)	(0.364)
lc^2 x me		0.422**	0.151*	0.879**	-0.120***		0.356***	0.223***	-0.496***	-0.250***		-0.200***	0.015***	-0.042**	-0.221**
		(0.173)	(0.086)	(0.357)	(0.007)		(0.001)	(0.022)	(0.048)	(0.061)		(0.067)	(0.002)	(0.019)	(0.103)
size	0.032	0.090	-0.080	-0.049	-0.027***	0.017*	0.143**	0.204**	0.017***	0.011*	0.275***	-0.015	0.088	0.016*	0.013
	(0.021)	(0.020)	(0.062)	(0.032)	(0.001)	(0.010)	(0.001)	(0.076)	(0.005)	(0.006)	(0.084)	(0.717)	(0.079)	(0.008)	(0.018)
depot	0.021	-0.050	0.202*	0.301	0.056***	0.027	0.947***	0.028**	0.090***	0.083***	0.081**	0.0664**	0.032	0.014**	0.069
	(0.039)	(0.055)	(0.005)	(0.201)	(0.018)	(0.030)	(0.001)	(0.001)	(0.013)	(0.004)	(0.038)	(0.029)	(0.033)	(0.005)	(0.064)
aq	0.039	-0.064	0.017*	0.207***	0.013***	-0.065	0.020***	0.017***	-0.011	0.013***	0.100	0.0160	0.031***	-0.019**	0.054**
	(0.081)	(0.160)	(0.010)	(0.018)	(0.004)	(0.057)	(0.004)	(0.001)	(0.030)	(0.003)	(0.452)	(0.0159)	(0.006)	(0.009)	(0.022)
inf	-0.047***	-0.038***	-0.023***	-0.017	-0.039***	-0.525***	-0.515***	-0.034***	-0.040***	-0.039***	-0.314***	-0.151**	-0.031	-0.367***	-0.026
	(0.011)	(0.012)	(0.001)	(0.015)	(0.017)	(0.001)	(0.001)	(0.003)	(0.016)	(0.002)	(0.077)	(0.073)	(0.050)	(0.054)	(0.109)
gdpg	0.183***	0.134***	0.102***	0.081*	0.124***	0.173***	0.200***	0.124***	0.162***	0.155***	0.118***	0.086**	0.035	0.1631***	0.038
	(0.040)	(0.045)	(0.026)	(0.048)	(0.038)	(0.040)	(0.030)	(0.014)	(0.008)	(0.010)	(0.033)	(0.033)	(0.024)	(0.033)	(0.045)
Constant	0.061*	0.034	0.118***	0.125*	0.143***	0.054**	0.132***	0.131***	0.138***	0.237***	0.060**	0.135***	0.121***	0.176***	0.541***
	(0.035)	(0.040)	(0.040)	(0.069)	(0.030)	(0.026)	(0.024)	(0.021)	(0.024)	(0.017)	(0.027)	(0.027)	(0.030)	(0.028)	(0.053)
Observations	344	344	344	344	344	344	344	344	344	344	344	344	344	344	344
Number of banks	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Number of instruments	33	26	24	33	33	33	26	24	33	33	30	28	28	35	32
AR (1) p-value	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR (2) p-value	0.052	0.070	0.071	0.096	0.140	0.052	0.330	0.051	0.370	0.390	0.68	0.073	0.94	0.075	0.144
Hansen test p-value	0.160	0.196	0.239	0.145	0.157	0.240	0.180	0.132	0.193	0.143	0.146	0.177	0.165	0.189	0.173

5. Conclusion and recommendations

The current paper investigates the curvilinear link that exists between liquidity creation and the efficiency of Islamic banks within the GCC countries, along with the moderating effects of CSR disclosure, audit quality, SSB, and institutional quality on this link. More specifically, the results depict the nexus between liquidity creation and Islamic bank efficiency in an inverted U shaped. In the beginning, while moving upward, efficiency improves with increased liquidity, but as soon as it reaches its optimal level of 31.60%, banks start to take more risks and, hence, become inefficient. This implies that while managers are initially prudent when faced with excess liquidity, as liquidity surpasses a certain level, managers are more likely to pursue risky strategies. However, this negative nexus is transformed into an upside-down U-shaped nexus where efficiency again rises with higher levels of liquidity through the moderating effects of disclosure of CSR practices, audit quality, presence of Sharia Supervisory Boards (SSBs), and institutional quality. This implies that managers of Islamic banks have to be all the more watchful with their liquidity management policies, adjusting their policies as excess liquidity increases. Besides, they must include appropriate mechanisms for governance and control that would enable them to take risks but with judiciousness to maximize returns. Moreover, surplus liquidity must be deployed gainfully, channelizing it into high social and economic potential investments while upholding the values of Islamic finance.

In addition, the political and regulatory authorities of GCC countries have to consider all these dynamics while formulating their policies related to banking. Given the non-linear relationship, as observed, which ranges from a positive effect initially to a negative effect and further to a positive effect under the influence of moderating factors, shows the importance of regulating liquidity management effectively. Regulators should encourage better governance and risk management practices in Islamic banks by enhancing the quality of audits, transparency in CSR practices, and the supervision of Sharia supervisory boards. Besides, institutional quality is of prime importance in encouraging banks to adopt bolder but controlled risk-taking strategies, hence promoting better long-term liquidity management.

The dynamics, therefore, need to be considered by the political and regulatory authorities in the GCC countries while formulating their banking policies. The non-linear relationship observed to change from a positive effect to a negative effect and then back to a positive effect under the influence of moderating factors underlines the importance of effective regulation of liquidity management. Moreover, regulators should encourage better practices of governance and risk management by enhancing the quality of audit, transparency in CSR behavior of a bank, and supervisions of Sharia supervisory board. Besides, high-quality institutions will lead banks towards robust but controlled risk-taking stance through which they can contribute much effectively and smoothly manage long-term liquidity positions for them. The regulators should impose strict standards to ensure that excess liquidity is utilized in the best possible manner, considering the ethical principles of Islamic finance, without compromising the stability of the banking sector. The policies should also encourage investment diversification and informed decision-making so that banks avoid excessive risk-taking, which may erode their financial strength.

The last limitation of the current research is that, first; it focuses on the Islamic banks in GCC countries in a specific time and thus has limited generalizability to other regions and/or periods. In addition, access to comprehensive data with regard to moderating factors such as audit quality and CSR may affect the preciseness of the analyses. Methodological choices can also affect the modelling of a non-linear relationship between liquidity and banking efficiency. Finally, other external factors, like economic shocks, have not been considered. In the future, comparative research on other regions and periods and more in-depth analysis of the impact of digitalization, banking regulations, and other moderating variables would further our understanding of the dynamics in liquidity management and efficiency within Islamic banks.

References

Acharya, V., Naqvi, H., 2012. The seeds of a crisis: A theory of bank liquidity and risk taking over the business cycle. Journal of financial economics 106, 349–366.

Akmal, M., Rashid, A., Shah, S.M.A.R., ur Rehman, J., 2024a. Corporate Governance and Performance in Islamic and Conventional Financial Institutions: Moderating Role of Institutional Quality. Audit and Accounting Review 4, 54–80.

Akmal, M., Rashid, A., Shah, S.M.A.R., ur Rehman, J., 2024b. Corporate Governance and Performance in Islamic and Conventional Financial Institutions: Moderating Role of Institutional Quality. Audit and Accounting Review 4, 54–80.

Alam, A.W., Banna, H., Hassan, M.K., 2021. ESG activities and bank efficiency: are Islamic banks better? Alam, AW, Banna, H., & Hassan, MK (2022). ESG ACTIVITIES AND BANK EFFICIENCY: ARE ISLAMIC BANKS BETTER 65–88.

Alharthi, M., Islam, M.M., Alamoudi, H., Murad, M.W., 2024. Determinants that attract and discourage foreign direct investment in GCC countries: Do macroeconomic and environmental factors matter? Plos one 19, e0298129.

Ali, M.H., Rosly, S.A., Radwan, M., Secinaro, S., 2019. An Examination of Factors Affecting Excess Liquidity, Evidence from Islamic Banks in Malaysia, in: De Vincentiis, P., Culasso, F., Cerrato, S.A. (Eds.), The Future of Risk Management, Volume II. Springer International Publishing, Cham, pp. 259–275. https://doi.org/10.1007/978-3-030-16526-0_10

Arellano, M., Bond, S., 1991a. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. The review of economic studies 58, 277–297.

Arellano, M., Bond, S., 1991b. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. The review of economic studies 58, 277–297.

Baklouti, I., 2022. Is the sharia supervisory board a friend or an enemy of Islamic banks? Journal of Islamic Marketing 13, 526–541.

Baradwaj, B.G., Shao, Y., Dewally, M., 2016. Institutions, capital control, and liquidity creation. Journal of financial economic policy 8, 396–422.

Bawuah, I., 2024. Bank capital and liquidity creation in Sub-Saharan Africa: the role of quality institutions. AJEMS 15, 458–482. https://doi.org/10.1108/AJEMS-01-2023-0036

Belasri, S., Gomes, M., Pijourlet, G., 2020. Corporate social responsibility and bank efficiency. Journal of Multinational Financial Management 54, 100612.

Ben Mim, S., Ben Ali, M.S., 2020. Natural Resources Curse and Economic Diversification in GCC Countries, in: Miniaoui, H. (Ed.), Economic Development in the Gulf Cooperation Council Countries, Gulf Studies. Springer Singapore, Singapore, pp. 1–18. https://doi.org/10.1007/978-981-15-6058-3_1

Berger, A.N., Boubakri, N., Guedhami, O., Li, X., 2019. Liquidity creation performance and financial stability consequences of Islamic banking: Evidence from a multinational study. Journal of Financial Stability 44, 100692.

Berger, A.N., Bouwman, C.H., 2009. Bank liquidity creation. The review of financial studies 22, 3779–3837.

Berger, A.N., Bouwman, C.H., Kick, T., Schaeck, K., 2016. Bank liquidity creation following regulatory interventions and capital support. Journal of Financial Intermediation 26, 115–141.

Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. Journal of econometrics 87, 115–143.

Boot, A.W., Thakor, A.V., 1993. Self-interested bank regulation. The American Economic Review 206–212.

Boot, A.W.A., Thakor, A.V., 2000. Can Relationship Banking Survive Competition? The Journal of Finance 55, 679–713. https://doi.org/10.1111/0022-1082.00223

Brunnermeier, M.K., 2009. Deciphering the liquidity and credit crunch 2007–2008. Journal of Economic perspectives 23, 77–100.

Cao, Q., Zhu, T., Yu, W., 2024. ESG investment and bank efficiency: Evidence from China. Energy Economics 133, 107516.

Chafai, A., Khémiri, W., Tobar, R., Attia, E.F., Abozeid, H.O., 2024. The moderating effect of audit quality on the relationship between financial inclusion and corporate investment: new evidence from the Middle East and North Africa region. Cogent Economics & Finance 12, 2378121. https://doi.org/10.1080/23322039.2024.2378121

Chen, W., Chen, Y., 2024. Corporate social responsibility and bank liquidity creation during financial crises. Euro Fin Management eufm.12498. https://doi.org/10.1111/eufm.12498

Cobbinah, B.B., Yang, W., Sarpong, F.A., Nyantakyi, G., 2024. From Risk to Reward: Unveiling the Multidimensional Impact of Financial Risks on the Performance of Ghanaian Banks. Heliyon e40777. https://doi.org/10.1016/j.heliyon.2024.e40777

Darlis, V., Utary, T., 2022. Determinan Efisiensi Bank Umum Syariah di Indonesia dengan Profitabilitas sebagai Pemoderasi. Akuntansi dan Manajemen 17, 20–39.

Diamond, D.W., Dybvig, P.H., 1983a. Bank Runs, Deposit Insurance, and Liquidity. Journal of Political Economy 91, 401–419. https://doi.org/10.1086/261155

Diamond, D.W., Dybvig, P.H., 1983b. Bank Runs, Deposit Insurance, and Liquidity. Journal of Political Economy 91, 401–419. https://doi.org/10.1086/261155

Duan, Y., Niu, J., 2020. Liquidity creation and bank profitability. The North American Journal of Economics and Finance 54, 101250. https://doi.org/10.1016/j.najef.2020.101250

Elbardan, H., Uyar, A., Kuzey, C., Karaman, A.S., 2023. CSR reporting, assurance, and firm value and risk: The moderating effects of CSR committees and executive compensation. Journal of International Accounting, Auditing and Taxation 53, 100579.

El-Chaarani, H., Abiad, Z., Jafar, S., 2023. The impact of liquidity on the financial performance of banks during the post-Covid-19. https://doi.org/10.1016/B978-0-44-313776-1.00111-2

Eldaia, D.M., 2020. Moderating role of Shariah committee quality on the relationship between audit committee and Malaysian Takaful performance: a literature review. International Journal of Islamic Economics (IJIE) 2.

Fama, E.F., 1965. The behavior of stock-market prices. The journal of Business 38, 34–105.

Forgione, A.F., Laguir, I., Staglianò, R., 2020. Effect of corporate social responsibility scores on bank efficiency: The moderating role of institutional context. Corp Soc Responsibility Env 27, 2094–2106. https://doi.org/10.1002/csr.1950

Fungacova, Z., Turk, R., Weill, L., 2021. High liquidity creation and bank failures. Journal of Financial Stability 57, 100937.

Garg, M., Kryzanowski, L., Zhang, J., 2024. Canadian Bank Capital and Liquidity Creation*. Asia-Pac J of Fin Stud 53, 626–663. https://doi.org/10.1111/ajfs.12493

George, A.K., Kayal, P., Maiti, M., 2023. Nexus of corporate social responsibility expenditure (CSR) and financial performance: Indian banks. The Quarterly Review of Economics and Finance 90, 190–200.

Gupta, J., Kashiramka, S., 2024. Examining the impact of liquidity creation on bank stability in the Asia Pacific region: Do ESG disclosures play a moderating role? Journal of International Financial Markets, Institutions and Money 91, 101955.

Haddad, A., 2024. How to Successfully Select the Best-Performing Bank Based on the Best Auditor's Choice Quality in Islamic and Conventional Banks?, in: New Topics in Emerging Markets. IntechOpen.

Haddad, A., 2022. The Impact of the External Audit Quality on the Financial Performance of Conventional and Islamic Banks. Asian Journal of Middle Eastern and Islamic Studies 16, 127–147. https://doi.org/10.1080/25765949.2022.2061156

Haddad, A., El Ammari, A., Bouri, A., 2022. The effect of audit committee quality on the conventional and Islamic banks' financial performance between subprime and Corona crises. Asian Journal of Accounting Research 7, 230–251.

Haniffa, R., Hudaib, M., 2007. Exploring the Ethical Identity of Islamic Banks via Communication in Annual Reports. J Bus Ethics 76, 97–116. https://doi.org/10.1007/s10551-006-9272-5

Hojer, A., Mataigne, V., 2024. CSR in the banking industry: A longitudinal analysis of the impact on financial performance and risk-taking. Finance Research Letters 64, 105497.

Javid, M., Chandia, K.E., Zaman Malik, Q.U., 2024. Nexus of liquidity creation, profitability and bank stability with the moderating role of corruption: an empirical analysis. JFC 31, 1332–1361. https://doi.org/10.1108/JFC-08-2023-0198

Jeitschko, T.D., Jeung, S.D., 2005. Incentives for risk-taking in banking–A unified approach. Journal of Banking & Finance 29, 759–777.

Jiang, H., Xu, S., Cui, J., Subhani, G., 2023. The impact of bank capital, liquidity and funding liquidity on sustainable bank lending: Evidence from MENA region. Economic Analysis and Policy 79, 713–726.

Kamarudin, F., Mohamad Anwar, N.A., Md. Nassir, A., Sufian, F., Tan, K.M., Iqbal Hussain, H., 2022. Does country governance and bank productivity Nexus matters? Journal of Islamic Marketing 13, 329–380.

Karatas, A., 2017. High Quality Liquid Suk\"\pmk: Relevance, Practice, and Empirical Research in the Context of Rising Global Interest Rates. Applied Economics and Finance 4, 141–154.

Khémiri, W., Alsulami, F., 2023. Corporate social responsibility disclosure and Islamic bank stability in GCC countries: Do governance practices matter? Cogent Business & Management 10, 2260559. https://doi.org/10.1080/23311975.2023.2260559

Khémiri, W., Chafai, A., Attia, E.F., Tobar, R., Farid Fouad, H., 2024. Trade-off between financial inclusion and Islamic bank stability in five GCC countries: the moderating effect of CSR. Cogent Business & Management 11, 2300524. https://doi.org/10.1080/23311975.2023.2300524

Khomsatun, S., Rossieta, H., Fitriany, F., Nasution, M.E., 2021. Sharia Disclosure, Sharia Supervisory Board and the Moderating Effect of Regulatory Framework: The Impact on Soundness of Islamic Banking, in: Barnett, W.A., Sergi, B.S. (Eds.), International Symposia in Economic Theory and Econometrics. Emerald Publishing Limited, pp. 291–321. https://doi.org/10.1108/S1571-038620210000028017

Laeven, L., Levine, R., 2009. Bank governance, regulation and risk taking. Journal of financial economics 93, 259–275.

Lee, C.-C., Lu, M., Wang, C.-W., Cheng, C.-Y., 2024. ESG engagement, country-level political risk and bank liquidity creation. Pacific-Basin Finance Journal 83, 102260.

Lensink, R., Meesters, A., 2014. Institutions and Bank Performance: A Stochastic Frontier Analysis*. Oxf Bull Econ Stat 76, 67–92. https://doi.org/10.1111/obes.12002

López-Penabad, M.C., Iglesias-Casal, A., Neto, J.F.S., Maside-Sanfiz, J.M., 2023. Does corporate social performance improve bank efficiency? Evidence from European banks. Rev Manag Sci 17, 1399–1437. https://doi.org/10.1007/s11846-022-00579-9

Luck, S., Schempp, P., 2023. Inefficient liquidity creation. Journal of Financial Intermediation 53, 100996. https://doi.org/10.1016/j.jfi.2022.100996

Mabrouk, A., Farah, L., 2021. Liquidity Risk Management in the Islamic Banking: Portfolio of Ijara and Murabaha. European Journal of Islamic Finance.

Mahawiya, S., Mahamuda, K., Abdulai, A.-M., 2023. Assessing the Impact of Bank Liquidity on the Performance of Banks in Ghana. International Journal For Multidisciplinary Research Volume 5. https://doi.org/10.36948/ijfmr.2023.v05i03.4102

Makhlouf, M.H., Soda, M.Z., Oroud, Y., Ramadan, A.H., 2022. The moderating effect of audit quality on the relationship between information asymmetry and earnings management: evidence from Jordan. AAJFA 12, 165. https://doi.org/10.1504/AAJFA.2022.123089

Mallin, C., Farag, H., Ow-Yong, K., 2014. Corporate social responsibility and financial performance in Islamic banks. Journal of Economic Behavior & Organization 103, S21–S38.

Mim, S.B., Mbarki, Y., 2021. Corporate governance in Islamic banks: the efficiency of the Shariah Supervisory Board, in: Corporate Governance and Its Implications on Accounting and Finance. IGI Global, pp. 322–337.

MORTADZA, N.S., PURWANINGSIH, Y., TRINUGROHO, I., MULYANINGSIH, T., HAKIM, L., 2024. Interplay of Institutional Quality, Efficiency, and Stability in The Islamic Banking Sector of Malaysia. International Journal of Economics & Management 18.

Neifar, S., Salhi, B., Jarboui, A., 2020. The moderating role of Shariah supervisory board on the relationship between board effectiveness, operational risk transparency and bank performance. International Journal of Ethics and Systems 36, 325–349.

Neves, M.E., Proença, C., Dias, A., 2020. Bank profitability and efficiency in Portugal and Spain: A non-linearity approach. Journal of Risk and Financial Management 13, 284.

Niu, J., 2024. Liquidity hoarding and bank profitability: The role of economic policy uncertainty. Finance Research Letters 68, 106003.

Persakis, A., Ra'fat, T., 2024. The influence of corporate social responsibility and social values on bank performance: A global study. Borsa Istanbul Review.

Rajan, R.G., 2006. Has Finance Made the World Riskier? Euro Fin Management 12, 499–533. https://doi.org/10.1111/j.1468-036X.2006.00330.x

Sahyouni, A., Wang, M., 2019. Liquidity creation and bank performance: evidence from MENA. ISRA International Journal of Islamic Finance 11, 27–45.

Salsabila, Z., Widyastuti, S., 2024. Does Shariah Supervisory Board Moderate the Effect of Islamicity Performance Index and Intellectual Capital on Financial Performance? KnE Social Sciences 152–175.

Shaddady, A., Alnori, F., 2024. ESG practices and bank efficiency: new evidence from an oil-driven economy. International Journal of Islamic and Middle Eastern Finance and Management 17, 233–251.

Shahwan, T.M., Habib, A.M., 2023. Do corporate social responsibility practices affect the relative efficiency of Egyptian conventional and Islamic banks? International Journal of Emerging Markets 18, 439–462.

Sidhu, A.V., Abraham, R., Bhimavarapu, V.M., Kanoujiya, J., Rastogi, S., 2023. Impact of liquidity on the efficiency of banks in India using panel data analysis. Journal of Risk and Financial Management 16, 390.

Stiglitz, J.E., Weiss, A., 1981. Credit rationing in markets with imperfect information. The American economic review 71, 393–410.

Sturm, M., Strasky, J., Adolf, P., Peschel, D., 2008. The Gulf Cooperation Council countries-economic structures, recent developments and role in the global economy. ECB occasional paper.

Sufian, F., Hassan, M.K., Kamarudin, F., Nassir, A.M., 2017. Country governance and the performance of Islamic and conventional banks: international evidence, in: Handbook of Empirical Research on Islam and Economic Life. Edward Elgar Publishing, pp. 306–331.

Tran, V.T., Lin, C.-T., Nguyen, H., 2016. Liquidity creation, regulatory capital, and bank profitability. International Review of Financial Analysis 48, 98–109.

Tran, V.T., Nguyen, H., 2024. Competition, liquidity creation and bank stability. Accounting & Finance 64, 2111–2146. https://doi.org/10.1111/acfi.13212

Veeramoothoo, S., Hammoudeh, S., 2022. Impact of Basel III liquidity regulations on US Bank performance in different conditional profitability spectrums. The North American Journal of Economics and Finance 63, 101826.

Vuong, Phạm,, Nguyen, 2024. The effect of liquidity creation activities on the profitability of Vietnamese commercial banks [WWW Document]. SciSpace - Paper. https://doi.org/10.59276/jelb.2024.09.2654

Wu, Z., Chen, S., 2024. Does Environmental, Social, and Governance (ESG) Performance Improve Financial Institutions' Efficiency? Evidence from China. Mathematics 12, 1369.

Yahaya, A., Mahat, F., M.H., Y., Matemilola, B.T., 2022. Liquidity risk and bank financial performance: an application of system GMM approach. JFRC 30, 312–334. https://doi.org/10.1108/JFRC-03-2021-0019

Zahid, R.A., Khan, M.K., Anwar, W., Maqsood, U.S., 2022. The role of audit quality in the ESG-corporate financial performance nexus: Empirical evidence from Western European companies. Borsa Istanbul Review 22, S200–S212.

Zhang, C., Mehmood, R., Palma, A., Wang, Z., 2024. The impact of culture and religion on financing decisions: Moderating role of CSR. Research in International Business and Finance 70, 102360.

Zheng, C., Cheung, A. (Wai K., Zhang, J., Haider, I., 2023. Corporate social responsibility and bank liquidity creation. J of Financial Research 46, 343–382. https://doi.org/10.1111/jfir.12322

Appendix A

Table A1. Bank liquidity creation construction

Assets	
Illiquid assets	Liquid assets
	Reserve Repos and Cash Collateral
	Trading Securities and at FV through Income
Other Mortgage Loans	Available for Sale Securities
Corporate and Commercial Loans (Mudaraba, Musharaka, Murabaha)	Held to Maturity Securities
Other Loans	At-equity Investment in Associates
Investment in Property	Other Securities
Other Earning Assets	Cash and Due from other Banks
Foreclosed Real Estate	Insurance Assets
Fixed Assets (Ijara)	
Goodwill	
Other Intangibles	
Current Tax Assets	
Deferred Tax Assets	
Discontinued Operations	
Other Assets	

Liabilities and Equity	
Liquid Liabilities	**Illiquid Liabilities and Equity**
Customer Deposits (Amanah, Mudaraba and Musharaka)	Senior Debt Maturing after 1 Year
Deposits from Banks	Subordinated Borrowing
Repos and Cash Collateral	Other Funding
Trading Liabilities	Fair Value Portion of Debt

Credit Impairment Reserves
Reserves for Pensions and Other
Current Tax Liabilities
Deferred Tax Liabilities
Other Deferred Liabilities
Discontinued Operations
Insurance Liabilities
Other Liabilities
Pref. Shares and Hybrid
Capital accounted for as Equity
Common Equity
Non-controlling Interest
Securities Revaluation
Reserves
Foreign Exchange
Revaluation Reserves
Fixed Assets Revaluation and other Accumulated OCI

Off-balance Sheet

Illiquid Guarantees	Liquid Guarantees
Guarantees	Prohibited by Gharar
Acceptances and Documentary Credits Reported Off-Balance Sheet	
Committed Credit Lines	
Other Contingent Liabilities	