KUWAIT'S BANKING SECTOR NAVIGATING GLOBAL FINANCIAL AND OIL PRICE VOLATILITY: A VAR ANALYSIS OF SECTORAL CREDIT ALLOCATION AND FOREIGN ASSETS

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رؤية بنك الكويت المركزي والبنوك الكويتية لتطوير الشباب الكويتي

The 2023 Third Place Research Paper Winner
"Kuwaiti Economic Student Prize"

البحث الفائز بالمركز الثالث "بجائزة الطالب الاقتصادي الكويتي" لعام 2023

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القطـاع المصرفي في الكويـت في ظـل تقلبـات الأسـواق العالميـة وأسـعار النفـط : تحليـل بإسـتخدام VAR لتوزيـع الائـتمان والأصـول الأجنبيـة.

الغرض:

تهـدف هـذه الورقـة إلى دراسـة ديناميكيـات القطـاع المصرفي الكويتـي في ظـل تقلبـات أسـعار النفـط العالميـة والأسـواق الماليـة. تركـز الدراسـة على تقييـم تـأثير الصدمـات على المتـغيرات المصرفيـة مـن خلال مـؤشرات تشـمل: تخصيـص الائـتمان القطاعـي، التعـرض الخارجـي، إدارة السـيولة، تقلـب أسـعار النفـط، واسـتقرار نمـو الائـتمان.

المنهجية:

تعتمـد الدراسـة على نمـوذج الانحـدار الـذاتي المتجـه (VAR) لتحليـل التفـاعلات الديناميكيـة بين المتـغيرات. تـم اسـتخدام

- Impulse Response Functions
- Forecast Error Variance Decomposition
- Granger's Causality testsg

لدراسة العلاقات السببية المحتملة بين المتغيرات.

النتائج:

تـشير النتائـج إلى أن تخصيـص الائـتمان الاستراتيجـي وتعـديلات الأصـول الأجنبيـة لـهما تـأثير مهـم على اسـتقرار القطـاع المصرفي. كما تـبين أن التعـرض الخارجـي وإدارة السـيولة يسـاعدان في التخفيـف مـن تـأثير تقلبـات أسـعار النفـط على القطـاع.

الآثار:

تقـدم الدراسـة رؤى حـول كيفيـة تـأثير البيئـة الماليـة العالميـة المتقلبـة على الاعـتمادات المصرفيـة في الكويـت. وتتضمـن توصيـات سياسـية تهـدف إلى تعزيـز اسـتقرار القطـاع المصرفي، مما يسـاعد البنـك المركـزي وصانعـي القـرار في حمايـة النظـام المالي المـحلي.

ABSTRACT

This research paper aims to study the dynamics of the Kuwaiti banking sector in the context of global financial and oil price volatility. By employing a Vector Auto Regression (VAR) model, impulse response functions, forecast error variance decomposition, and Granger's causality tests all for further analysis of the dynamic interactions and potential causal relationships between variables in a VAR model. The paper's goal is to explore the impact of shocks on the banking sector variables. We construct indices including the Sectoral Credit Allocation Index (SCAI), Foreign Exposure Index (FEI), Liquidity Management Index (LMI), Oil Price Volatility (OPV), and Credit Growth Stability Index (CGSI). Key findings reveal how strategic credit allocation and foreign asset adjustments both bolstering and affecting banking stability. This paper contributes insights into Kuwait's banking dependencies and the volatile global financial environment, and ends by offering policy recommendations for sustained banking sector strength, the central bank and decision-makers keen on safeguarding domestic banking stability.

KEYWORDS: Efficient credit allocation, diversification in oil-dependent economies, economic growth, Kuwaiti banking sector, banking net foreign assets.

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1. INTRODUCTION

In the late nineteenth century and during the peak of the industrial era in Great Britain, a need for a stable food source arose. Workers needed to be fed an affordable and nutrient meal all year round. The British land was mainly used for industrial purposes and could not afford to lose a sizable land for the purpose of agriculture. Colonized Ireland on the other hand presented a great prospect to grow a fast-growing crop due to the rainy weather and fertile land. The crop of choice was potatoes, due to many factors like: Less area of land to grow, extremely nutrient, affordability, and they can be stored for longer periods of time compared to other crops. The results were great and worked exactly as intended. The crop was used by the Irish people as the main meal of their day and was the main source of income for most of the population. Since the results were great and the scenario was going according to plan, there was no need to diversify the economy to include a different crop or to expand beyond the agricultural sector. Up until an infectious disease destroyed the potato crops all over Ireland and along came down the economy.

Fast forward about fifty years later, in a different continent across the world. The most dependent on source of income in Kuwait was “Pearls” trade. Kuwait was considered one of the biggest exporters of pearls. The Kuwaiti pearls were highly sought after due to their natural shape, size, color and silky-smooth touch. The commodity was of the finest grade in the world. As a result, the Kuwaiti economy was resilient and created many jobs for the population at the time. Up until 1928, when the “Cultured Pearls'' appeared in the market. The newly emerged technology could produce the same quality of pearls at a much faster pace and larger quantities. Consequently, the main source of income in Kuwait had collapsed along with the whole Kuwaiti economy. Jobs became scarce, pearl merchants could no longer provide aid to the needy as they used to, and some even became a low-income household themselves. The discovery of “Cultured Pearls” took a toll on the economy of Kuwait that lasted for about ten years until the discovery of the biggest oilfield in the world in 1938, Burgan oilfield (Alojairi, 2017).

In the past few years, during the COVID19 outbreak, the global supply chain industry took the strongest hit in terms of revenue. As a result, oil exports were no longer generating the expected outcomes. The prices of crude oil reached an all-time low. Economists in Kuwait projected an extreme budget deficit that will be hard to recover from. All eyes turned toward the “2035 vision projects” that aim to diversify the economy. The importance of diversification resurfaced and the conclusion was drawn that these projects are behind schedule and will need at least an extra five years to be completed. Therefore, a serious concern arose from the

public and pressured the government to pursue a more diverse and sustainable source of income besides oil exports. However, that pressure started to diminish as the energy crisis in Europe emerged. Consequently, increasing the demand on oil exports and raising the prices of crude oil to levels higher than before the COVID19 outbreak.

The reason this paper begins with these short stories is to point out that resilient economies are prone to collapsing if not diversified. The collapse can be extreme and long lasting as in the case of the "Irish Potato Famine" or less severe as in the case of "Pearl Merchants' Crisis". As the saying goes "those who do not learn history, are doomed to repeat it". Nowadays, the need to diversify and build a multisectoral and resilient economy is stronger than ever.

Previous literature reviewed in this paper have separately studied the effects of diversification on economic growth, and asset management on economic growth in developing countries that are non-oil dependent. Most studies concluded that diversification and effective asset management can boost economic growth. However, this research paper will combine an analysis of both sector credit allocations –which implies diversification- and foreign asset reserves in parallel with oil price fluctuation in an oil-dependent country, which is Kuwait. The study's timeline extends over a twelve year period, from 2011 till 2023. First, this study explores diversification throughout sectoral credit distribution to promote economic diversification in Kuwait. Secondly, this study also investigates boosting economic growth through optimized credit allocation and foreign reserves. And lastly evaluating the interaction between foreign assets, liabilities, and banking sector stability.

This paper hopes to bridge the gap in existing research through utilizing Vector Auto Regression (VAR) methodology specifically tailored to Kuwait's unique economic and banking sector landscape, with the aim to propose optimization strategies for navigating global volatility and more precisely, shocks in the oil sector.

This paper is organized in seven main sections. Section II is an overview of the study. Section III contains a review of literature with similar purposes. Section IV describes the methodology and model used in this study. Section V deals with the data description and how they are interpreted for the purpose of this study. Section VI talks about the empirical results of the study. And the last section VII talks about what this study concludes.

2. OVERVIEW

In order to achieve a diverse and resilient economy in Kuwait in the shadow of oil price fluctuations, it is important to observe the patterns of the investigated variables and how they move concurrently. The variables are Foreign Exposure Index (FEI), Liquidity Management Index (LMI), Credit Growth Stability Index (CGSI), Oil Price Volatility (OPV), and Sectoral Credit Allocation Index (SCAI).

But first, it is important to connect the dots logically. It is commonly understood that credit allocation is a key factor for economic growth since it is considered the main source for funding investments, consumption, and new business firms. Business firms, especially small and medium enterprises, can focus on plans of expanding and not worry about funding if credit is available and at reach. This systematic causal line can arguably stimulate economic growth. On the other hand, foreign assets can also play a pivotal role in a country's economy. Foreign assets can range from direct investments in goods and services to holdings of an appreciated foreign currency. For the case of Kuwait, foreign investments include both categories. Not only Kuwait holds a reserve of a resilient currency, but it also backs the Kuwaiti Dinar by a basket of multiple sought-after currencies like Euros and United States Dollars, which contributes to the stability of the Kuwaiti Dinar despite worldwide economic volatility. The possession of such assets can influence Kuwait's economic growth by providing capital that can be liquidated whenever necessary to stimulate the economy on a domestic level. On a relevant note, oil prices can have two different impacts on economies depending on whether the investigated economy is an importer or exporter of oil. For the case of Kuwait, an obviously oil dependent and world leading oil exporter, spikes in oil prices can have a direct positively related and immediate short-term outcome on the government's budget and economic growth. The relation is the opposite for oil importing countries. However, oil price volatility can have a less significant impact when the economy is generally diverse, which can be accomplished by multi sectoral credit allocation and a well-managed foreign investment portfolio. Consequently, we are led to this study's research question.

Figures 1A, 2A, and 3A, show the oil prices, GDP growth levels, FDI net inflows and net domestic credit in the United States of America (USA) during the same time period, respectively. From the first three graphs we can notice a similar pattern of a moving line, which can help support

an assumption that oil prices, FDI net inflows and GDP growth are positively correlated to each other. Figure 4A, net domestic credit shows an upward sloping curve with respect to time, which indicates a growing lending activity within the domestic economy, which can be correlated with higher economic growth but also poses risks such as inflation and financial instability. From the figures, we can safely assume that with decreasing oil prices and depreciating assets, a better domestic credit allocation is correlated with higher levels of economic growth.

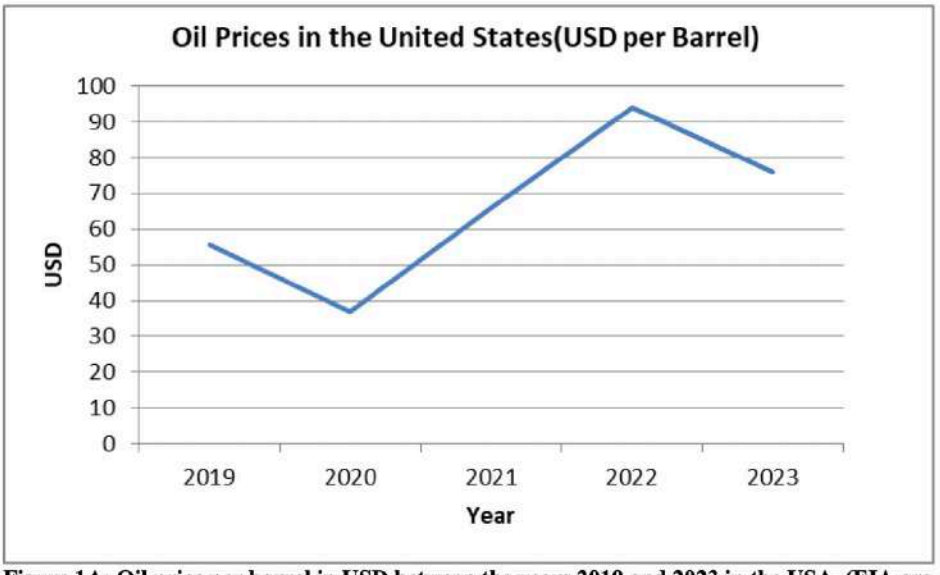


Figure 1A: Oil price per barrel in USD between the years 2019 and 2023 in the USA. (EIA.org, 2024)

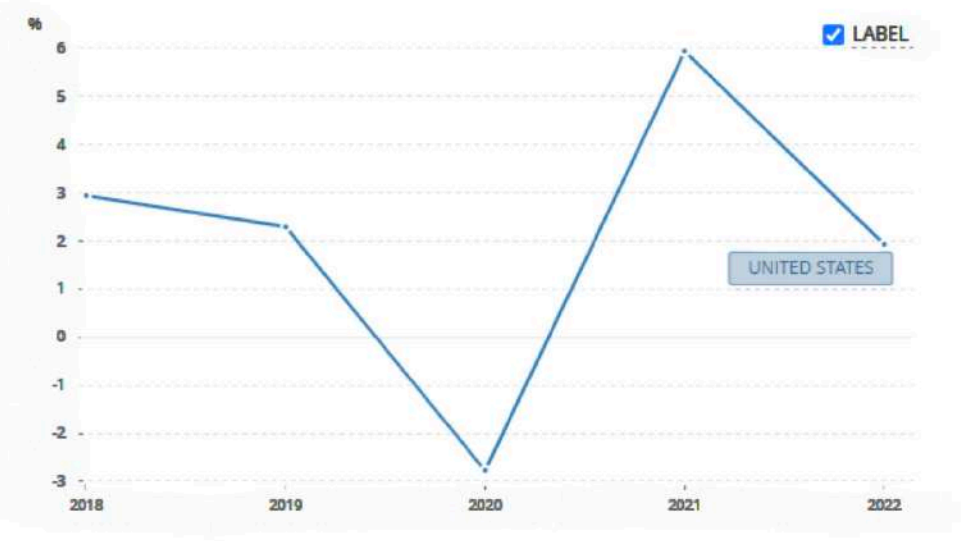


Figure 2A: GDP growth % between the years 2018 and 2022 in the USA. (WorldBank.org, 2024)

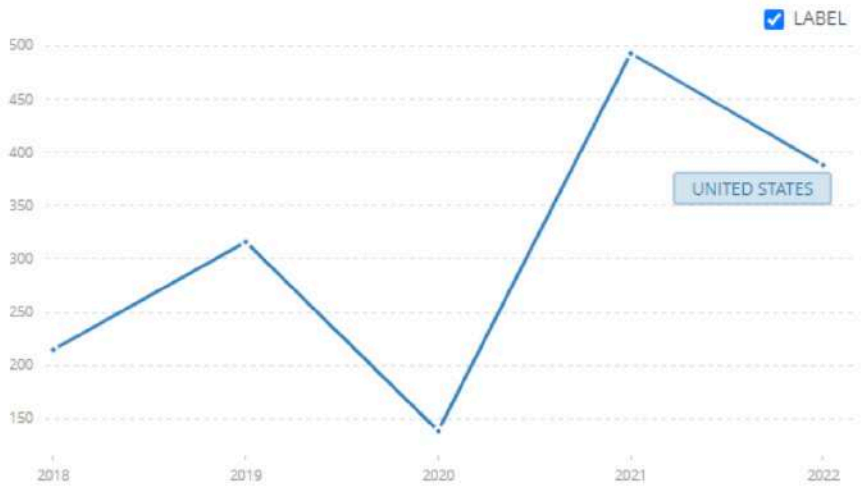


Figure 3A: FDI, net inflows in the USA between the years 2018 and 2022 in the USA. (WorldBank.org, 2024)

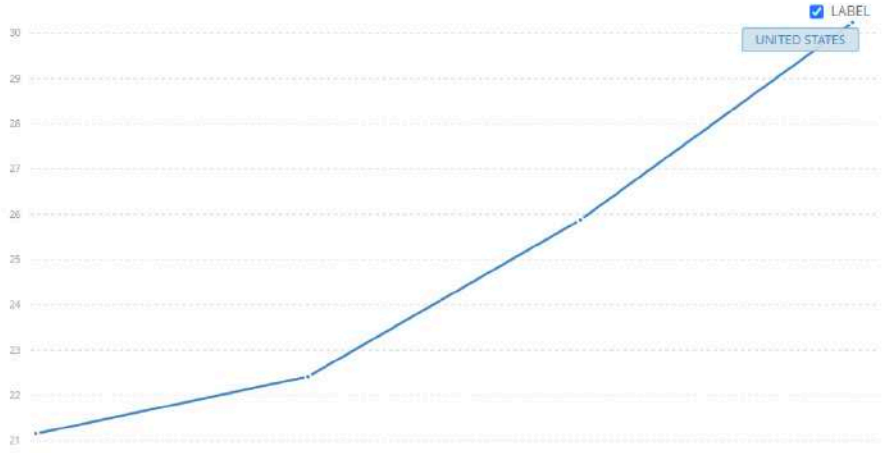


Figure 4A: Net domestic credit in USD 2018 and 2021 in the USA. (WorldBank.org, 2024)

3. LITERATURE REVIEW

As noted in the introductory section, evaluation of the interconnected relationship between the variables of interest, namely: Sector credit allocation, foreign asset management and oil price volatility. In this section, a comprehensive review of the general findings that emerged in this literature will be conducted. The goal is to evaluate and comment on the relevance of each literature on oil-dependent countries and developing economies and how they relate to Kuwait specifically. The literature will be categorized in four groups. The first will be literature that discusses sector credit allocation. The second is literature that explores economic development through diversification. The third group will analyze literature that discusses foreign asset management. The last group will analyze literature that investigate oil prices relationship with respect to banks profitability and risk.

3.1 Sector credit allocation:

3.1.1 Literatures on GCC economies

With respect to the ways in which sector credit allocation towards non-hydrocarbon sectors affect economic growth within the GCC region, Al-Kharusi, S. and Gani, A. (2022) investigated the effects of financial sector credit allocation in the services sector, manufacturing sector and agricultural sector on economic growth within all the six GCC countries. The findings point out strong evidence towards a significant and positive effect of multi sectoral credit allocation by banking institutions on economic growth.

3.1.2 Literature on multiple and global economies

On a relevant note, a study by Muller, K. and Verner, E. (2023) that employed a novel database on sectoral credit allocation that covered 117 countries from 1940 to 2014, have found disproportionality within credit flows lead to different outcomes. Utilizing the chain-linking method, the literature studied the interconnections of credit expansion, macroeconomic fluctuations, and financial crises. The findings document that credits expansions to the tradable sector implies higher growth rates. On the contrary, credit flows towards the non-tradable sector predicts growth slowdowns.

3.1.3 Literatures on developing economies

Other studies in developing economies conducted by Obalade, A. & Fapetu, O, (2015) and John, S. (2019) both have concluded using OLS regression that bank's credit allocations towards government, personal and professionals are associated with higher economic growth rates in Nigeria. While also analyzing Nigeria's banks' sectoral credit allocation, Ndubuisi, P. (2017) utilized a Vector Error Correction Model (VECM) to investigate the correlation with economic growth between the years 1994-2015. The study concluded that credit to agriculture is bi-directionally related to economic growth while credit to manufacturing sector granger causes economic growth.

3.1.4 Literature on a Developed Economy

The last literature reviewed in this category has analyzed outstanding loans by local banks across 64 different economic sectors in Portugal and found patterns of misallocation. Azevedo, N. et al. (2018) argued that this pattern of misallocation was correlated with the sluggish performance of economic growth in Portugal between the years 2008-2016.

3.2 Economic development and diversification

3.2.1 Literatures on GCC & MENA economies

Using the Generalized Method of Moments (GMM) that utilized data between 1961 and 2013 in the GCC, a study by Al-Moulani, A. (2016) has found that banking sectors in the GCC are generally underdeveloped and have a rather small total effect on economic development in the long-term. The study also predicts through a simulation that with regulatory reforms; development can be achieved in the long run. The literature contributes to this paper by providing policymakers with insights for developing the banking sectors. Yu, V. (2022) have argued in his literature that oil-dependent countries -Kuwait considered- are subject to volatility in their annual budget without a fast-tracked pathway towards sustainable development and especially in the energy sector.

Another literature that examined procedures and regulation that govern free trade in the Middle East and North African region (MENA) have concluded that MENA economies are controlled by bureaucratic and interventionist regulatory agencies that hinder the efforts of economic growth. Shackmurove, Y. (2022) argues that measures as small as market entry barriers can play a pivotal role in growth rates. Therefore, unlike earlier discussed studies that urges domestic banks to better manage their credit allocation, this literature highlights the importance of regulatory measures in efforts to maintain a resilient and diverse economy that promotes free trade.

3.2.2 Literature on developing economies

Khou, V. et al. (2015) highlights the challenges facing the economic development and economic growth while on the importance of diversification in Cambodia. The paper states that the main reasons for slow growth rates is that the financial system in Cambodia is based on a foreign currency and that access to financial establishments and services is limited. The literature suggests expanding financial services into rural areas to boost economic diversification and injecting the market with the required human capital through employment at the high performing sectors.

3.3 Asset management

3.3.1 Literatures on GCC economies

Literature has expanded beyond the importance of diversification and credit allocation by examining the role that asset management and investing firms play in enhancing the economic growth levels. In a recent study by Al-Shammari, N. et al. (2015) analyzing the output efficacy of 40 investment firms on the economic growth levels in Kuwait. Using non-parametric data envelopment analysis (DEA) covering the years 2006 through 2010, the finding shows that asset management firms were negatively impacted by the 2008 world financial crisis. Thus, pointing out a correlation between asset management and economic growth levels. In terms of market liquidity and strategic asset allocation, Al Janabi, M. (2014) has utilized data covering the period from 2004 until 2009 using Liquidity-Adjusted Value at Risk (L-VaR) model. The study stresses on the importance of incorporating the asset liquidity risk into risk management methodologies by regulatory authorities and policymakers. On a relevant note, trying to capture and identify the determinants of Foreign Direct Investment (FDI) inflows in the GCC economies, Al-Matari, E. et al. (2021) utilized panel data regressions for the period extending from 1995 to 2018. The study found a significant positive correlation between GDP growth rates and FDIs. Interestingly enough and contrary to the belief, the study also found a negative correlation between FDIs and increased tourism activities. Thus, laying down the ground for policy makers to take into consideration the double-sided effects of supporting tourism sectors in the GCC.

3.4 Oil Price Volatility on Banks Performance

3.4.1 literatures on oil-dependent economies

Das, D. et al (2022) contributed to previous literature by investigating not only oil prices with respect to financial stresses, but also by providing a forward-looking oil price uncertainty with thirty days projection ahead. Using ARDL to analyze the time varying effects, the finding showed a positive relationship between oil prices volatility and financial stresses and a lead-lag examination showed that oil price volatility is the driver of the relationship. Mollick, A. V. et al (2024) studied the "shale oil" revolution in the United States by analyzing monthly data extending from 1998-2020 using a six-factor OLS regression model. The findings unraveled conflicted results, between 1998-2009 oil prices had a negative impact on equity returns of regional banks and no correlation with the national banks, the next period showed a significant effect of oil prices on both regional and national banks. Maghyereh, A. et al (2022) have followed the footsteps of previous studies by employing VAR model to capture the effects of oil prices on banks' risk in oil exporting countries. The authors have used GCC countries in their sample and found that the increase in oil prices raises bank risk, whereas the similar increase in price due to economic expansion or oil-market specific demand reduces that risk. However, the paper found different effects of oil prices on "Islamic" banks depending on size, income diversification and profitability. Other studies conducted by Elsayed, A. et al (2023) and Saif-Alyousfi, A.Y.H. (2021) have also investigated the multilayer spillover effects of oil and gas prices on the performance of the banking sector across the GCC region. The studies concluded a relatively similar spillover effects between the variables at play. Pointing out that Islamic banks tend to be more prone to negative effects with a more volatile oil prices while conventional banks tend to benefit more from positive oil prices shocks.

In conclusion, all the previous literature has unanimously supported the notion that the banking sector in Kuwait can efficiently navigate global financial and oil price volatility by boosting economic diversification through better sectoral credit allocation and constructive foreign asset management. However, this puts more work on this research paper to build a solid data set that specializes specifically in the Kuwaiti Banking sector to analyze their credit allocation patterns and their net foreign asset levels throughout a model that covers a more extensive timeline. Moreover, most previous literature has discussed the effects of one variable on another, for instance: the effects of credit sector allocation and economic growth, or the effects of net foreign asset accumulation on economic growth…etc. This study is particularly relevant and bridges the gaps in previous literature as it will attempt to unravel the complex dynamics and interconnection between sectoral credit allocation, foreign assets and liabilities positioning, all while balancing domestic liquidity and other stability measures in the context of external shocks, namely oil price volatility and global financial conditions.

4. DATA DESCRIPTION

Most of the data used is sourced from the Central Bank of Kuwait's publicly available Dynamic Statistical Releases, which provide comprehensive information on monetary variables, the CBK and local banks. These sources provide reliable and consistent datasets that required only minimal modifications to ensure consistency, as data organization and table formats evolved over the years. The other source is the Federal Reserve Economic Data (FRED), from which global price of Brent Crude oil (POILBREUSDM) was also obtained to serve as a proxy for global oil prices.

Data Time Frames:

All data is in a monthly time series format, originally spanning from January 2009 to December 2023. However, due to the year-on-year calculations performed as part of the data preprocessing and variables construction stages, the effective starting point of the dataset is January 2011. This was a necessary adjustment to maintain the accuracy of the model and trend analysis.

Sampling Techniques:

Aside from the selection of economic indicators, we deemed relevant to understanding Kuwaiti banking sector's stability, no specific sampling techniques were needed. Our analysis included all variables that met the criteria, with no significant exclusions necessary.

Data Integrity and Consistency:

Throughout the data collection process, no major inconsistencies or missing data issues were encountered. The CBK and FRED data, despite limited updates to tables and compositions in the former's data structure, are consistent and reliable. In terms of data integrity for this paper, we are confident that the data is accurate and free from biases.

Our pre-processed database records financial and economic indicators that together offer a snapshot of economic conditions and banking activities. Key metrics include the global average price of oil, banks' foreign assets and liabilities, total credit to the private sector, government and private sector deposits, the breakdown figures of banks' balance sheets, and sector-specific financial metrics. Together, these insights shed light into the financial health and activities of banks, as well as the flow of funds within the banking sector.

Observed Trends:

There are several trends noticeable in the data. The upward trend in total credit to the private sector reflects healthy lending activities and rising business investments. The increase in total banking assets, including net foreign positions, as well as the steady rise in private and public sector deposits indicate a strengthening banking sector and rising confidence in the banking system. Additionally, volatility in global oil prices reflect a major source of the risks the Kuwait economy faces.

Five main indices were constructed to serve as variables to run the VAR model. These indices are Foreign Exposure Index (FEI), Liquidity Management Index (LMI), Credit Growth Stability Index (CGSI), Oil Price Volatility (OPV), and Sectoral Credit Allocation Index (SCAI). The process of constructing these indices is justified by the need to capture the interactions between the key economic variables influencing Kuwait's banking sector.

4.1 Foreign Exposure Index (FEI)

The FEI quantifies the banking sector's exposure to foreign assets and liabilities, relative to its total assets. It captures banks' vulnerability to international financial conditions, indicating susceptibility to external shocks. FEI is included in the VAR model to understand how global financial conditions influence Kuwait's banking sector. The integration of FEI into the VAR model helps evaluate the influence of external financial shocks on the valuation and performance of banks' foreign holdings and funding sources, and can guide policymakers in enhancing banking stability, contributing to a more robust financial system. We express FEI as a percentage to provide a clear measure of the banking sector's exposure to foreign assets and liabilities relative to its total assets.

We construct the index in the following steps:

1. FEI = (Foreign Assets - Foreign Liabilities) / Total Banking Sector Assets.
2. Choose a base year and calculate the index values for other years relative to it.
3. Standardize the FEI by subtracting the mean and dividing by the standard deviation.

4.2 Liquidity Management Index (LMI)

The LMI is an aggregate indicator which aims to measure the effectiveness of liquidity management practices within Kuwait's banking sector. By including LMI in the VAR model, we can analyze how liquidity practices help shield banks from economic fluctuations, such as oil price

volatility or global financial market instability that makes its way through various channels. LMI is a unitless index, with higher values indicating stronger liquidity management.

We construct the index in the following steps:

1. Aggregate key liquidity indicators (liquid assets/short-term liabilities, loan-to-deposit ratio).
2. Normalize each indicator to a common scale (0-1) to ensure comparability.
3. Aggregate the normalized indicators into a single index.

4.3 Credit Growth Stability Index (CGSI)

The CGSI measures the volatility of credit growth to the private sector through time. Lower values indicate more stable credit growth patterns. CGSI is included in the VAR model to evaluate the predictability of credit expansion and the banking sector's ability to support sustainable and stable growth within the economy. This enables policymakers to manage credit growth stability and promote healthy credit dynamics. CGSI is a unitless index, with higher values indicating more stable credit growth.

We construct the index in the following steps:

1. Calculate year-over-year growth rates of total credit to the private sector as percentages.
2. Measure the volatility of credit growth rates using standard deviation.
3. Invert the volatility measure so that higher values indicate more stable credit growth.
4. Create the CGSI index with a base year by dividing the inverted volatility measure for each year by the inverted volatility measure of the base year, then multiply by 100.

4.4 Oil Price Volatility (OPV)

OPV captures the volatility in oil prices. When it comes to Kuwait, which is considered a country that is heavily reliant on the oil sector, OPV serves as an external variable impacting the country’s economy. OPV is included in the VAR model to explore the sensitivity of the banking sector to oil price changes and how it propagates through the banking industry. Understanding the interconnections of this relationship can help both policymakers and banking institutions in implementing strategic decisions to mitigate risks.

We construct the index in the following steps:

1. Calculate monthly log returns of oil prices.

2. Calculate the standard deviation of the monthly log returns of oil prices.

3. Annualize the volatility measure and express OPV as an annualized percentage, with higher values indicating greater oil price volatility.

4.5 Sectoral Credit Allocation Index (SCAI)

The SCAI uses the Herfindahl-Hirschman Index (HHI) approach to measure the diversity or concentration of credit allocation across various economic sectors. SCAI is included in the VAR model to examine how changes in credit allocation strategies impact the banking sector. By focusing additionally on the proportions allocated to non-oil sectors, the index highlights the role banks can and do play in fueling economic diversification. The VAR model can analyze the response of SCAI to changes in other variables to help identify credit distribution approaches that enhance and maintain financial stability. SCAI is a unitless index, with lower values indicating greater diversification.

We construct the index in the following steps:

1. Calculate the proportion of total credit allocated to each sector.

2. Square each proportion.

3. Sum the squared proportions to obtain the HHI.

4. Normalize the HHI to a 0-1 scale through (HHI - 1/N) / (1 - 1/N), where N is the number of sectors.

Conceptual VAR Model and our Decision to Include Five Variables

It is recognized that incorporating five variables into the VAR model comes with risks, such as overfitting, diminished predictive power, and the increased difficulty in interpreting the model's results, such as the IRF and FEVD plots. However, we argue that their inclusion is justified by the benefits attained through capturing comprehensive dynamics of the Kuwaiti banking sector and our research objectives. In essence, our decision is grounded in our recognition of the importance of adopting a holistic view of the multidimensional factors influencing Kuwait's banking sector and understanding the mechanisms through which the banking sector interacts with the broader economy and responds to external shocks. Ultimately, the complexity of the model is justified, we believe, by its ability to capture diverse dynamics, leading to more informed insights than simpler models could provide.

5. METHODOLOGY

Introduction

This study seeks to provide a deeper understanding of some of the key variables that capture the dynamics of the Kuwaiti banking sector in the context of global financial and oil price volatility. As such, the methodology employed aims to uncover these interdependencies among the variables, and evaluate the model's ability to do so through clearly-defined diagnostics.

Python ecosystem and various libraries are used for all statistical and econometric analyses and created custom scripts for automating and conducting aspects of the analysis.

5.1 Econometric Model Selection

The methodology of choice follows a logical econometric sequence to ensure, to the best of our ability, the stability and reliability of the VAR model. Aside from VARs, we considered other models and approaches, including panel data analysis, cointegration analysis, and error correction models (ECM). However, given the fact we observed no indication of long-term equilibrium relationships between variables, and for its flexibility and its ability to capture the interrelationships between multiple time series, we settled on the general form VAR model.

5.1.1 Justification for VAR Model

VAR model is employed for its ability to capture interdependencies among multiple time series variables without imposing any restrictive assumptions of a long-term equilibrium. VAR models treat all variables as endogenously interacting with each other, each one affected by its own past values and the past values of the rest of the variables in the model. In the context of our research, a VAR model will help capture the interactions among the variables and give us insights into how shocks to any one variable propagate through to others.

The Vector Autoregressive (VAR) model can be represented with the following equation:

$$\mathbf{Y}_t = \mathbf{c} + \sum_{i=1}^{j} \mathbf{A}_i \mathbf{Y}_{t-i} + \epsilon_t$$

Where:

• *Yt* is a k x 1 vector of endogenous variables at time t.

• *c* is a k x 1 vector of constants.

• *Ai* are k x k coefficient matrices for each lag i (where i = 1,2,… j), representing the influence of the lagged values of the variables on the current values.

• *j* is the number of lags in the model.

• ϵt is a k x 1 vector of error terms (white noise) at time t, assumed to be uncorrelated with each other and have a mean of zero.

5.2 Data Handling and Preparation

5.2.1 Seasonality

After storing the data, cleaning and organizing it, ensuring no missing values existed, nor significant outliers that demand attention, we addressed the issue of seasonality in the time series data. Seasonal fluctuations can bias the underlying relationships between variables, and so by decomposing each variable into trend, seasonal, and residual components, and isolating those seasonal effects, we can obtain a seasonally adjusted time series that allows for a clearer understanding of the variables' underlying trends. This improved accuracy will be vital in subsequent analyses and modeling.

5.2.2 Stationarity

A fundamental assumption in time series analysis, to try to avoid spurious results and invalidating the model's results, is stationarity, the property of having a constant mean, variance, and autocorrelation. Stationarity is tested using both the Augmented Dickey-Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests.

• The ADF test checks for the presence of a unit root, with the null hypothesis being that the series is non-stationary. The test helps in identifying trends in the time series.

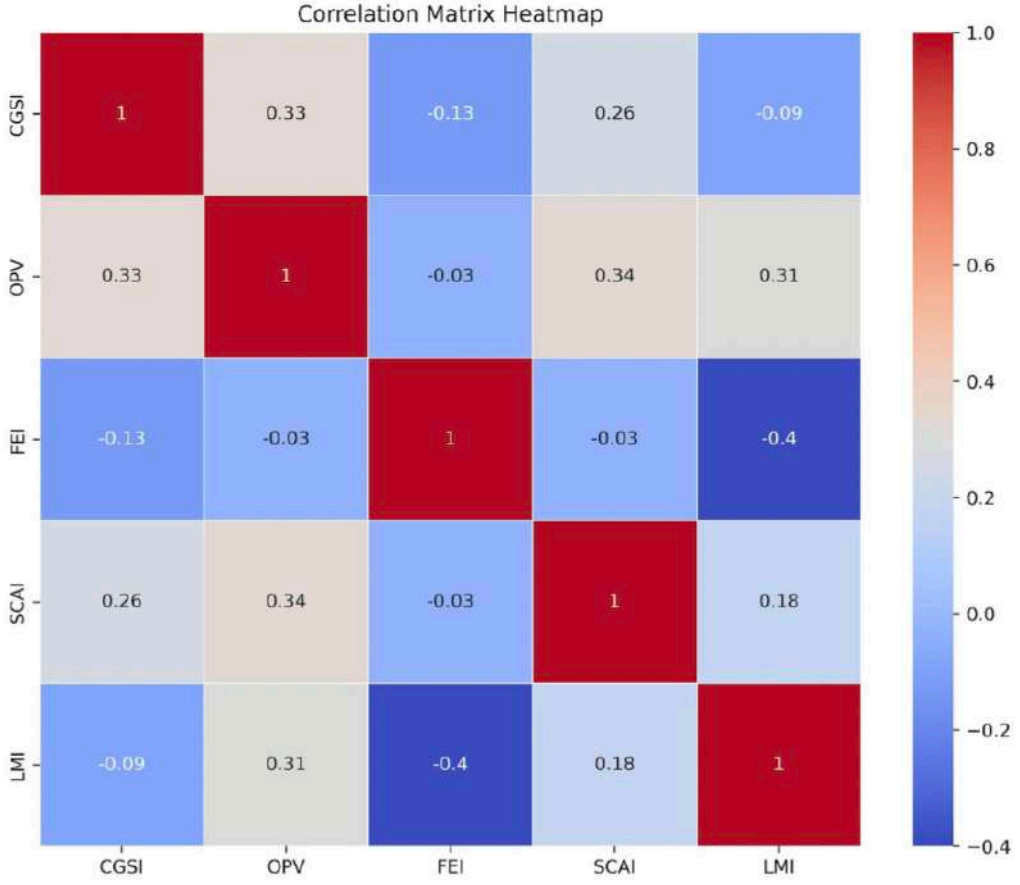
• The KPSS test assumes the null hypothesis of stationarity, complementing the ADF test to verify the stability of the time series and validate the model results.

Running both tests provides a higher degree of certainty on stationarity, informing the need for differencing non-stationary series. Aside from CGSI, all variables were found to be initially non-stationary, but achieved stationarity after one differencing.

5.2.3 Multicollinearity

High correlations among variables could indicate multicollinearity, which might undermine the interpretability of the model results. Its presence makes it much harder to evaluate the relative importance of any individual variable in the model, causing imprecise and unstable coefficient estimates. To detect potential multicollinearity, we computed a correlation matrix to quantify the pairwise correlations among our variables and performed the Variance Inflation Factor (VIF) analysis to quantify how much the variance of a regression coefficient is inflated due to multicollinearity among the independent variables.

Due to differences in scale and units among the variables, we wanted to avoid the risk of any single variable dominating and contributing unequally to the model. We employed standardization to transform the data to have a mean of zero and a standard deviation of one, improving the numerical stability of the VAR estimation process.



5.3 Fitting the VAR model

After confirming stationarity, we proceed with fitting the VAR model. A crucial step here, in which we faced a persistent set of challenges, was in deciding the best approach to reconcile conflicting values from the information criteria that are commonly used to determine the appropriate lag length. These criteria are: the Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and Hannan-Quinn Information Criterion (HQIC). There is almost an inherent tradeoff between model fit and complexity; we ideally want the model to be as parsimonious as possible, but still be able to capture important dynamics in the data without becoming overly complex and over-parameterized.

5.3.1 Lag Length Selection

• The AIC leans towards more complex models and tends to suggest higher lag lengths, while the BIC and HQIC lean towards parsimony.

• The approach used iteratively fits VAR models with increasing lag orders until the residuals no longer exhibited serial correlation. The selected lag length ensured the model captures the dynamics of the five time series without overfitting.

5.4 Diagnostic Tests and Model Validation

Several diagnostic tests were employed on the residuals to evaluate and validate our VAR model and ensure robustness.

• Normality test: The Jarque-Bera test for normality indicated that the residuals were not normally distributed, but the effect on the model's predictive power was minimal.

• Serial correlation: The Ljung-Box test found no significant signs of serial correlation, suggesting that the model adequately represents the temporal dependencies. For higher conviction, we ran a multivariate Portmanteau test for serial correlation at higher lags, and the test showed no significant presence of serial correlation, further evidence that the VAR's residuals correspond to white noise.

• Heteroscedasticity: For detecting heteroscedasticity in the residuals, we performed a Breusch-Pagan test, which indicated heteroscedasticity was present in the CGSI and SCAI indices. It was addressed by conducting further robustness checks.

• Both the Ljung-Box and multivariate Portmanteau tests confirmed serial correlation was absent in the model, indicating temporal dependencies were adequately captured.

Since low correlations among the variables are indicative of effective model specification, the low and sometimes minimal values in the residual correlation matrix are a positive sign.

6. EMPIRICAL RESULTS AND DISCUSSION

6.1 Impulse Response Functions

Impulse Response Function (IRF) plots are an integral and common application in VAR analysis. The plots illustrate how a one-unit one-time shock to one variable affects another variable over time, both in terms of magnitude and the direction of impacts - valuable in helping us understand the dynamic relationships between variables. Insights from IRF plots can guide policymakers on the potential consequences of economic shocks, informing better policies and mitigating risks that may otherwise have not been obvious.

Commentary

Stable credit growth and diversified credit allocation seems to consistently enhance liquidity management measures, though the effect varies over time. More stable credit growth initially leads to more diversified sectoral credit allocation.

Significance of Findings:

The finding that stable credit growth promotes diversified credit allocation can be viewed as an important indicator of financial stability, and the fact that Kuwaiti banks exhibit this means the regulatory framework and practices in Kuwait can potentially be incorporated in other oil-dependent economies.

In terms of oil price volatility, higher levels appear to result in more stable credit growth. One potential explanation is that banks adopt more cautious lending practices during economic uncertainty. It also appears that banks initially bolster their foreign assets, possibly as a hedge. Rising oil price volatility initially disrupts liquidity management processes, however banks adapt to the market conditions, albeit with varying degrees of stability. Extended oil price volatility, on the other hand, prompts banks to diversify credit allocation, which can be viewed as a risk mitigation strategy, enabling banks to navigate the economic landscape more effectively.

Broader Implications:

Oil-dependent economies can better insulate themselves from global oil price volatility with credit diversification and robust liquidity management policies. The stable credit growth trends exhibited by Kuwaiti banks in parallel with rising oil price volatility is a testament to the policymakers' work and developed risk management strategies.

Credit diversification increases banks' net foreign asset exposure, but it is likely that as domestic sectors stabilize, the need for foreign asset exposure and hedging decreases.

Diversified credit allocation leads to more stable credit growth, a finding echoed by Al-Kharusi and Gani (2022), who similarly find a positive relationship between sectoral diversification in credit allocation and economic growth in the GCC region. It is true that while diversified credit allocation is crucial for economic stability in economies like Kuwait, this fact may not hold over longer periods of time, where more structural considerations need to be considered.

Unlike the findings by Azevedo et al. (2018), however, who find evidence in Portugal of sluggish growth caused by credit misallocation, our study did not find significant misallocation within Kuwait's banking sector. Kuwait's robust regulatory framework and economic environment might explain the absence of credit misallocation observed in other economies.

Refer to (Appendix D) For variable-specific IRF plots and interpretations.

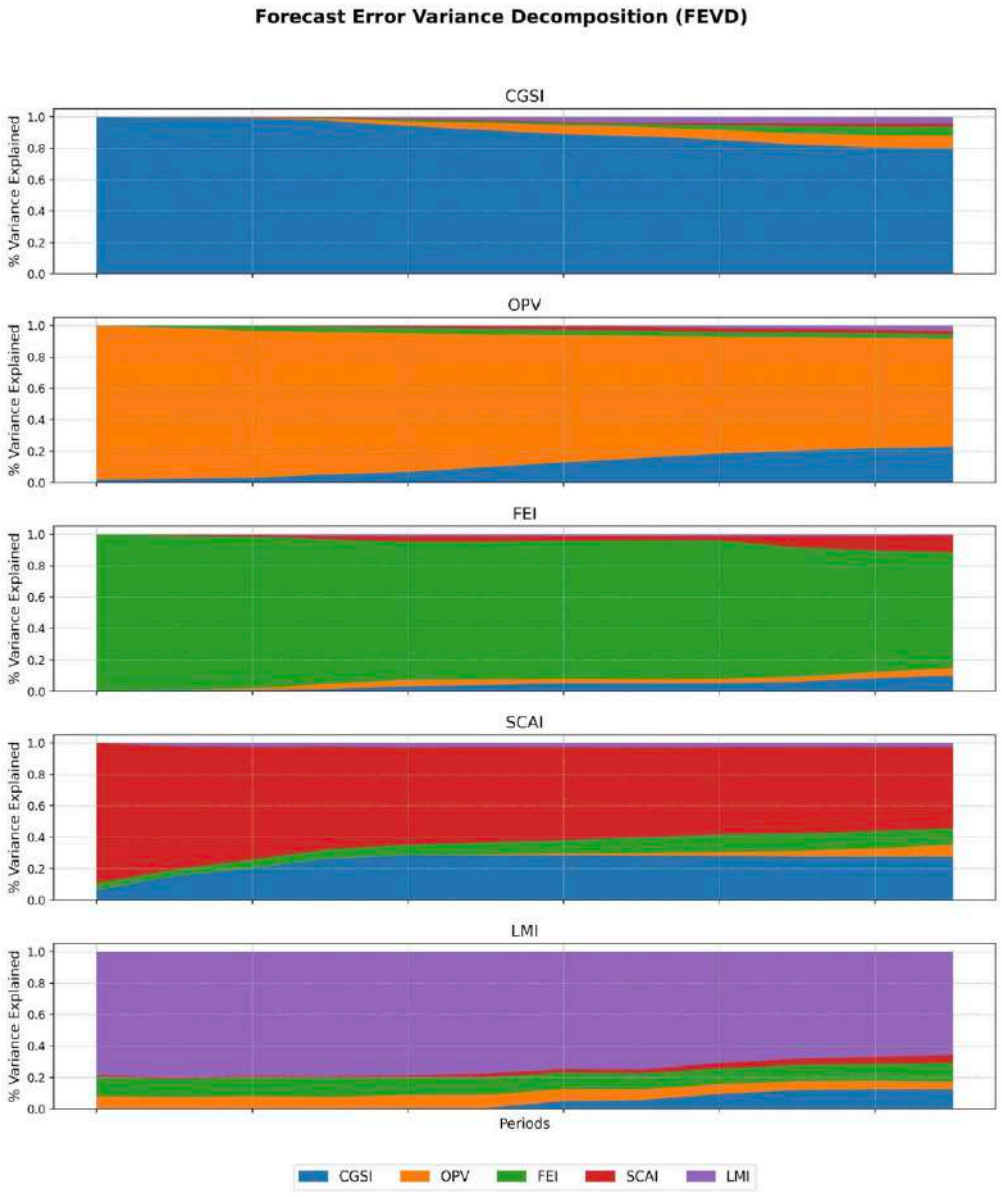
Policy Implications:

Kuwaiti policymakers should continue incentivizing banks to diversify their lending practices, especially to non-oil sectors, through targeted sector-specific policies and a dynamic approach to managing foreign assets and liabilities.

Refer to (Appendix D) for variable-specific IRF plots and interpretations.

6.2 Forecast Error Variance Decomposition

The FEVD plots provide insights into the contributions of different variables to the forecast error variance of our variables. It helps clarify the relative importance of each variable. These insights can be valuable for central banks, facilitating the effective design of policies that promote financial stability and economic growth.



CGSI (Credit Growth Stability Index): Variance is mostly explained by its own shocks, with contributions from other variables negligible.
Significance of Findings: the stability of credit growth in Kuwait's banking sector is mainly determined by internal factors rather than external ones. This leads to two important insights: One, maintaining robust credit policies and monitoring credit market dynamics closely are crucial; and two, given the self-contained nature of CGSI, any disruptions in credit growth are more likely to be caused by domestic factors, which further underscores the importance of monitoring internal credit market conditions for policymakers.

OPV (Oil Price Volatility): Variance is overwhelmingly explained by its own shocks, meaning internal oil market dynamics and its past values. **Significance of Findings:** The volatility in oil market has a self-perpetuating nature, driven by global dynamics and largely independent from Kuwait's ability to influence. Policymaker vigilance in monitoring global oil market trends and possible impacts on the domestic economy is crucial.

FEI (Foreign Exposure Index): Like CGSI and OPV, variance is mainly explained by its own historical values. **Significance of Findings:** This indicates that internal dynamics and strategic decisions influence the banking sector's exposure to foreign assets and liabilities more so than external factors. This suggests that banks in Kuwait have adequate control over their foreign exposure, which is crucial for managing risks associated with international financial markets.

SCAI (Sectoral Credit Allocation Index): While mainly explained by its own shocks, the clear contributions from other variables towards the end of the forecast period indicates some interdependence with other variables. **Significance of Findings:** While it appears sectoral credit allocation is mainly self-determined, other factors, like credit growth stability and foreign exposure, also influence it. This suggests that diversified credit allocation serves both as a stabilizing factor for the Kuwaiti banking sector, and also interacts with and impacts other variables.

LMI (Liquidity Management Index): Variance is mainly explained by its own shocks, but there are small contributions from other variables, implying that implementing robust liquidity management frameworks within banks is crucial. **Significance of Findings:** It appears current liquidity management practices within Kuwait's banks are robust and capable of maintaining stability from external financial shocks.

Commentary:

FEVD data reveals a few points that warrant policymakers' attention. CGSI, OPV, FEI, and LMI all exhibit high dependency on their own historical values, highlighting the importance of focusing on internal stability within each respective sector. It is a positive sign for economic stability that these indices are primarily self-contained. It suggests that Kuwait's banking sector enjoys a strong degree of internal control, but that naturally means that any disruptions or inefficiencies within these areas can negatively affect the wider financial system.

The findings suggest that foreign exposure in Kuwaiti banks is primarily driven by internal banking dynamics, rather than external factors, deviates from the findings of Al Janabi (2014), who find strategic asset allocation in the GCC being significantly affected by market liquidity. This contrast might be due to the differences in the periods studied and/or reflects the idiosyncrasies of the Kuwaiti banking sector.

In the case of OPV, policymakers have no way to influence its behavior, so careful monitoring is crucial for detecting any changes in the degree of impact oil price fluctuations have on banking stability. Finally, given how connected SCAI is to the other variables, sectoral diversification in credit allocation should be considered a priority for the stability of the system.

6.3 Granger Causality Tests

The methodology furthermore incorporates Granger causality tests to assess whether one variable helps predict another variable, in an attempt to discover directional and potential causal relationships.

Interpretation of Granger Causality Test Results:

For central banks to make informed decision-making, understanding the dynamic interactions between variables is crucial. While not proof of causality per se, Granger causality tests can help determine if changes in one time series can predict changes in another. Results are based on p-values and a null hypothesis that variable X does not Granger-cause variable Y. The lower the p-value, the stronger the evidence against the null hypothesis. We run Granger causality tests over 12 lags and interpret the results at both the 5% and 10% significance levels.

We interpret the results based on the following guidelines:

• p-value < 0.05: Strong evidence to reject the null hypothesis (variable X Granger-causes variable Y).

• p-value < 0.10 but > 0.05: Moderate evidence to reject the null hypothesis.

• p-value > 0.10: Insufficient evidence to reject the null hypothesis (variable X does not Granger-cause variable Y).

Summary of Findings: (Causality direction)

- No Granger Causality:
  - OPV → SCAI
  - OPV → FEI

- OPV → LMI
- OPV → CGSI
- CGSI → SCAI
- CGSI → LMI
- SCAI → FEI
- SCAI → LMI

- Moderate Evidence at 10% Level:
- CGSI → FEI: At lag 11.

- Strong and Moderate Evidence:
- SCAI → CGSI:
  - Strong evidence at lags 2, 3, 5, and 6.
  - Moderate evidence at lags 4, 7, and 8.

Commentary on Granger Causality Results:

Significance of Findings:

Based on the lack of evidence OPV Granger-causes SCAI, it appears that sectoral credit allocation is likely driven by domestic policies or sector-specific developments, not fluctuations in oil price. Again, this suggests that Kuwait's sectoral credit strategies are relatively insulated from external oil market volatility and encourages the maintenance of and regular updating of policy frameworks aimed at driving sectoral credit allocation.

Additionally, seeing as we find no evidence that OPV Granger-causes FEI, it appears banks' foreign exposure strategies are influenced by global and perhaps domestic financial conditions and regulatory frameworks rather than directly by oil price volatility. This is important to emphasize: it suggests that the foreign exposure of the Kuwaiti banking sector is decoupled from the volatility inherent in the oil markets.

The absence of evidence that OPV Granger-causes LMI suggests that existing liquidity management practices within Kuwait's banking sector are robust enough to provide stability against external economic shocks. Similarly, with no evidence that OPV Granger-causes CGSI, the implication is that credit growth stability is not directly impacted by oil price volatility. This further reinforces the argument that the risk management mechanisms in place can both absorb shocks within the credit market and ensure stable credit growth in volatile environments.

Broader Implications:

The findings contribute to the understanding of how the banking sectors in oil-dependent economies like Kuwait can maintain stability despite external financial and commodity shocks. A lot of it boils down to robust domestic policies and diversified credit strategies.

Shifting to the Credit Growth Stability Index (CGSI), we find no evidence that CGSI Granger-causes SCAI. That reflects consistency in credit allocation strategies, regardless of credit growth stability fluctuations. We observe moderate evidence that CGSI Granger-causes FEI, but at the 11th lag. In terms of policy implications, policies to stabilize credit growth should consider impacts on foreign asset and liability exposure. There is no evidence that CGSI Granger-causes LMI, implying that banks' liquidity management practices are robust enough not to be destabilized by fluctuating credit growth rates.

No evidence is found to indicate Sectoral Credit Allocation Index (SCAI) Granger-causes FEI or LMI, suggesting that sectoral credit allocation and foreign exposure are impacted by separate factors and current liquidity management strategies are not influenced by credit allocation across sectors. Interestingly, we find strong evidence at 5% significance level and moderate evidence at 10% that SCAI Granger-causes CGSI. This means having diversified credit allocation across sectors significantly influences the stability of credit growth. For policymakers, working to encourage sectoral diversification can be a valuable approach to enhance credit growth stability.

Conclusion:

The Granger causality tests reveal that internal policies and regulatory frameworks, and not variables like oil price volatility, are what maintain Kuwait's banking sector stability. It is notable that the lack of Granger causality we see between oil price volatility and sectoral credit allocation in Kuwait diverges from the findings of Das et al. (2022) and Maghyereh et al. (2022). These two papers find bank performance and risk in oil-exporting countries is strongly impacted by oil price volatility.

This contrast maybe due to Kuwaiti-specific regulatory frameworks and economic policies, including the country's substantial FX reserves, that serve to insulate Kuwait's domestic economy from oil price volatility, and reduce the impact of oil price volatility on sectoral credit allocation.

The finding that SCAI Granger-causes CGSI captures the impact diversified credit allocation has on stable credit growth, which shows how encouraging sectoral diversification should be a priority for policymakers.

7. CONCLUSION AND POLICY RECOMMENDATIONS

In conclusion, the findings in our study align with existing literature, like Al-Kharusi and Gani (2022) and Al-Shammari et al. (2015), who similarly conclude with the importance of sectoral credit diversification and management of foreign asset exposure for economic stability in the GCC.

The resilience we observe in Kuwait's banking sector - how oil price shocks and volatility in oil markets seem to have no significant negative impact on credit allocation or foreign asset strategies, suggests that Kuwait has a more developed financial infrastructure relative to other oil-dependent economies found in the literature.

7.1 IRF Policy Implications

Observing the results of the IRFs offers insights that policymakers might find interesting and useful for policy considerations. These results highlight the importance of sectoral diversification, robust liquidity management, and prudent foreign exposure strategies in stabilizing Kuwait's banking sector. We provide the following policy recommendations and insights:

• **Prudent Lending Practices:** We suggest reinforcing existing prudent lending practices, regularly updating banking credit risk assessment frameworks to account for sectoral diversification and staying updated of credit growth trends. Introducing policies through targeted incentives for banks to lend to specific sectors that are deemed vital for economic diversification and response to economic conditions is another idea.

• **Targeted Sectoral Incentives:** Introduce incentives for banks that align credit allocation with sectors that contribute to economic diversification and to Kuwait's national economic goals, such as the 2035 Vision.

• **Liquidity Management:** The results emphasize the value of having temporary liquidity facilities to mitigate external shocks. Policymakers should also consider introducing dynamic reserve requirements that adapt to economic conditions, ensuring banks have adequate liquidity to respond to stress.

• **Foreign exposure Management:** Considering our findings that Kuwaiti banks' foreign exposure is influenced more by internal banking dynamics than by external financial factors, we therefore, developing a flexible yet separate framework for regular regulatory and financial stress testing of foreign exposure is essential.

7.2 Granger Causality Policy Actions and Considerations:

• **Focus on Sectoral Diversification:** Policies that encourage sectoral diversification should be prioritized, given the evidence that diversified credit allocation stabilizes credit growth. An environment conducive to diversified lending can also mitigate the risks of over-concentration in any one sector.

• **Independent Drivers of Foreign Exposure:** Probably the more effective way to ensure that Kuwait's banking sector remains resilient against external financial shocks is to manage foreign exposure risk by monitoring global factors and regulatory frameworks.

• **Monitor Credit Growth and Foreign Exposure:** Policymakers need to consider the relationship between the stability of credit growth and foreign asset and liability exposure for integrated policy design. Standardizing regulations governing credit growth and foreign exposure is crucial for ensuring a more robust financial stability framework.

• **Stability Against External Shocks:** the findings in this paper indicate that existing mechanisms are effective in insulating the impact of oil price volatility on financial stability. Policy makers should maintain and even enhance the robustness of existing mechanisms and pay particular attention to liquidity management frameworks. Introducing regular stress testing and scenario analysis will also ensure that banks are even better prepared to sustain various shocks.

7.3 Broader Implications and Future Research

This study aims to add nuance to the broader understanding of how small, oil-dependent economies can maintain financial stability in a volatile environment. Sectoral credit diversification, flexible and regularly updated foreign exposure management policies, and strong liquidity frameworks are ways this research contributes insights for Kuwaiti policymakers and those in other countries similar to Kuwait working to enhance their banking and financial sector's resilience.

For an even more nuanced understanding of the factors that influence the banking sector stability in Kuwait, here are possible future research directions:

• **Incorporating Scenario Analysis:** Future research could incorporate scenario analysis and explore more variables such as digital and technological disruption, regulatory shocks, and geopolitical risks.

• **Comparative Studies:** As suggested by Mollick et al. (2024), a comparison between Kuwait's domestic banking sector and those in other oil-dependent economies, especially in the GCC, might provide deeper insights and highlight more effective frameworks and best practices in managing shocks.

• **Advanced Econometric Models:** Econometric models, such as Structural VARs or Dynamic Stochastic General Equilibrium (DSGE) models, with their ability to study the dynamic interrelationships among variables in greater detail, might enhance our understanding and help formulate more effective policy recommendations.

• **Granular Data Analysis:** Constructing indices with more granular data might allow for more precise analysis, and even including sector-specific data can help inform more targeted policy interventions.

In conclusion, appreciating some of the limitations of this paper, the following ideas are possible avenues for further research that might expand the applicability of the findings: Incorporating scenario analysis, such as by adding more variables, like geopolitical risks, technological disruptions, regulatory shocks; a comparison between Kuwait's domestic banking sector and that in other oil-dependent economics, such as the GCC; using other econometrics models, such as structural VARs or Dynamic Stochastic General Equilibrium (DSGE) models to study the dynamic interrelationships among the variables; and refine and enhance the index construction for more other granular data, perhaps even sector-specific analysis.

APPENDIX (A)

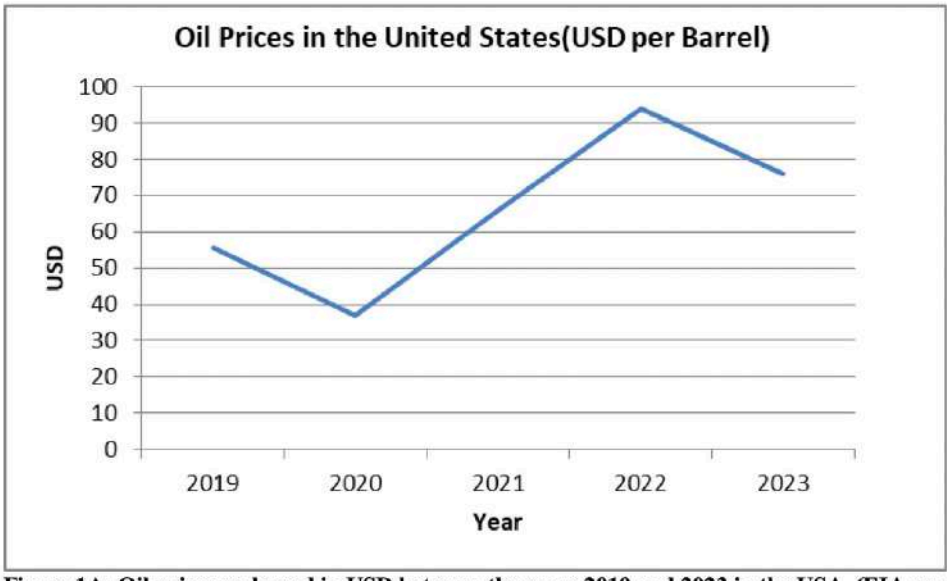


Figure 1A: Oil price per barrel in USD between the years 2019 and 2023 in the USA. (EIA.org, 2024)

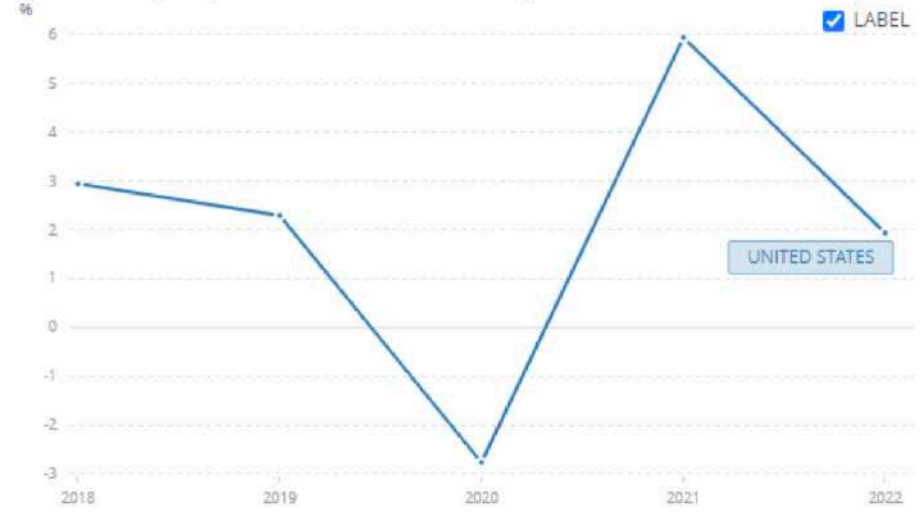


Figure 2A: GDP growth % between the years 2018 and 2022 in the USA. (WorldBank.org, 2024)

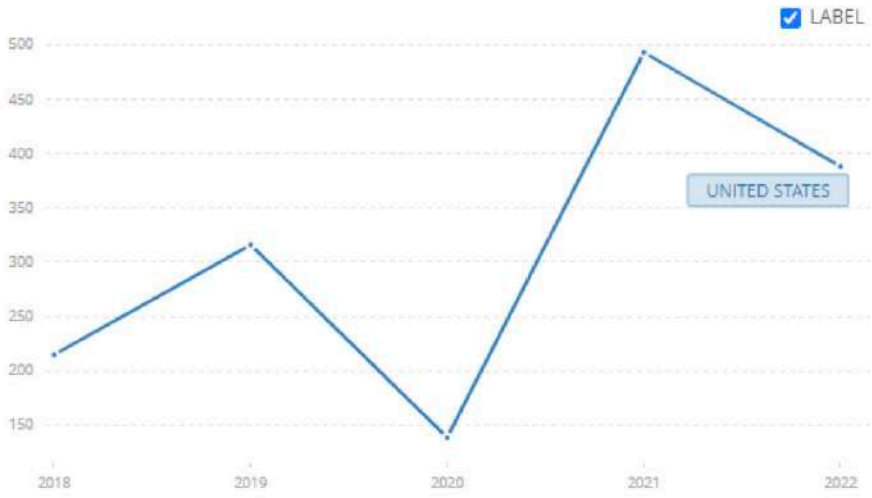


Figure 3A: FDI, net inflows in the USA between the years 2018 and 2022 in the USA. (WorldBank.org, 2024)

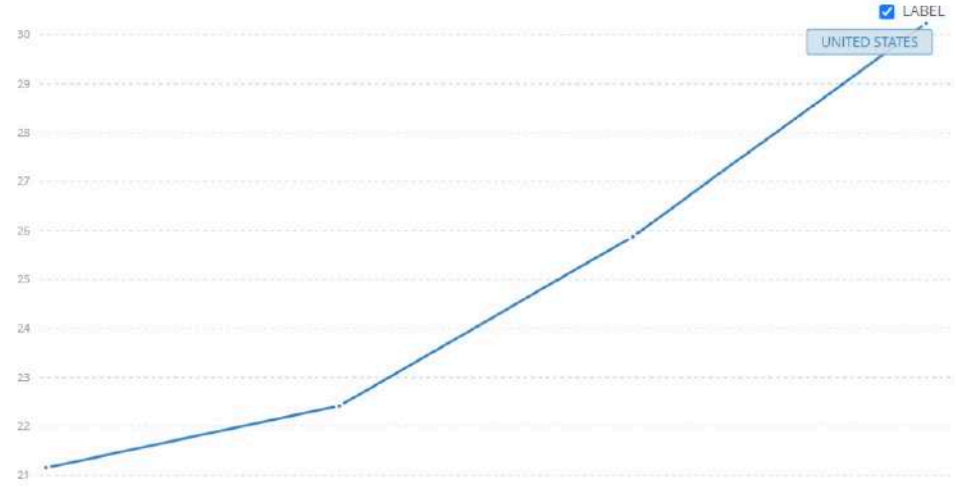


Figure 4A: Net domestic credit in USD 2018 and 2021 in the USA. (WorldBank.org, 2024)

APPENDIX (B)

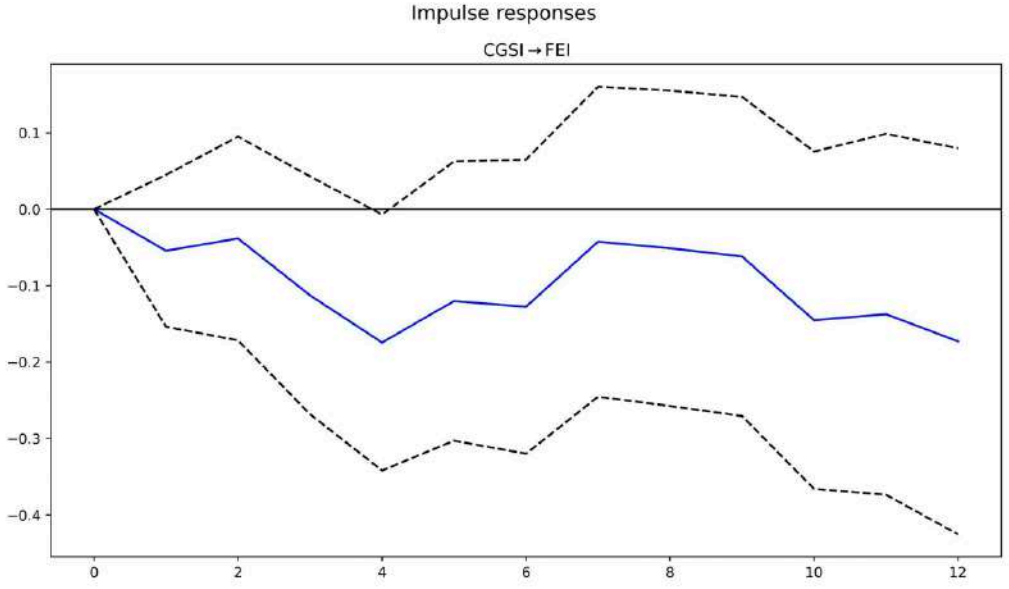


Figure 1B: IRF plot displaying the effetcs of a shock to CGSI on FEI

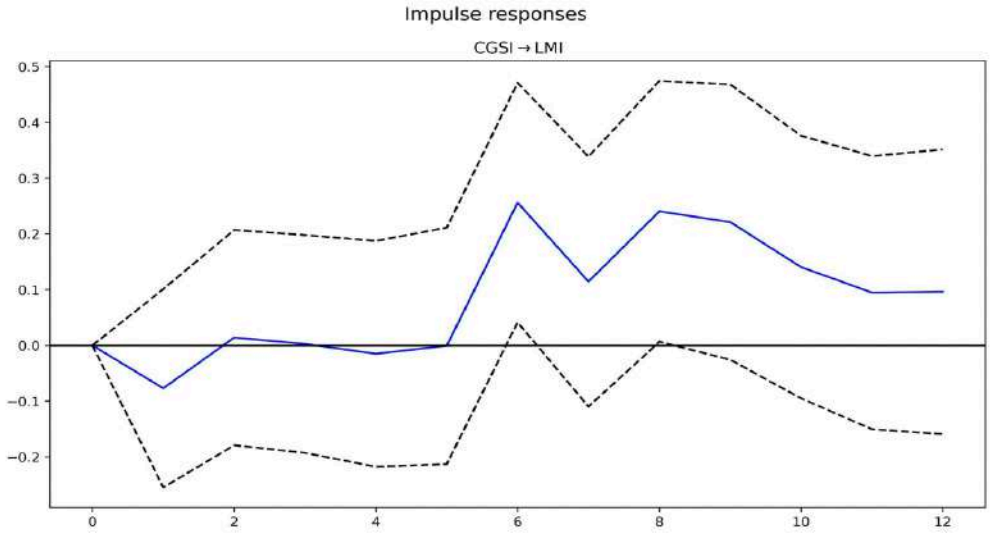


Figure 2B: IRF plot displaying the effects of a shock to CGSI on LMI

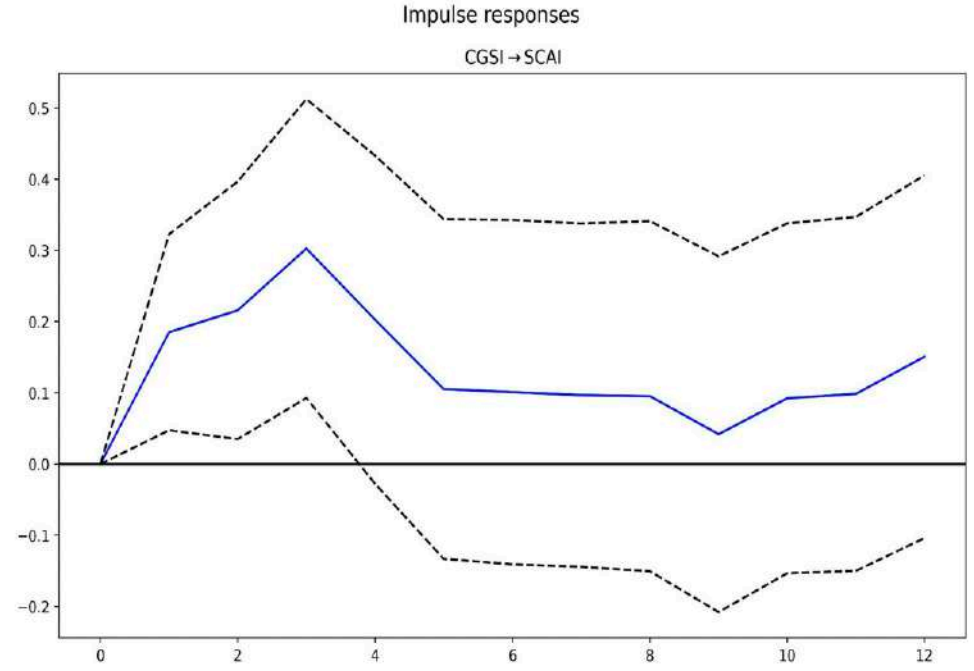


Figure 3B: IRF plot displaying the effects of a shock to CGSI on SCAI

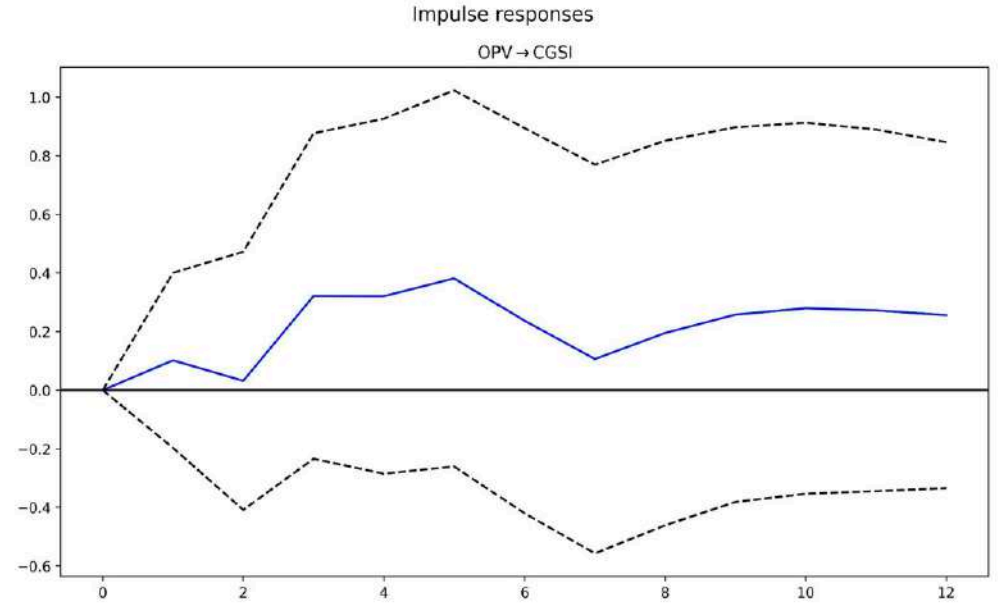


Figure 4B: IRF plot displaying the effects of a shock to OPV on CGSI

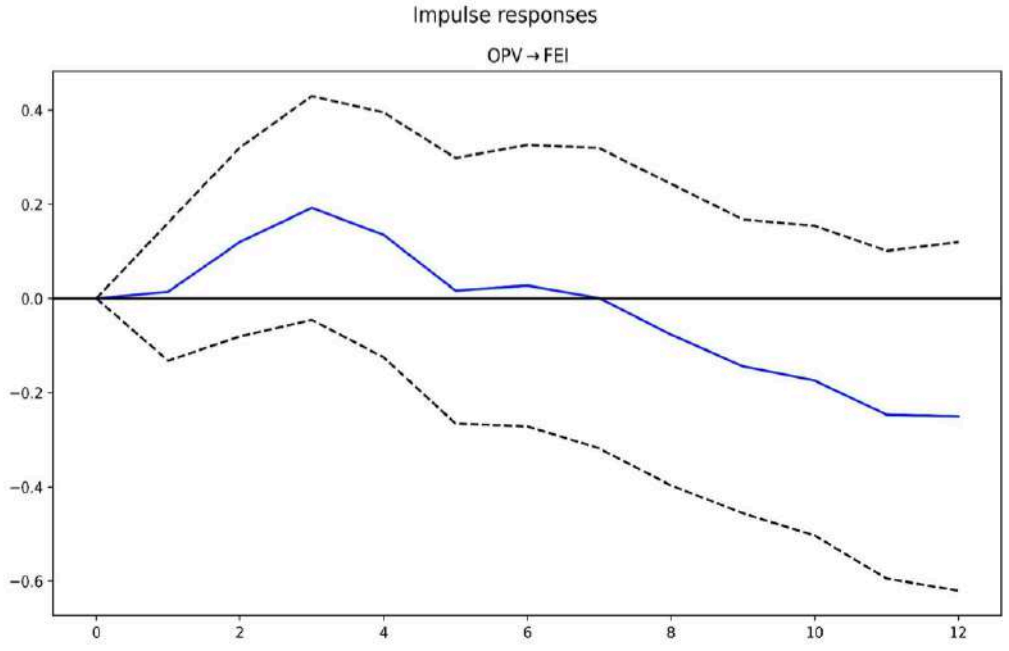


Figure 5B: IRF plot displaying the effects of a shock to OPV on FEI

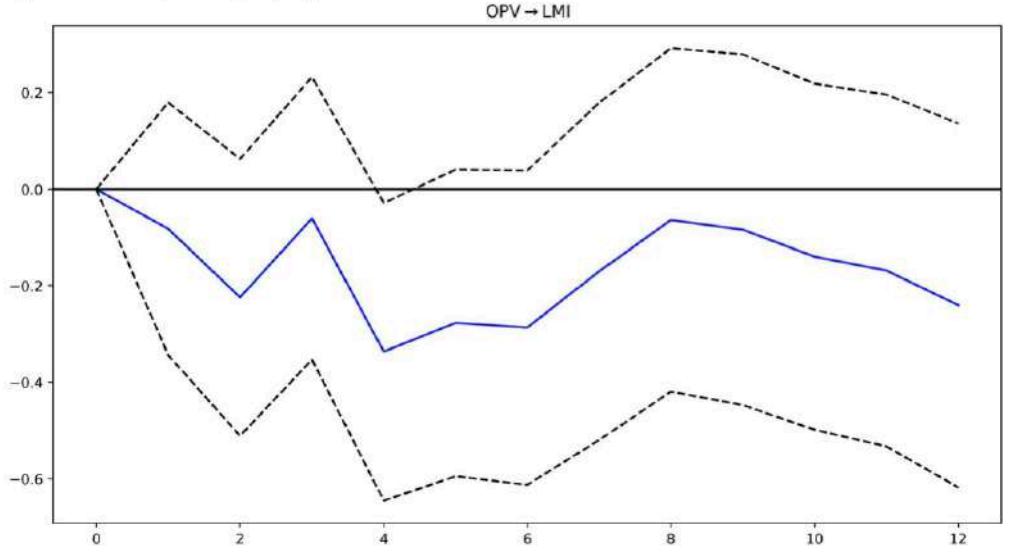


Figure 6B: IRF plot displaying the effects of a shock to OPV on LMI

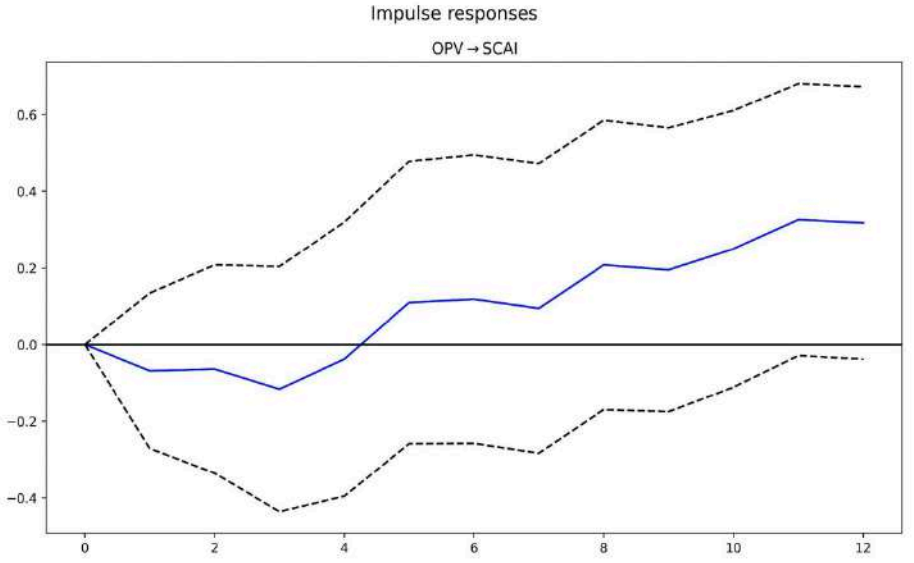


Figure 7B: IRF plot displaying the effects of a shock to OPV on SCAI

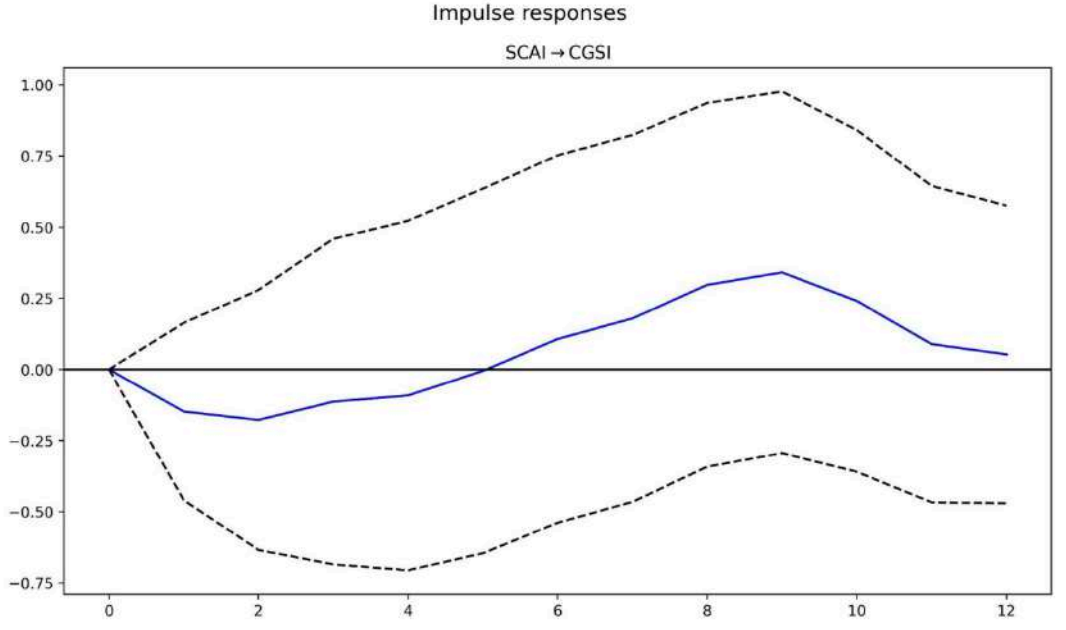


Figure 8B: IRF plot displaying the effects of a shock to SCAI on CGSI

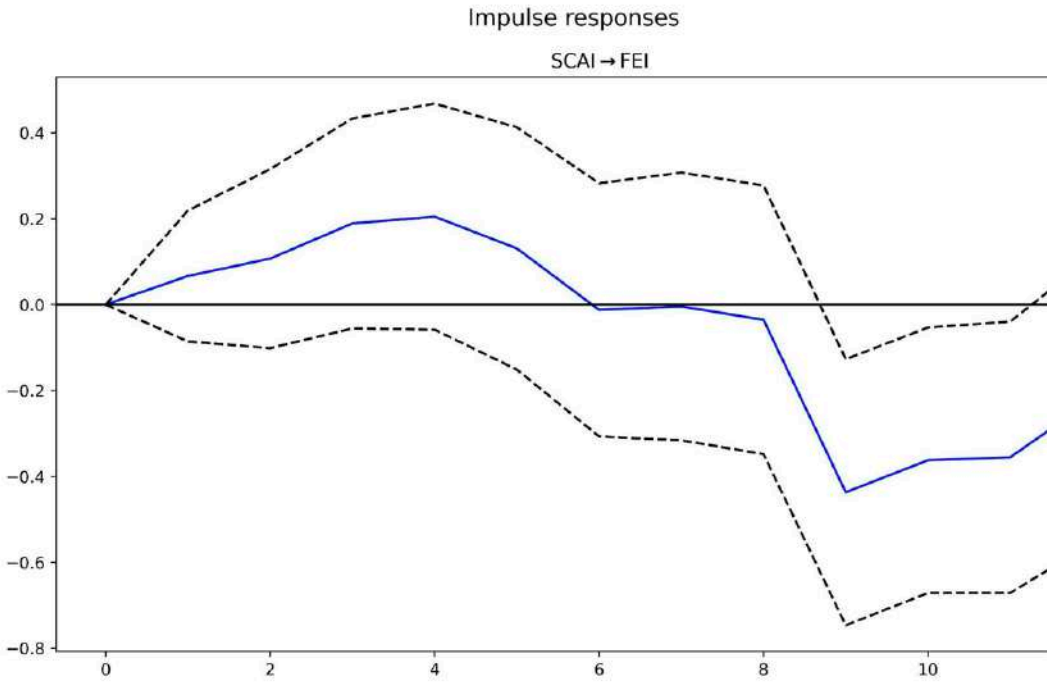


Figure 9B: IRF plot displaying the effects of a shock to SCAI on FEI

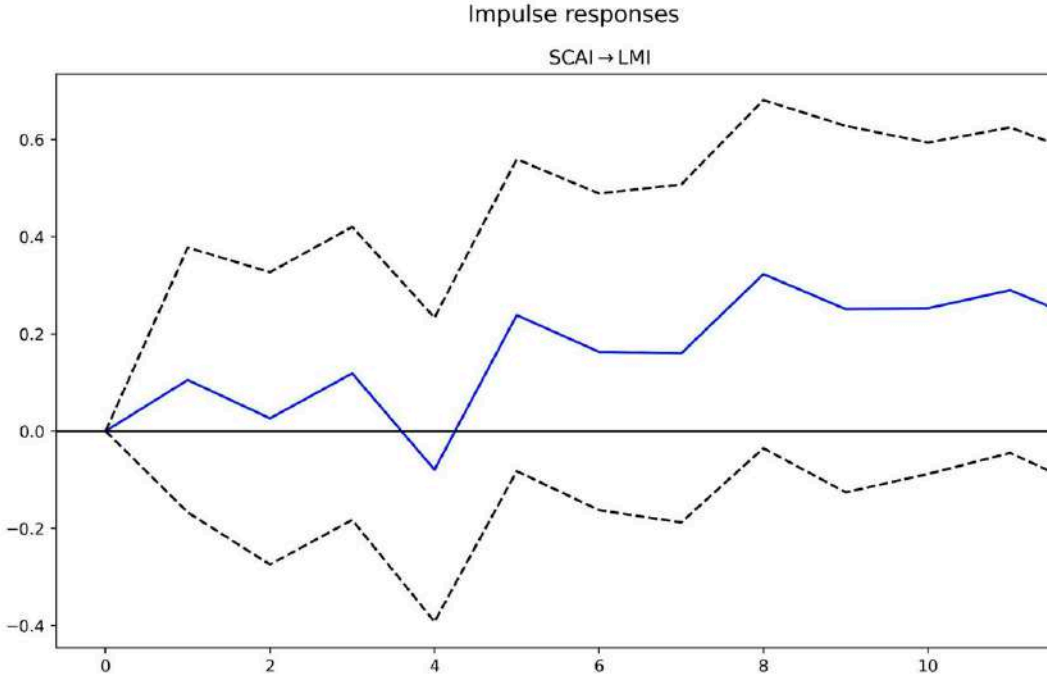


Figure 10B: IRF plot displaying the effects of a shock to SCAI on LMI

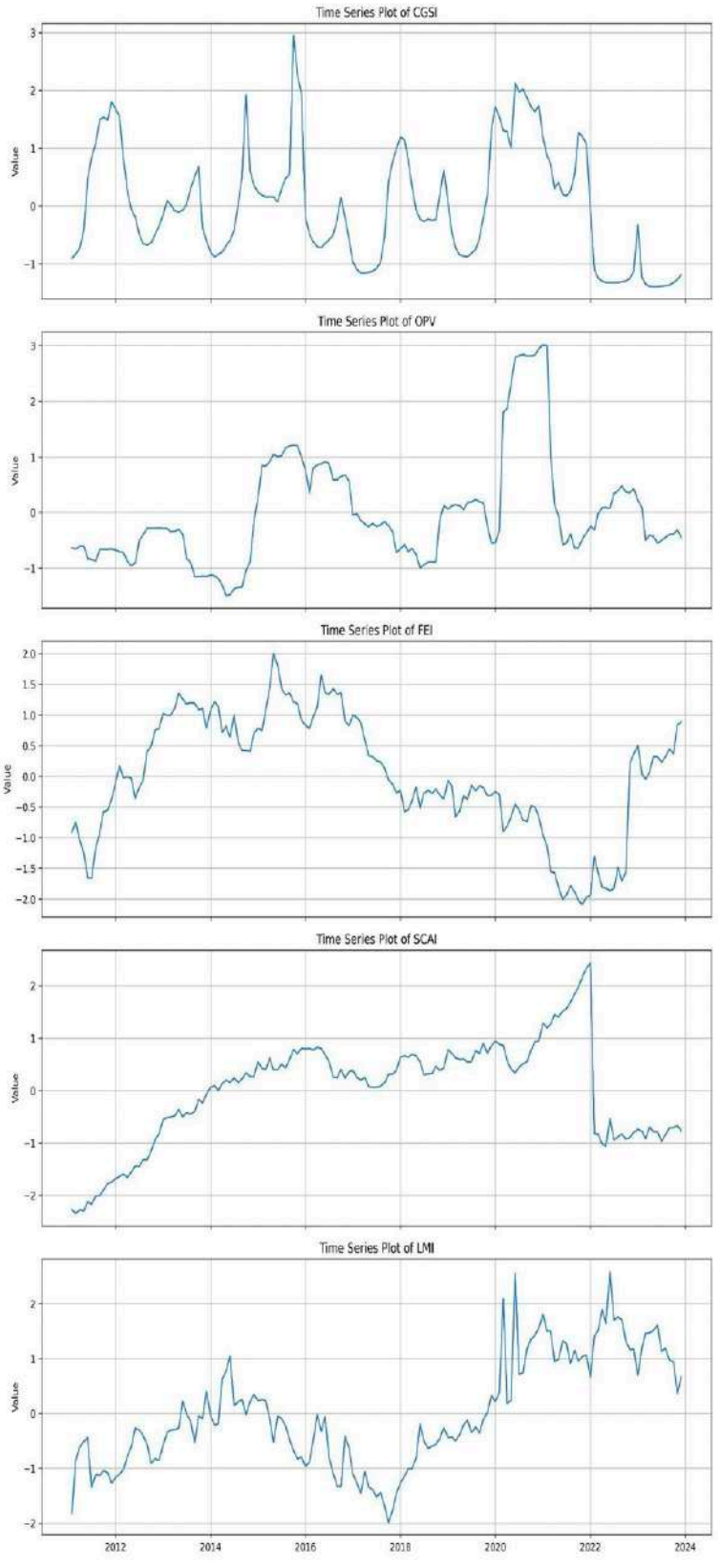


Figure 11B: Time series plots of the investigated indices

APPENDIX (C)

The following are commentary on each of our tests:

1. OPV causing SCAI: We find no evidence that oil price volatility (OPV) Granger-causes the Sectoral Credit Allocation Index (SCAI).

2. OPV causing FEI: We find no evidence that OPV Granger-causes the Foreign Exposure Index (FEI).

3. OPV causing LMI: We find no evidence that OPV Granger-causes the Liquidity Management Index (LMI).

4. OPV causing CGSI: We detect weak evidence that OPV Granger-causes the Credit Growth Stability Index (CGSI) at the first lag, but nothing more.

5. CGSI causing SCAI: We find no evidence that CGSI Granger-causes SCAI.

6. CGSI causing FEI: We find moderate evidence at the 10% significance level towards the end of the lag period, but no strong evidence at the 5% level.

7. CGSI causing LMI: We find no evidence that CGSI Granger-causes LMI.

8. SCAI causing FEI: We find no evidence that SCAI Granger-causes FEI.

9. SCAI causing LMI: We find no evidence that SCAI Granger-causes LMI.

10. SCAI causing CGSI: We find both strong and moderate evidence that SCAI Granger-causes CGSI at various lags. This is our only consistent evidence that SCAI significantly influences CGSI.

APPENDIX (D)

Variable-Specific Interpretations:

1. CGSI to FEI (Credit Growth Stability Index to Foreign Exposure Index): A shock to CGSI negatively impacts FEI, however the negative impact increases over a few periods before stabilizing.

2. CGSI to LMI (Credit Growth Stability Index to Liquidity Management Index): A shock to CGSI has a small positive impact on LMI that fluctuates, peaking around period 6, and then stabilizes with more significant later impacts.

3. CGSI to SCAI (Credit Growth Stability Index to Sectoral Credit Allocation Index): A shock to CGSI causes a quick increase in SCAI, peaking around period 2 and then gradually decreasing, with a significant initial positive impact.

4. OPV to CGSI (Oil Price Volatility to Credit Growth Stability Index): A shock to OPV leads to a substantial increase in CGSI, peaking around period 4 and remaining high, indicating statistical significance.

5. OPV to FEI (Oil Price Volatility to Foreign Exposure Index): A shock to OPV has a positive impact on FEI, peaking around period 3, then decreasing and turning negative, with both initial positive and subsequent negative impacts being significant.

6. OPV to LMI (Oil Price Volatility to Liquidity Management Index): A shock to OPV initially has a negative impact on LMI that fluctuates, turning positive around period 4, then decreasing again, with significant fluctuations.

7. OPV to SCAI (Oil Price Volatility to Sectoral Credit Allocation Index): A shock to OPV initially has no significant impact on SCAI but becomes positive and increases steadily over time, eventually becoming significant.

8. SCAI to CGSI (Sectoral Credit Allocation Index to Credit Growth Stability Index): A shock to SCAI results in an immediate increase in CGSI, peaking around period 4 and then gradually decreasing, with a significant initial positive impact.

9. SCAI to FEI (Sectoral Credit Allocation Index to Foreign Exposure Index): A shock to SCAI leads to a positive impact on FEI that remains positive for several periods before turning negative around period 8, with both initial positive and subsequent negative impacts being significant.

10. SCAI to LMI (Sectoral Credit Allocation Index to Liquidity Management Index): A shock to SCAI initially has a positive impact on LMI that remains positive and stable over the entire period, with this positive impact being significant throughout.

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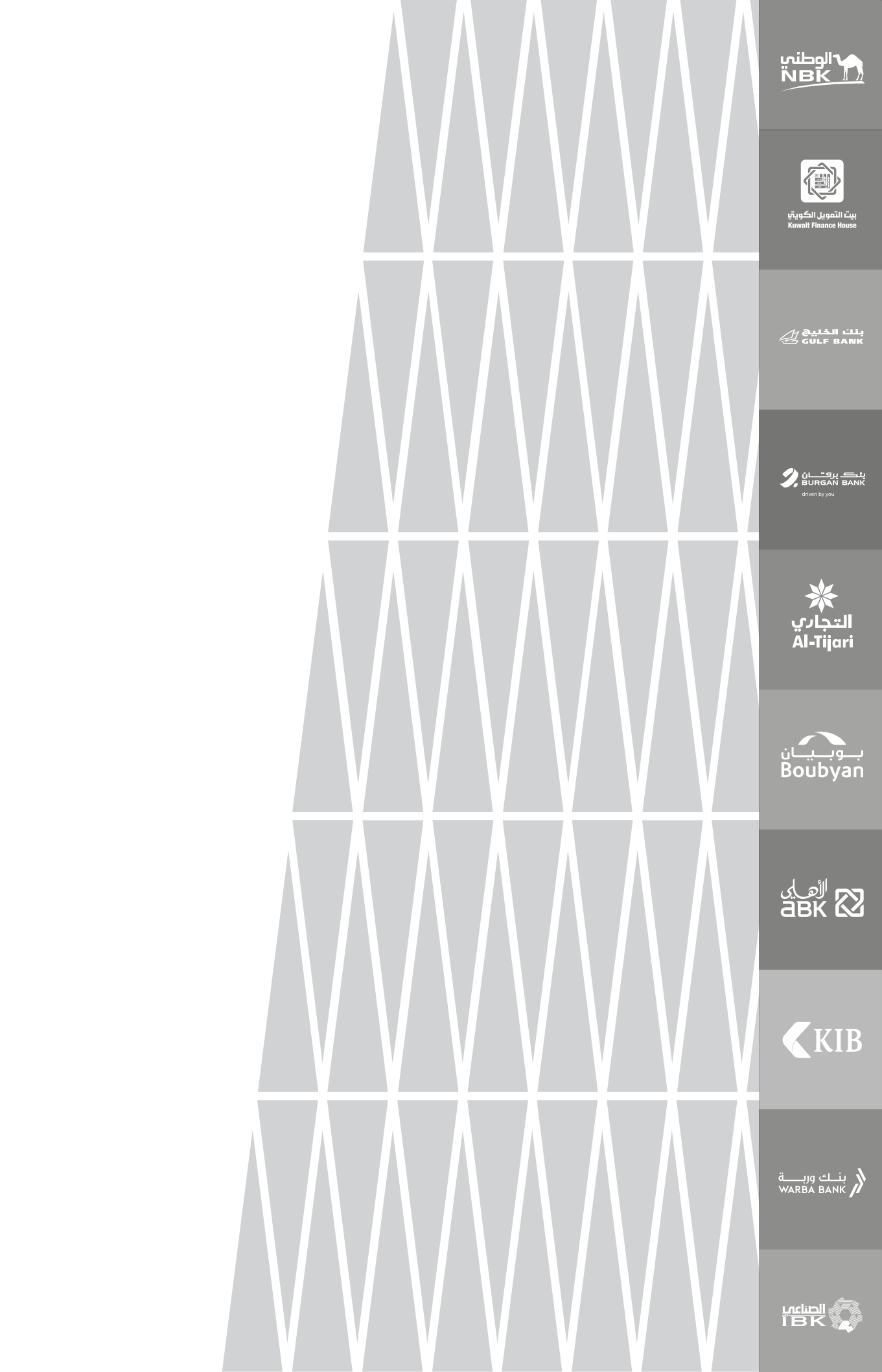
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Kuwait Finance House
بنك الخليج
GULF BANK
بنك برقان
BURGAN BANK
driven by you
التجاري
Al-Tijari
بوبيان
Boubyan
الأهلي
ABK
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WARBA BANK
الصناعي
IBK