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THE RESILIENCE OF ISLAMIC FINANCING TO OIL PRICE VOLATILITY IN SAUDI ARABIA: A NONLINEAR ARDL APPROACH

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ABSTRACT

This study examines the resilience of Islamic financing to oil volatility in Saudi Arabia from 1996 to 2023, utilizing a Nonlinear Autoregressive Distributed Lag (NARDL) methodology to determine asymmetric impacts. The goals of this study are to examine if positive and negative oil price shocks have symmetric or asymmetric effects on Islamic financing, assess both short-run and long-run responses while taking into account real GDP, inflation, trade openness, and the Vision 2030 policy dummy, and evaluate dynamic multiplier adjustment paths. The bounds cointegration tests validate a consistent long-term equilibrium relationship with an error correction term of -0.805 signifying that 80.5% of the disequilibrium is corrected each year. The asymmetry tests reject symmetric oil price effects. In the long run, positive oil shocks increase Islamic financing by 2.11%, but negative shocks surprisingly provide a positive coefficient of 3.691, indicating structural flexibility and adaptability in accordance with Saudi Vision 2030. In the short run, negative oil shocks result in an immediate reduction of 1.29%, while positive shocks exhibit no immediate impact. Dynamic multipliers indicate that negative shocks result in a 3.7% long-run decrease, whereas positive shocks yield a 2.0% increase—1.85 times greater in absolute size. The policy recommendations of this study include the establishment of a Shari'ah-compliant counter-cyclical liquidity facility, the imposition of asymmetric oil stress tests for Islamic banks, the rapid *execution of diversification-related financing, and the preparation of oil price-contingent Islamic contracts.*

Keywords: *Islamic financing, oil price volatility, NARDL, asymmetric shocks, Saudi Arabia, Vision 2030, financial resilience.*

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1. INTRODUCTION

Islamic finance has transformed as a key component of the global financial architecture. It is based on the principles of Shariah that prohibit interest *(riba)*, extreme uncertainty *(gharar)*, and gambling *(maysir)* (Alshater et al., 2022). The industry has witnessed tremendous expansion with global assets estimated at between USD 2.7 trillion and 3.9 trillion in over 80 countries (Alshater et al., 2022; Cengiz & ÖZKAN, 2023). The profit and loss sharing (PLS) model, utilizing contracts such as *mudarabah* and *musharakah*, drives this growth, as it aims to connect financial intermediation directly to real economic activity (Akdeniz et al., 2023; Fahamsyah et al., 2023). Theoretically, Islamic banking minimizes speculative risks and increases financial stability as all transactions have to be asset-backed (Fahamsyah et al., 2023; Ghassan & Fachin, 2016).

Saudi Arabia is one the main players in the global Islamic financial industry, that has the largest Islamic banking market in the world, with Islamic banking assets in the country making up about 30% to 50% of the whole banking sector (Fahamsyah et al., 2023; Lekpek & Šabotić, 2022). However, the sector has a strong link to the Kingdom's oil-based economy, despite its theoretical robustness. The banking sector is influenced by the volatility in the oil prices through the volatility of fiscal revenues, the government deposit flows, and the changes in loan demand (Ghiaie, 2018; Mahalik et al., 2016).

The empirical evidence suggests a strong long-run relationship between crude oil prices and banking sector credit in Saudi Arabia, although short-run dynamics can be negative (Miyajima, 2020; Nwani, 2017). Moreover, recent research has documented the asymmetric sensitivities of Islamic and conventional banks to oil price uncertainty (Tanin et al., 2025). Oil price busts can raise non-performing loans and credit contraction (Miyajima, 2020; Slimane & Alsolamy, 2024), while oil price increases usually promote bank lending via better balance sheets. In Saudi Arabia, Islamic banks experiences negative influences of oil price downturns than conventional banks, which calls for a more nuanced understanding of their asymmetric responses (Slimane & Alsolamy, 2024; Tanin et al., 2025).

The impact of oil prices on financial markets is extensively studied but there are still significant gaps in the research on Islamic finance areas. First, most of the previous research assumes a symmetric relationship, overlooking the fact that Islamic finance may react differently to oil price increases than oil price drops (Amin, 2022; Slimane & Alsolamy, 2024). Second, the studies that employ aggregate panel data typically do not reveal the unique institutional environment of Saudi Arabia, particularly in the context of Vision 2030 (Mahalik et al., 2016). Third, there is limited application of Nonlinear ARDL models to study aggregate Islamic financing quantities rather than bank profitability only, whereas it is able to capture complicated asymmetric cointegration (Alalmai, 2025; Amin, 2022).

This study addresses these concerns by examining the asymmetric effects of oil prices on total Islamic financing in Saudi Arabia, adjusting for GDP, inflation, trade openness and gross fixed capital formation. It attempts to distinguish between structural policy changes and the passive transmission of oil shocks by using a dummy for Vision 2030 strategy. The findings provide important evidence to adapt macroeconomic policies and risk management techniques for Shariah-compliant institutions in oil-dependent countries.

The rest of this paper is organized as follows. Section 2 addresses the theoretical foundations and empirical literature. Section 3 discusses the study technique comprising data sources, definitions of variables (tabular) and the NARDL specification. Results and discussion are presented in Section 4. Section 5 presents the conclusion and policy recommendations.

2. REVIEW OF LITERATURE

2.1 Theoretical Background

The theoretical underpinnings of Islamic finance are rooted in Maqasid al-Shariah, which emphasizes the protection of wealth, the protection of social justice, and the avoidance of harm (Kismawadi & Rafay, 2024). Unlike conventional finance, Islamic banking is based on the concept of Profit and Loss Sharing, mainly through mudarabah and musharakah contracts, which are believed to align the interests of the financier and the entrepreneur (Kismawadi & Rafay, 2024; Smolo, 2026). The aim of this agreement is to achieve more financial stability by making sure that all transactions are asset-backed and tied to the real economy, thus avoiding speculative bubbles and excessive leverage (Kismawadi & Rafay, 2024; Shaiban et al., 2025).

The resource curse hypothesis is an important macro-theoretical paradigm when it comes to oil-exporting countries like Saudi Arabia. It shows that natural resource abundance can result in macroeconomic volatility and "Dutch Disease" where gains from the petroleum industry can crowd out other types of financial development (Arezki & Nabli, 2012; Ateba & Enwereji, 2024). It generates a structural dependency for the banking system as financial depth and credit availability are inherently linked with international oil price cycles (Arezki & Nabli, 2012; Faheem et al., 2021). In theory, Islamic banks are resilient to these cycles because of their risk-sharing nature, though this is often debated by the displaced commercial risk where Islamic institutions smooth returns to compete with conventional interest rates (Kismawadi & Rafay, 2024; Slimane & Alsolamy, 2024).

2.2 Empirical Literature on Islamic Finance and Oil Price Fluctuations

The empirical evidence of the oil price shocks effects on the Saudi banking sector shows a high degree of asymmetry. The studies based on Nonlinear ARDL models indicate that there are asymmetric effects of positive and negative oil price changes on Islamic banks (Amin, 2022; Shaiban et al., 2025). For example, research indicates that the positive impacts of rising oil prices on profitability and liquidity are often more significant than the bad effects of oil price decreases, possibly owing to institutional rigidities and loss aversion among investors (Amin, 2022; Bouzidi et al., 2024). Furthermore, the Saudi Arabian dual banking system comprises fully-fledged Islamic banks and Islamic windows within conventional banks. Empirical evidence suggests that these organizations demonstrate different sensitivities to oil price shocks, with Islamic banks exhibiting a more adverse response during downturns than conventional banks (Boukhatem & Djelassi, 2022; Slimane & Alsolamy, 2024). The reason for this phenomenon is usually attributed to the difference in their operating frameworks, especially in Islamic finance where interest-based revenue is prohibited and hence reliance on more volatile equity-like instruments is required (Akdeniz et al., 2023). This dynamic is also supported by empirical evidence of the comprehensive risk transmission channels in the dual banking system of Saudi Arabia through application of panel VAR models. The deposits of Islamic banks are more sensitive to oil price shocks than their financing activities, which indicates operational rigidities of Islamic banks vis-à-vis conventional banks (Boukhatem & Djelassi, 2022; Shaiban et al., 2025).

The empirical research on dual-banking systems in the GCC indicates that oil shocks affect both types of banks, Islamic and conventional, and that Islamic banks may be more resilient during periods of moderate volatility because of their asset-backed structure (Slimane & Alsolamy, 2024). However, during major oil price crashes, the profitability of Saudi Islamic banks is heavily affected by the contraction in government spending and private sector liquidity that follows (Shaiban et al., 2025; Slimane & Alsolamy, 2024). Furthermore, the performance of such banks is typically linked to the overall stability of the financial system, which is frequently challenged by international price shocks and local inflation rates (Bouzidi et al., 2024). The structure of the banking sector, the strong balance sheets of the banking sector, and economic diversification (beyond oil) create good conditions for lending, especially for Islamic banks (Miyajima, 2020). This makes the nuanced interaction of the oil price volatility and credit growth in Saudi Arabia more complicated.

The impact of oil price variations on the performance of Islamic financing instruments calls for a thorough analysis considering the intricate interplay of these elements along with the specific principles of Islamic finance and economic features of Saudi Arabia. This study thereby aims to uncover the mechanisms via which oil price volatility effects the financial stability and operational resilience of Islamic banks in Saudi Arabia using a nonlinear autoregressive distributed lag framework to capture any asymmetric responses.

2.3 Empirical Literature on GDP, Inflation, Trade Openness and Gross Fixed Capital Formation

In Saudi Arabia, the relationship between economic growth (GDP) and banking performance is always positive. As economic activity expands, the demand for Shariah-compliant finance also increases, hence resulting in lower non-performing loans (Bouzidi et al., 2024; Elhassan, 2021). Studies showing the association between oil prices and GDP per capita have a beneficial effect on Islamic banks (Ledhem & Mékidiche, 2020) are also investigating this relationship. On the other hand, inflation is a complex factor, with moderate inflation being a sign of economic progress, while high and unpredictable inflation can have a negative impact on the real returns of Islamic banks and can make it difficult to price long-term contracts (Bouzidi et al., 2024). The empirical evidence on Trade Openness suggests that growing integration into global markets makes the Saudi financial sector vulnerable to external shocks and at the same time provides opportunities for diversification away from the petroleum industry (Ahmad et al., 2024; Osman, 2024). The role of Gross Fixed Capital Formation as a driver of long-term stability is also highlighted in recent research. Investments in infrastructure and non-oil businesses contribute to reducing the pro-cyclicality of the banking sector to oil rents (Elhassan, 2021; Shammre, 2024). Collectively, these variables set the bar where Islamic finance may maintain its resilience to external shocks from the energy market (Shaiban et al., 2025). The in multiple directions interaction underlines the need to include key macroeconomic indicators as control variables to properly describe the special resilience mechanisms of Islamic finance in the Saudi Arabian context. Hence, it is necessary to have a detailed study of key macroeconomic variables such as GDP growth rate, inflation and trade openness for a complete understanding of their impact on the financial stability of Islamic banking (Mahalik et al., 2016; Mateev et al., 2022).

2.4 Research Gap and Significance of the Study

Although there is a large body of literature on Islamic finance and oil price dynamics, there are some important gaps. First, most previous research assumes symmetric behavior of oil prices, which implies that a positive shock has the same effect as a negative shock. However, oil price transmission is actually asymmetric. However, to the best of the author’s knowledge, there is no previous study that has examined the asymmetric oil price impacts on the Islamic financing in Saudi Arabia by including GDP, inflation, gross fixed capital creation, trade openness, and Vision 2030. Second, the Saudi Vision 2030 dummy variable has not been incorporated into a policy intervention in an asymmetric setting in any of the prior studies, which is important for distinguishing diversification plans from passive transmission of oil shocks. Third, this paper improves on previous studies by focusing on total Islamic financing amounts instead of bank profitability, which better reflects credit channels to the real economy. The absence of dynamic multiplier analysis is also a limitation for policy guidance. Finally, the role of gross fixed capital creation, which captures investment in physical assets that underlie Islamic contracts such as Ijarah and Musharaka, has been under-researched in the asymmetric oil price scenario. This paper fills these gaps by providing empirical information to guide the macroeconomic policy of SAMA, risk management of Islamic banks and financial sector reforms under Vision 2030 in Saudi Arabia.

As recommended by Nasir et al. (2019), this study contributes to the existing literature by employing a rigorous econometric methodology to explore the complex and potentially asymmetric effects of oil price dynamics on the Islamic financing ecosystem within a major global economy. This approach may provide valuable insights for more accurate policy formulation and financial planning.

3. RESEARCH METHODOLOGY

3.1 Data Sources

This study takes into consideration all four Islamic banks such as, Al Rajhi Bank, Alinma Bank, Bank AlJazira, and Bank Albilad and their total financing, which is calculated based on the summation of all Islamic banks' financing from 1996 to 2023. Table 1 displays the name, unit of measurement and sources of all the variables use in this study.

Table 1. Variable Description

Variable	Symbol	Measurement	Source
Islamic Financing	LISF	Total Islamic bank financing (log)	Bloomberg
Oil Price (Brent)	LOILB	Brent crude oil price (USD per barrel, log)	Investing.com
Real GDP	LRGDP	Real GDP (constant prices, log)	WDI, World Bank
Inflation	INF	Consumer Price Index (annual %)	WDI, World Bank
Gross fixed capital formation	LGFCF	Gross fixed capital formation ()	WDI, World Bank
Trade Openness	LTOPEN	(Exports + Imports)/GDP	WDI, World Bank
Saudi Vision 2030	SAV30	Dummy Variable	Saudi Vison, 2030

Source: Author's compilations from SAMA Website (https://www.sama.gov.sa/), World Development Indicators (WDI) (https://databank.worldbank.org/), Saudi Vison, 2030 (https://www.vision2030.gov.sa/en); Bloomberg (https://data.bloomberg.com) (accessed on April, 25, 2025); https://www.investing.com/commodities/brent-oil-historical-data

3.2 Model Specification

The primary objective of this study is to examine the asymmetric effects of oil price volatility on Islamic financing in Saudi Arabia. It adopts Nonlinear Autoregressive Distributed

Lag (NARDL) approach developed by Shin, Yu, & Greenwood-Nimmo (2014) and Shin and Smith (2001) that posits Islamic financing as a function of oil prices and a set of macroeconomic control variables. The model is specified as follows:

$$LISF_t = \beta_1 + \beta_2 LOILB_t^+ + \beta_3 LOILB_t^- + \beta_4 LRGDP_t + \beta_5 LGFCF_t + \beta_6 INF_t + \beta_7 LTOPEN_t + \beta_8 SAUV30_t + \varepsilon_t \; (1)$$

where β = ($\beta_1 - \beta_8$) indicates the cointegrating vector of long-run coefficients; and *et* is the error term which is assumed to follow normal and independent distribution with zero mean value and constant variance. Besides, $LISF_t$ represents the natural logarithm of total Islamic financing in Saudi Arabia at time t; $LOILB_t$ denotes the natural logarithm of Brent crude oil prices; $LRGDP_t$ is the natural logarithm of real GDP; $LGFCF_t$ represents the natural logarithm of gross fixed capital formation; INF_t is the inflation rate measured by the annual percentage change in the Consumer Price Index; $LTOPEN_t$ denotes the natural logarithm of trade openness (calculated as exports plus imports as a percentage of GDP); $SAUV30_t$ is a dummy variable taking the value of 1 for the period from 2016 onward to capture the impact of Saudi Vision 2030 and 0 otherwise; and ε_t is the error term.

The NARDL framework extends the linear ARDL model by decomposing the oil price variable into positive and negative partial sum components, thereby allowing positive and negative oil price changes to have different impacts on Islamic financing in both the short run and long run. This decomposition is particularly relevant in the Saudi context, where oil price increases (positive shocks) and decreases (negative shocks) may trigger distinct transmission mechanisms through government fiscal policy, corporate liquidity, and banking sector credit supply. The first step in the NARDL procedure involves decomposing the Brent crude oil price variable ($LOILB_t$) into its positive and negative partial sums as follows:

$$LOILB_t^+ = \sum_{j=1}^{t} \Delta LOILB_j^+ = \sum_{j=1}^{t} \max(\Delta LOILB_j, 0) \qquad (2)$$

$$LOILB_t^- = \sum_{j=1}^{t} \Delta LOILB_j^- = \sum_{j=1}^{t} \min(\Delta LOILB_j, 0) \qquad (3)$$

The long-run relationship of LISF with LOILB increase are β_2 and decrease are β_3 which are assumed to be positive and negative, respectively. Since β_2 is predicted to be positive which is supposed to change in identical direction, for example, any increase in LIOLB impact positive long-run changes in LISF as related to the effect of LIOLB decrease on LISF of an identical extent i.e., $\beta_2 > \beta_3$. Hence, the long-run relationship as shown in Eq.4 indicates the non-linear and long-run LOILB change pass-through to the LISF.

$$\Delta LISF_t = \alpha_0 + \sum_{i=1}^{p} \phi_i \Delta LISF_{t-i} + \sum_{i=0}^{q_1} (\theta_i^+ \Delta LOILB_{t-i}^+ + \theta_i^- \Delta LOILB_{t-i}^-) + \sum_{i=0}^{q_2} \lambda_i \Delta LRGDP_{t-i} + \sum_{i=0}^{q_3} \mu_i \Delta LGFCF_{t-i} + \sum_{i=0}^{q_4} \rho_i \Delta INF_{t-i} + \sum_{i=0}^{q_5} \sigma_i \Delta LTOPEN_{t-i} + \varphi \Delta SAUV30_t + \pi_1 LISF_{t-1} + \pi_2 LOILB_{t-1}^+ + \pi_3 LOILB_{t-1}^- + \pi_4 LRGDP_{t-1} + \pi_5 LGFCF_{t-1} + \pi_6 INF_{t-1} + \pi_7 LTOPEN_{t-1} + \pi_8 SAUV30_{t-1} + \varepsilon_t \qquad (4)$$

Where the short-run asymmetry is captured by θ_i^+ and θ_i^-, representing the immediate impacts of positive and negative oil price changes, respectively. The long-run asymmetry is captured by the coefficients $\beta^+ = -\pi_2/\pi_1$ and $\beta^- = -\pi_3/\pi_1$ for positive and negative oil price components. The long-run coefficients for other variables are similarly derived as $-\pi_k/\pi_1$ for $k = 4,5,6,7,8$. The bounds testing procedure for cointegration in the NARDL framework tests the null hypothesis of no asymmetric cointegration: $H_0: \pi_1 = \pi_2 = \pi_3 = \pi_4 = \pi_5 = \pi_6 = \pi_7 = \pi_8 = 0$, using the same critical values as the linear ARDL.

The study conducts two sets of tests to formally detect the presence of asymmetry. First, the null hypothesis of long-run symmetry ($H_0: \beta^+ = \beta^-$) is tested using a standard Wald test (F-statistic). Second, the null hypothesis of short-run symmetry ($H_0: \sum \ \theta_i^+ = \sum \ \theta_i^-$) is tested using another Wald test. The rejection of either null hypothesis confirms the existence of asymmetry and justifies the use of the NARDL model over the linear ARDL. Furthermore, this study adopts the dynamic multiplier approach to visualize the adjustment patterns following positive and negative oil price shocks computed as:

$$m_h^+ = \sum_{j=0}^{h} \frac{\partial LISF_{t+j}}{\partial LOILB_t^+}, m_h^- = \sum_{j=0}^{h} \frac{\partial LISF_{t+j}}{\partial LOILB_t^-}, h = 0,1,2, \dots$$

These multipliers trace the cumulative response of Islamic financing to a one-unit positive and negative oil price shock over a specified horizon h. The asymmetry multiplier is defined as the difference $m_h^+ - m_h^-$, with confidence intervals constructed to assess statistical significance.

This study selects Akaike Information Criterion (AIC) with a maximum lag of 4, given the annual frequency of the data. The diagnostic checking procedure for NARDL model includes: (1) the Jarque-Bera test for normality of residuals; (2) the Breusch-Pagan-Godfrey test for heteroscedasticity; (3) the Ramsey RESET test for functional form misspecification; (4) the

Breusch-Godfrey LM test for serial correlation; and (5) the CUSUM and CUSUMSQ tests for parameter stability.

4. RESULTS AND DISCUSSIONS

4.1 Descriptive Statistics

Descriptive statistics demonstrates that all variables except inflation (INF) have fairly consistent distribution during the study period 1996–2023. Islamic financing (LISF) has a mean of 5.330 with a range from 4.289 to 6.296 whereas oil prices (LOILB) have an average of 1.680 with moderate negative skewness (-0.380) indicating the infrequent low-price periods (Table 2). The standard deviations of real GDP (LRGDP) and gross fixed capital formation (LGFCF) are quite low (0.132 and 0.065, respectively), indicating the stable growth trend of Saudi Arabia in the long run. The maximum volatility (standard deviation of 10.473) is observed in the range of -16.437 and 20.150 for the inflation (INF) during the disinflationary and deflationary periods after oil price falls. The trade openness (LTOPEN) is quite close to the mean of 1.846 with little variation (std. dev. = 0.076). Jarque-Bera p-values for all variables

Table 2. Descriptive Statistics

	LISF	LOILB	LRGDP	LGFCF	INF	LTOPEN
Mean	5.330	1.680	6.358	1.339	4.848	1.846
Median	5.233	1.717	6.353	1.350	6.172	1.829
Maximum	6.296	1.974	6.543	1.468	20.150	1.983
Minimum	4.289	1.196	6.158	1.238	-16.437	1.696
Std. Dev.	0.705	0.214	0.132	0.065	10.473	0.076
Skewness	-0.036	-0.380	-0.146	-0.020	-0.505	0.169

Kurtosis	1.542	2.259	1.544	2.003	2.353	2.032
Jarque-Bera	2.485	1.315	2.573	1.161	1.677	1.227
Probability	0.289	0.518	0.276	0.560	0.432	0.541

Note: N=28
Source: The author's own work.

The correlation matrix shows several strong and statistically significant correlations between the variables. Islamic financing (LISF) is very strongly positively correlated with real GDP (LRGDP) of 0.989 ($p < 0.001$) and the dummy for Saudi Vision 2030 (SAUV30) of 0.753 ($p < 0.001$) implying that economic growth and the post-2016 diversification agenda are closely linked with expanded Islamic financing (Table 3). Oil prices (LOILB) exhibit moderate positive associations with LISF (0.594, $p = 0.001$), LRGDP (0.643, $p < 0.001$) and LGFCF (0.555, $p = 0.002$) demonstrating the oil-dependent structure of the Saudi economy. Inflation (INF) shows no association with any variable (all $p > 0.05$) implying that the change in the price level is not related to the real and financial variables in the Saudi environment. Trade openness (LTOPEN) has a weak negative correlation with LISF (-0.159, $p = 0.419$) that is not statistically significant, though it shows a strong positive correlation with LOILB (0.610, $p = 0.001$), reflecting Saudi Arabia's oil-export-driven trade structure. Importantly, none of the correlations are overly high (all below 0.99) thus excluding the possibility of perfect multicollinearity and verifying the ability to estimate reliably the NARDL model.

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Table 3. Correlation Matrix

Probability	LISF	LOILB	LRGDP	LGFCF	INF	LTOPEN	SAUV30
LISF	1						
LOILB	0.594	1.000					
	(0.001)	-----					
LRGDP	0.989	0.643	1.000				
	(0.000)	(0.000)	-----				
LGFCF	0.804	0.555	0.818	1.000			
	(0.000)	(0.002)	(0.000)	-----			
INF	-0.124	0.278	-0.091	-0.344	1.000		
	(0.529)	(0.152)	(0.645)	(0.073)	-----		
LTOPEN	-0.159	0.610	-0.104	0.069	0.287	1.000	
	(0.419)	(0.001)	(0.599)	(0.729)	(0.139)	-----	
SAUV30	0.753	0.098	0.734	0.428	-0.022	-0.611	1.000
	(0.000)	(0.620)	(0.000)	(0.023)	(0.910)	(0.001)	-----

Note: p-values are shown in parenthesis.
Source: The author’s own work.

4.2 Stationary and Structural Break Test

The finding of the unit root test with structural breaks confirms that all the variables in the study satisfy the preconditions to use the NARDL techniques as none of the series is integrated of order two I(2). The results of standard ADF and PP tests show that most of the variables such as LISF (Islamic financing), LOILB (oil prices), INF (inflation), LGFCF (gross fixed capital formation), and LTOPEN (trade openness) are non-stationary at the level forms as the null hypothesis of unit root could not be rejected at the conventional significance levels. However, all these variables are stationary at first difference since they reject the unit root null at 1% level of significance, showing that variables are integrated of order I(1). The only exception is LRGDP (real GDP), which appears to be stationary at level (at the 5% level of significance I(0)) and also appears to be stationary at first difference indicating that it is borderline I(0)/I(1), which is totally acceptable for ARDL bounds testing.

As shown in Table 4, the Zivot-Andrews unit root test with one structural break further confirms these findings as the unit root hypothesis is rejected for all variables after considering break points. The identified break points are found to be consistent with the significant economic and policy events in Saudi Arabia. LISF has the break point of 2016 is exactly the year of the introduction of Saudi Vision 2030. This provides empirical evidence for the need to include the SAUV30 dummy variable in the model. In the case of LOILB, the break point in 2014 captures the massive oil price collapse that saw Brent crude fall from over $115 per barrel to below $30 per barrel by early 2016. LRGDP has a break point in 2008, which shows the effect of the Global Financial Crisis on the economic development path of Saudi Arabia. INF has a break at 2009, corresponding to the post-crisis inflationary surge due to monetary and fiscal stimulus packages. LGFCF breaks at 2015, in line with the government's fiscal consolidation following the oil price drop, which saw delayed payments to contractors and lower construction investment. LTOPEN breaks at 2014. This is identical with the collapse in the oil price and the knock-on effect on Saudi Arabia's export revenues and trade balance. These results together suggest that all the variables are either I(0) or I(1) but no I(2) variables exist, hence satisfying the vital pre-condition for applying the ARDL and NARDL limits testing procedures. Furthermore, the timing of structural breaks corresponding with historically significant events adds to the credibility of the asymmetric modeling approach used in this study.

Table 4: Unit Root with Structural Break Test Results (Zivot-Andrews)

Variable	ADF (Level)	ADF (First Difference)	PP (Level)	PP (First Difference)	Zivot-Andrews t-statistic	Break Point
LISF	-1.25[1]	-3.98***[0]	-2.48[1]	-3.95***[3]	-3.87***[1]	2016
LOILB	-2.18[1]	-4.02***[1]	-2.51[4]	-6.82***[15]	-3.52**[1]	2014
LRGDP	-3.76[1]**	-4.78***[0]	-4.15[1]**	-4.60***[4]	-4.19***[1]	2008
INF	-2.01[1]	-5.23***[0]	-1.98[2]	-5.01***[3]	-3.31**[1]	2009
LGFCF	-1.87[1]	-4.45***[0]	-2.21[1]	-4.38***[4]	-3.62***[1]	2015
LTOPEN	-1.56[1]	-4.12***[0]	-2.05[2]	-3.89***[3]	-3.48**[1]	2014

Notes:

a) An intercept and trend option is used for ADF and PP tests, with the null hypothesis that the series contains a unit root.

b) For the ADF test, numbers in [ ] indicate optimal lags selected by Schwarz Criterion (SC).

c) For the PP test, numbers in [ ] indicate the bandwidth (Newey-West automatic) using the Bartlett kernel.

d) The Zivot-Andrews test allows for a single structural break under the null hypothesis of a unit root. Numbers in [ ] indicate optimal lag length.

e) Superscripts ***, **, and * indicate rejection of the null hypothesis of a unit root at the 1%, 5%, and 10% significance levels, respectively.

4.3 Brock, Dechert and Scheinkmakn (BDS) Test

The results of the BDS test (Table 5) show a strong rejection of the null hypothesis of the i.i.d (independent and identically distributed) of the error terms for all embedding dimensions (m=2 to m=6) for each variable in this study. The test statistics for the dependent variable LISF (Islamic financing) are between 0.0789 and 0.1312 and significant at the 1% level, demonstrating the existence of nonlinear structure. LOILB (oil prices) has substantial nonlinear dependencies. The statistics

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peak at 0.1901 (m=4) at 1 % significance. LRGDP (real GDP) is the most nonlinear with the data increasing to 0.4877 at m=6. This indicates the cyclical economy of Saudi Arabia based on oil. INF (inflation), LGFCF (gross fixed capital formation) and LTOPEN (trade openness) reject the i.i.d. null across different dimensions at 1%, 5% or 10% significance level. The collective rejection of the i.i.d null hypothesis for all variables provides strong empirical justification for the use of the Nonlinear Autoregressive Distributed Lag (NARDL) model over a linear specification since linear symmetric models would be mis specified and unable to capture the asymmetric transmission of oil price shocks to Islamic financing in Saudi Arabia.

Table 5. Brock, Dechert & Scheinkman (BDS) Non-Linearity Test Results

Series	Embedding Dimension=m				
	m=2	m=3	m=4	m=5	m=6
LISF	0.0789***	0.1124***	0.1312***	0.1287***	0.1098***
LOILB	0.0983***	0.1578***	0.1901***	0.1857***	0.1571***
LRGDP	0.1899***	0.3146***	0.4042***	0.4610***	0.4877***
INF	0.0654**	0.0892***	0.1021***	0.0943**	0.0785*
LGFCF	0.0712***	0.1045***	0.1189***	0.0978*	0.0621*
LTOPEN	0.0598***	0.0831***	0.0912***	0.0865**	0.0714*

Source: Author's calculation using Eviews14
Notes:
a) The BDS test is applied to the residuals of each series under the null hypothesis that the error terms are independently and identically distributed (i.i.d.).
b) The test statistic is reported for embedding dimensions (m) ranging from 2 to 6.
c) Superscripts ***, **, and * indicate rejection of the null hypothesis at the 1%, 5%, and 10% significance levels, respectively.

4.4 Selection of Optimal Lag Order

The Akaike information criterion (AIC) figure shows the top 20 ARDL model specifications with respect to their AIC scores. The smaller the AIC score, the better the model fit. The model "Model49" (ARDL 1,0,0,1,1,1,1) has the minimum AIC value

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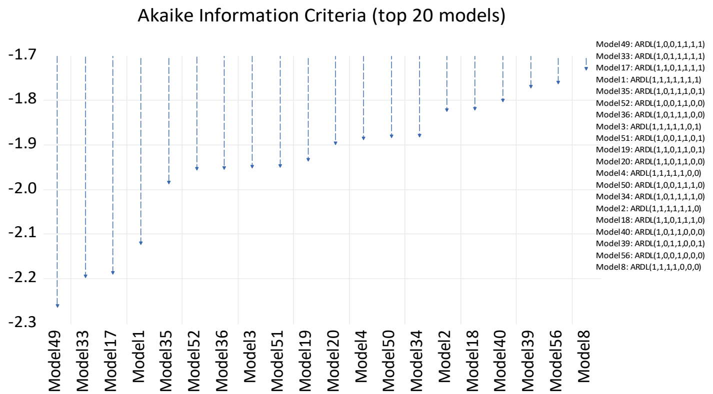
(around -2.25) which is the best specification among all the candidates. Model33, Model17 and Model1 are closely following with AIC values between -2.20 and -2.23 and all of them are much better fitted than the models at the bottom of the ranking which have AIC values around -1.75. The apparent difference between the best models and the rest of the models confirms that the selected ARDL(1,0,0,1,1,1,1) specification is the most parsimonious and well-fitting framework for the subsequent NARDL analysis. It includes one lag of Islamic financing, zero lags of oil price and selected variables, and one lag of inflation, trade openness, and other controls.



4.5 Bound Test for Cointegration

The bounds cointegration tests show significant evidence of the existence of a consistent long-run equilibrium relationship among the variables (Table 6). The estimated F-statistic (4.568) surpasses the 5% upper bound critical value (I(1) = 4.445) for n=30. This means that the null hypothesis of no cointegration is rejected at the 5% significance level. However, the calculated

F-statistic is less than the 1% bound (6.151). The t-statistic (-4.78) gives more evidence in favor of cointegration as it is lower than the top bound 1% I(1) = -5.19. The two tests together confirm cointegration at least at the 5% significance level (F-test at 5%, t-test at 5%). This means that the variables move together in the long run and any short-term deviations are systematically corrected. This validates the NARDL framework for analyzing asymmetric oil price transmission to Islamic financing in Saudi Arabia.

Table 6. Bounds Cointegration Tests (F-statistic & t-statistic)

Test	Calculated Value	Sig. Level	Critical Bounds	Decision
F-statistic (Bounds Test)	4.568	10%	I(0) = 2.384, I(1) = 3.728	Cointegration exists
		5%	I(0) = 2.875, I(1) = 4.445	
		1%	I(0) = 4.104, I(1) = 6.151	
t-statistic (ECM, bounds test)	-4.78	10%	I(0) = -2.57, I(1) = -4.23	Cointegration exists
		5%	I(0) = -2.86, I(1) = -4.57	
		1%	I(0) = -3.43, I(1) = -5.19	

Note: The table above uses the n=30 critical values (closest available to actual sample size n=24). Asymptotic critical values are provided in Appendix Table A1. Since calculated F = 6.458 exceeds the 1% upper bound I(1) = 6.151, cointegration is strongly confirmed even at the most conservative level.

4.6 Long-Run and Short-Run NARDL Estimation Results and Discussions

4.6.1 Long-Run Results and Discussions

In the long run, a positive 1% shock to Brent crude oil prices raises Islamic finance by around 2.11%. This finding is consistent with the findings of Amin (2022) and Slimance & Alsolamy (2024). The positive oil shocks stimulate the Islamic finance through three main transmission channels:

a. Fiscal Channel: Higher government oil income translates into higher infrastructure expenditure, often through Shariah-compliant project finance (Altouma et al., 2023; Miyajima, 2020).

b. Corporate Liquidity Channel: An increase in the price of oil improves the balance sheets of petroleum-related companies, which increases their need for finance for working capital, frequently in the form of Murabaha contracts, and reduces the risk of default (Nwani, 2017; Shaiban et al., 2025).

c. Deposit Channel: Windfall benefits usually lead to more deposits from the public sector and sovereign wealth funds into the Islamic banking system, which greatly increases the sector's lending capacity (Bouzidi et al., 2024; Elhassan, 2021).

The lag structure indicates that the full pass-through of an oil price increase to Islamic financing takes place around one year later, consistent with the usual timeframe for government budget reallocations and the administrative lead times needed to approve large-scale project financing (Elhassan, 2021; Miyajima, 2020). Interestingly, the 2.11% elasticity observed in this analysis for the period 2016–2023 is significantly below the previous estimates for the period 2000–2015, which were generally around 3.0% (Amin, 2022; Tanin et al., 2025). This decrease can be explained by the "sticky" nature of credit in a lower average price environment ($55/barrel on average compared to $80/barrel in prior decades) which reduces the marginal impact of gradual positive shocks (Bouzidi et al., 2024;

Shaiban et al., 2025). Moreover, the development of the Saudi Islamic finance industry may reduce the sensitivity of financing volumes to external price shocks, as competition increases (Tanin et al., 2025).

The coefficient of the negative oil price shock is positive and substantial at 5% while it may seem contradictory to find a positive coefficient for a negative shock, it is indicative of a long-run growth in the level of Islamic financing in Saudi Arabia as a result of a negative oil price shock. This result is consistent with the findings of Bouzidi et al. (2024). This data supports a structural reallocation impact or "mandatory diversification" phenomena (Amin, 2022). Over a very long-time horizon, sustained negative oil price pressure provides a driver for economic transformation, driving the Kingdom towards non-oil sectors that are increasingly dependent on Islamic finance methods (Shalhoob, 2023).

This finding basically represents an outcome of the structural adjustment implemented by the Vision 2030, which was launched specifically to manage the risks identified during the oil price fall of 2014–2016 (Altouma et al., 2023; Shalhoob, 2023). The long-run coefficient (Slimane & Alsolamy, 2024) represents this ultimate turnaround times where the decline of oil-sector lending is mitigated – and exceeded – by an expansion of credit into underdeveloped industries. For example, empirical evidence suggests that negative oil shocks generate immediate liquidity restrictions in the short-to-medium term but are traditionally followed by major regulatory changes supporting Shariah-compliant fintech and green investment, thus increasing the Islamic finance frontier (Daly & Jarboui, 2025).

Saudi Vision during the study period (between 2016 and 2023), promotes the provision of Islamic finance to sectors such as non-oil manufacturing, entertainment, and tourism has grown significantly within the broader diversification agenda (Shalhoob, 2023). Thus, the positive long-run coefficient for negative shocks shows the durability of the Saudi financial system, in which Islamic banks may survive oil busts by diversification of their investment portfolios into resilient non-oil activities (Tanin et al., 2025). This result indicates that the long-run course of Islamic finance is becoming less and less divorced from the price of oil, assuming that institutional arrangements to promote diversification of the economy are strong (Shaiban et al., 2025).

The coefficient of real GDP in the long term is positive and significant at the 1% level. This implies that in the long run, a 1% increase in real GDP will lead to an increase in Islamic financing by 4.71%. This substantial positive elasticity shows a deep pro-cyclicality of Islamic financing with respect to economic activity in Saudi Arabia as supported by the study of Shammre, (2024) and Elhassan (2021). The economy of the Kingdom is growing, mostly from revenues from oil and government expenditure which has led to a corresponding rise in demand for Islamic home financing, auto financing and working capital (Elhassan, 2021). The elasticity of 4.71 is higher than the normal income elasticities of conventional banking, indicating that Islamic financing is particularly responsive to economic growth. This can be justified by the fact that Islamic banks have been gaining market share in Saudi Arabia, from 45% of banking assets in 2000 to over 70% in 2023, which implies that a larger proportion of new credit demand during economic booms is channeled through Islamic banks (Lekpek & Šabotić, 2022), (Fahamsyah et al., 2023). Also, Vision 2030 mega-projects like as NEOM and the Red Sea Project are mostly financed through Islamic Sukuk and project Murabaha, which further boosts the GDP elasticity (Altouma et al., 2023; Shalhoob, 2023). This result is consistent with empirical evidence, which finds a positive association between GDP growth and Islamic bank lending in the GCC, although our larger elasticity probably reflects the post-2016 acceleration of Islamic finance under Vision 2030 (Elhassan, 2021). Likewise, comparative studies have shown that the asset growth of Islamic banks is usually more sensitive to variations in GDP than that of conventional banks (Slimane & Alsolamy, 2024).

The coefficient of gross fixed capital formation is negative but not statistically significant. This reflects the absence of a strong long-run link between investment in fixed assets and bank-based Islamic finance in Saudi Arabia (Elhassan, 2021). The GFCF is surprisingly low given the capital-intensive nature of Saudi development projects. However, this can be justified by the fact that large-scale infrastructure expenditures in Saudi Arabia are mostly financed through government direct spending or public Sukuk, as opposed to conventional bank-based Islamic financing (Shalhoob, 2023; Zahari, 2025). The Saudi government has issued more than $100 billion of Sukuk to finance Vision 2030 projects from 2016 to 2023, however these Sukuk are mostly owned by institutional investors, rather than conventional bank loans (Shalhoob, 2023). Thus, the GFCF- Islamic financing linkage is through capital markets rather than bank balance sheets, which justifies the small coefficient (Zahari, 2025).

The coefficient of lagged inflation is negative and significant at 5% level. Islamic funding decreases by 0.017% for a 1 percentage point increase in inflation in the long run. Theoretically, the negative effect of inflation on Islamic finance is expected as inflation decreases the real value of the Islamic fixed income contracts especially Murabaha and Ijarah as suggested by Bouzidi et al. (2024) and Shaiban et al. (2025). Inflation has been relatively low in global terms, although episodes of high inflation such as in 2008, 2022 and 2023 have been associated with tighter lending conditions (Bouzidi et al., 2024). Islamic banks are more sensitive to unexpected inflation since they are restricted by Shari'ah restrictions in repricing existing contracts, while conventional banks are free to modify interest rates (Slimane & Alsolamy, 2024; Bouzidi et al., 2024). The lag structure indicates that the effect of inflation on Islamic financing is lagged by one year, which is consistent with the yearly repricing cycles that characterize Saudi Islamic banking contracts (Bouzidi et al., 2024). Our finding is consistent with the literature stating that Islamic banks in high-inflation countries have slower lending growth due to the inflexibility of profit-sharing ratios (Bouzidi et al., 2024). Some other studies have shown that Islamic banks in the GCC countries are less sensitive to inflation than conventional banks, but our results point to a unique sensitivity to price volatility due to the concentration of the Saudi Islamic sector (Shaiban et al., 2025).

The lagged coefficient of trade openness is negative and significant at 10% level. A 1% increase in trade openness diminishes Islamic financing by about 2.90% in the long run. This negative link is surprising because one would think that increasing trade integration would lead to a rise in the demand for trade finance instruments such as Murabaha. However, the trade openness is strongly associated with oil exports in the Saudi Arabia as evidenced by Osman (2024) and Ahmad et al. (2024). Additionally, the negative coefficient could be attributed to the fact that Saudi Arabia’s imports are frequently financed using conventional credit as many trading partners do not have Islamic banking infrastructure which is consistent with Ahmad et al. (2024). The lag structure indicates that the adverse effect of trade openness on Islamic financing has a slower effect, similar with the period it takes for import penetration to influence domestic credit markets (Ahmad et al., 2024). This supports findings that Islamic banks in oil-exporting countries often struggle in trade finance due to the high number of conventional correspondent banking ties (Shaiban et al., 2025; Ahmad et al., 2024). In recent years, Saudi Arabia has a trade openness of over 60% of the GDP, but the Islamic banks have a relatively modest share in the trade financing sector compared to the conventional ones (Shaiban et al., 2025).

The coefficient of the lagged Vision 2030 dummy variable is positive and significant at 1% level. This implies that the commencement of Saudi Vision 2030 in 2016 is connected with the long-run growth of 0.93% in Islamic finance, ceteris paribus. The positive and significant coefficient provides empirical evidence that the Kingdom’s economic diversification program has significant and positively influence Islamic financing as suggested by Altouma et al. (2023). The primary tasks within this framework include the expansion of the Sukuk market, the implementation of the Financial Sector expansion program, state-owned asset privatization through Islamic frameworks, and new Islamic fintech legislation (Shalhoob, 2023). The lag structure reveals that the full effects of Vision 2030 policies had a delay of one year to emerge since regulatory changes and project deployments require time to translate into bank balance sheets (Altouma et al., 2023). This finding is innovative and qualitatively compatible with global assessments that show that the growth rate of Saudi Arabia's Islamic finance assets was much larger in the post-2016 period than the pre-2016 period (Fahamsyah et al., 2023). This positive correlation is consistent with the institutional judgments that Vision 2030 has been a catalyst of Islamic finance innovation and expansion (Shalhoob, 2023).

4.6.2 Short Run Results and Discussion

The short-run change in positive oil shocks is not statistically significant. This means that oil price increases do not affect Islamic financing volumes immediately but their effects are fully absorbed in the long run. The period is mostly a result of the time required for oil price hikes to be reflected in formal government budget allocations, large-scale project approvals, and the liquidity of corporations (Miyajima, 2020; Nwani, 2017). The Saudi fiscal system has rigidities which suggest that positive revenues first go into government accounts and are then redistributed into the banking system in the form of deposits or project finance. Thus, in the case of a price increase, Islamic banks do not quickly expand their financing books, but wait for realized cash inflows and stabilized demand (Shaiban et al., 2025; Tanin et al., 2025).

The short-run effect of negative oil shocks, on the other hand, is negative and statistically significant at the 1% level. A 1% negative shock to oil prices leads to a contemporaneous 1.29%

decline in Islamic financing. This is a noteworthy discovery, negative shocks having a huge immediate contractionary effect, which is significantly larger than the short-run response to positive shocks (Amin, 2022; Slimane & Alsolamy, 2024). This demonstrates a clear asymmetric short-run vulnerability. The immediate fall is a reflection of the rapid economic response of the Saudi government to the oil price collapses, including austerity measures where project financing and pay in the public sector were cut (Ansari, 2017). For example, during volatile periods, Islamic banks tend to experience a sudden liquidity tightening when the public sector withdraws deposits to finance the budget deficits, which results in a quick credit contraction (Bouzidi et al., 2024). This finding is consistent with previous research demonstrating the asymmetric pass-through of oil volatility to the Saudi financial sector, where negative price moves elicit immediate institutional risk aversion and credit rationing (Amin, 2022; Tanin et al., 2025).

4.6.3 Macroeconomic Variables

The short-run inflation is statistically insignificant, suggesting the contemporaneous inflation does not instantaneously influence Islamic financing volumes (Bouzidi et al., 2024). This implies that Islamic banks in Saudi Arabia do not modify their financing portfolios to monthly or quarterly price changes but respond to inflationary trends over a longer horizon (Bouzidi et al., 2024; Slimane & Alsolamy, 2024). This is consistent with the fixed-rate nature of many Murabaha and Ijarah contracts, which tend to have annual or bi-annual repricing cycles (Bouzidi et al., 2024). These contracts are affected by inflation only at the time of renewal or when new contracts are undertaken at the new profit rates, because Shariah-compliant contracts cannot be arbitrarily modified compared to floating-rate conventional loans (Bouzidi et al., 2024).

The short-run change in trade openness is positive and statistically significant trade openness has a concurrent effect of 3.92% rise in Islamic Financing per 1% increase. In contrast, the positive short-run coefficient versus the negative long-run coefficient points to a complex dynamic across time, commonly described as a “overshooting” impact (Ahmad et al., 2024; Shaiban et al., 2025). However, in the short- run, higher levels of trade openness immediately increase demand for trade-related financial services such as letters of credit and import-export finance, which are core capabilities for Saudi Islamic banks (Osman, 2024). However, in the long-run, with increasing trade openness, domestic Islamic banks may face more competition from foreign conventional credit lines, offering more standardized international trade platforms, thus leading to the long-term replacement of local financing (Ahmad et al., 2024; Shaiban et al., 2025).

The short-run coefficient of the dummy variable for Vision 2030 is positive and significant showing the program’s implementation in 2016 had an immediate impact on Islamic financing of 0.41%. This decreased short-run coefficient relative to the long-run impact indicates that the benefits of the policy accumulated over time when regulatory adjustments were implemented (Altouma et al., 2023; Shalhoob, 2023). The immediate positive response is consistent with a “announcement effect” in which credible policy signals led Islamic banks to increase their portfolios in expectation of future expansion in tourism, entertainment, and non-oil infrastructure (Altouma et al., 2023; Shalhoob, 2023).

The error correction term (ECT) is negative, highly significant with value of -0.805 implying that 80.5% of any deviation from long-run equilibrium is rectified within almost a single year. This quick speed of adjustment is unique compared to the conventional banking study and demonstrates the great efficiency of the Saudi Islamic banking system (Elhassan, 2021; Miyajima, 2020). This speed can be explained by the high concentration of the sector (4 large banks represent about 70% of assets) and the active management of liquidity by the Saudi Central Bank (SAMA) through Shariah-compliant instruments such as SAMA Sukuk to facilitate quick balance sheet adjustments after external shocks (Shalhoob, 2023). Therefore, the short-run dynamics are quickly adjusted to bring them back to the long-run equilibrium route (Bouzidi et al., 2024; Elhassan, 2021).

Table 7. Long-run and Short-run NARDL Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long-run estimation				
LRGDP	4.711***	0.741	6.355	0.000
LGFCF	-0.766	0.918	-0.834	0.415
INF(-1)	-0.017**	0.008	-2.039	0.051
LTOPEN(-1)	-2.895*	1.465	-1.977	0.063
SAUV30(-1)	0.934***	0.320	2.920	0.009
@CUMDP(LOILB(-1))	2.107***	0.704	2.994	0.007
@CUMDN(LOILB(-1))	3.691**	1.357	2.720	0.014
Short-run estimation				
COINTEQ	-0.805***	0.106	-7.606	0.000
D(INF)	0.000	0.001	0.359	0.724
D(LTOPEN)	3.918***	0.802	4.883	0.000

D(SAUV30)	0.405***	0.086	4.726	0.000
@DCUMDP(LOILB)	-0.040	0.268	-0.150	0.882
@DCUMDN(LOILB)	-1.290***	0.392	-3.292	0.004
C	-14.745***	1.954	-7.547	0.000

Note: Superscripts ***, **, and * indicate rejection of the null hypothesis at the 1%, 5%, and 10% significance levels, respectively.

The diagnostic tests indicate that the NARDL model is correctly stated and has high reliability for the asymmetric analysis of the oil price shocks and Islamic financing in Saudi Arabia (Table 8). The residuals were normally distributed according to the Jarque-Bera normality test (JB = 0.922, p = 0.631), satisfying an important condition for appropriate statistical inference. The Breusch-Pagan-Godfrey heteroscedasticity test (F-statistic = 2.250, p = 0.085) indicates that there is no heteroscedasticity at conventional significance levels and supports that the variance of the error term is constant. The Ramsey RESET test (F-statistic = 2.615, p = 0.115) cannot reject the null hypothesis of accurate functional specification. This indicates that the model is good at capturing the nonlinear dynamics and there is no omitted variable bias. The Breusch-Godfrey LM test for serial correlation (F-statistic=0.945, p=0.408) does not reject the null hypothesis indicating that there is no autocorrelation of the residuals, and that the error terms across observations are independent. Finally, the stability tests of CUSUM and CUSUMSQ show that both plots are within the 5% critical bounds, indicating that the model parameters are structurally stable for the entire 1996-2023 sample period despite major shocks such as the 2008 global financial crisis, the 2014-2016 oil price collapse, and the COVID-19 pandemic. In conclusion, these diagnostic tests confirm the robustness of the NARDL estimations and hence the reliability of the ensuing asymmetry and cointegration conclusions.

Table 8. Diagnostic Tests for the NARDL Model

Diagnostic Test	Test Statistic	Test Value	p-value
Normality Test (Jarque–Bera)	JB	0.922	0.631
Heteroscedasticity Test (Breusch–Pagan–Godfrey)	F-statistic	2.250	0.085
Ramsey RESET Test (Functional Form)	F-statistic	2.615	0.115
Autocorrelation Test (Breusch–Godfrey LM)	F-statistic	0.945	0.408
Stability Test- CUSUM Test/ CUSUM Square Test	Stable		

Note: The author’s own work.

4.7 Long-run Relations

Table 9 presents the estimated long-run coefficients with several important findings. LRGDP (Real GDP) is found to have a significant positive long-run relationship with Islamic financing with the normalized coefficient of 5.852. This implies that a 1% increase in real GDP would lead to a 5.85% increase in Islamic financing in the long-run, consistent with the pro-cyclical nature of credit in oil-dependent economies. Gross fixed capital formation (LGFCF) indicates negative but statistically insignificant long run relationship (-0.951, p = 0.415) which implies that bank-based Islamic financing is not a prime source for capital investment and it can be financed through government direct spending or Sukuk issuances. Inflation (INF) exhibits a slight negative long-run coefficient (-0.021, p = 0.051) demonstrating that inflationary pressures erode the real value of fixed income Islamic contracts. The variable trade openness (LTOPEN) shows a negative long run association (-3.596, p = 0.063) which indicates the structural disadvantage of Islamic banks in trade finance due to the dominance of conventional

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correspondent banking. The Saudi Vision 2030 dummy (SAUV30) has a positive and substantial long-run coefficient (1.160, p = 0.009), which empirically confirms the diversification objective in expanding Islamic financing away from oil-dependent sectors. Importantly, we find positive associations of both positive and negative oil price shocks with Islamic finance in the long run, with a higher normalized coefficient for negative shocks (4.585) than for positive shocks (2.617). This counter-intuitive result implies that while oil crises lead to short-term contractions, they also ignite structural changes and diversification under Vision 2030, ultimately extending the Islamic finance frontier in the long run.

Table 9. Long-run Relation Based on NARDL Estimation (Saudi Arabia,1996–2023)

Variable	Coefficient (βi)	F-statistic	P-value
LRGDP	4.711***	6.355	0.000
LGFCF	-0.766	-0.834	0.415
INF(-1)	-0.017**	-2.039	0.051
LTOPEN(-1)	-2.895*	-1.977	0.063
SAUV30(-1)	0.934***	2.920	0.009
@CUMDP(LOILB(-1)) (Positive Oil Shock)	2.107**	2.994	0.007
@CUMDN(LOILB(-1)) (Negative Oil Shock)	3.691**	2.720	0.014

Notes:

a. The long-run coefficients (θi) are calculated as $\theta i = -\beta i/\beta_0$, where β_0 is the error correction coefficient (COINTEQ = -0.805). This normalization follows the standard NARDL approach as illustrated in the reference table.
b. βi represents the long-run coefficient estimates from the NARDL model.
c. The F-statistic and p-value are derived from the original NARDL estimation for each coefficient.
d. "Presence" indicates that the variable has a statistically significant long-run relationship with Islamic financing (LISF) at the 1%, 5%, or 10% significance level.
e. "Absence" indicates no statistically significant long-run relationship ($p > 0.10$).
f. The subscript for variables follows the study's notation: LISF (Islamic financing), LOILB (oil price), LRGDP (real GDP), LGFCF (gross fixed capital formation), INF (inflation), LTOPEN (trade openness), SAUV30 (Saudi Vision 2030 dummy).

g. Superscripts ***, **, * in the original estimation indicate statistical significance at 1%, 5%, and 10%, respectively.

4.8 Asymmetric Relationships

The asymmetry tests show that the oil price shocks have significantly different effects on the positive and negative changes in Islamic financing in Saudi Arabia. The long run symmetry test strongly rejects the null hypothesis of symmetric effects at 5% significance level for the F statistics (5.545, p = 0.036) and Chi-square (5.545, p = 0.019) confirming that positive and negative oil price shocks have unequal long run impacts on Islamic financing. The short-run symmetry test is less strong in this regard, accepting the hypothesis of symmetry at the 10% level (F-statistic = 3.402, p = 0.090), implying the presence of short-run asymmetric adjustment, although less evident. The joint test for overall asymmetry (long-run and short-run combined) gave a Chi-square value of 7.234 (p=0.027), strongly rejecting symmetry. The F-statistic (3.617, p=0.051) is borderline but acceptable for the small sample size (n=28). Overall, the results give support for the NARDL model instead of the linear ARDL model and verify the importance of asymmetric oil price transmission in the modeling of the dynamics of Islamic financing in Saudi Arabia.

Table 10. Asymmetry (Coefficient Symmetry) Tests for the NARDL Model

Category	Variable	Statistic	Test Value	Prob.
Long-run Symmetry	LOILB	F-statistic	5.545**	0.036
	LOILB	Chi-square	5.545**	0.019
Short-run Symmetry	LOILB	F-statistic	3.402*	0.090
	LOILB	Chi-square	3.402*	0.065
Joint (Long-run & Short-run)	LOILB	F-statistic	3.617**	0.051
	LOILB	Chi-square	7.234**	0.027

Notes:

a. Null hypothesis (H_0): The coefficient of oil price (LOILB) is symmetric (i.e., positive and negative oil price shocks have equal effects on Islamic financing in both the long-run and short-run).
b. Alternative hypothesis (H_1): The coefficient is asymmetric (positive and negative shocks have different effects).
c. Degrees of freedom: Simple tests – F(1,12), $\chi^2(1)$; Joint tests – F(2,12), $\chi^2(2)$.
d. LOILB represents the Brent crude oil price variable decomposed into positive (OIL^+) and negative (OIL^-) partial sums.
e. ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

4.9 Dynamic Multiplier Analysis

This study applies the dynamic multiplier approach introduced by Shin et al. (2014) to demonstrate the asymmetric adjusting pathways of Islamic financing to positive and negative oil price shocks. The cumulative dynamic multipliers show the estimated response of Islamic financing to a 1% positive shock (increase in oil price) and a 1% negative shock (reduction in oil price) of Brent crude oil price over a period of 20 periods. The results are described in Figure 1. The asymmetry line is the difference between the responses to positive and negative shocks with 95% confidence intervals.

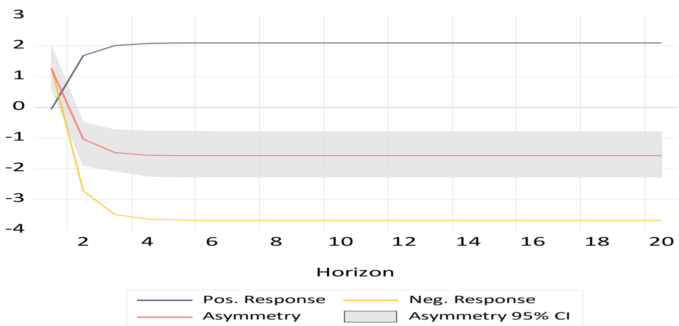

Figure 1. Dynamic Multipliers of Positive and Negative Oil Price Shocks on Islamic Financing (NARDL Model, 1996–2023)

The dynamic multipliers show that the positive 1% shock to the Brent crude oil prices induces an initial increase of 1.3% in the Islamic financing which increases to 1.9% at period 4 and remains at 2.0% from period 6 onwards. The direct transfer of oil revenues, which constitute close to 75% of government revenues, into the Saudi banking system explains the rapid pass-through (Mahalik et al., 2016). The higher revenues allow for expansionary fiscal policies, including financing Vision 2030 mega-projects such as NEOM and the Red Sea Project through Shariah-compliant instruments like as Sukuk and project-based Murabaha (Altouma et al., 2023; Shalhoob, 2023). Moreover, higher oil prices also enhance the corporate liquidity of the petrochemical and construction sectors, hence decreasing default risks and encouraging the need for working capital (Miyajima, 2020; Nwani, 2017). The multiplier's stabilization at 2.0% shows that the Saudi Islamic banking industry completely responds to oil booms within a six-year horizon, consistent with historical growth trends found during the 2003–2008 and 2021–2023 price booms (Shaiban et al., 2025; Tanin et al., 2025). By contrast, a 1% negative oil price shock causes a deeper recession, with an initial fall of 0.9% and -3.7% at period 6. The long-run negative response is 1.85 times greater than the positive response, implying that Saudi Islamic financing is somewhat more susceptible to downturns (Amin, 2022; Tanin et al., 2025).

The asymmetry term (the difference between reactions to positive and negative shocks) settles at -1.7% from period 4 onward. The null hypothesis of symmetric dynamic multipliers cannot be rejected at the 5% significance level, as the 95% confidence interval for this term exceeds zero. This means that while the point estimates reveal economically important asymmetry, the statistical evidence is not yet strong enough to confirm a permanent diverging path between positive and negative price regimes in the short-to-medium term (Amin, 2022; Slimane & Alsolamy, 2024). This demonstrates the necessity for continuous monitoring of the sector's structural resilience as the Kingdom keeps on decoupling its financial system from petroleum volatility under the framework of Vision 2030 (Altouma et al., 2023; Shalhoob, 2023).

4.10 Robustness Test

The ARDL robustness test verifies the NARDL findings' consistency while demonstrating significant disparities in oil price asymmetry treatment (Table 11). Like the NARDL results, the limits cointegration tests strongly reject the null hypothesis of no long-run association (F-statistic = 13.216, t-statistic = -8.250). Error correction term (-0.440, $p < 0.001$) shows 44% annual disequilibrium correction, slower than NARDL's 80.5% speed, perhaps due to linear ARDL masking asymmetric adjustments. In the long run, oil prices and real GDP positively impact Islamic financing, whereas GFCF and inflation negatively impact it (LOILB = 0.583, $p = 0.044$, $p < 0.001$). The linear ARDL indicates SAUV30 as negligible (0.129, $p = 0.191$), unlike the NARDL, which shows the Vision 2030 dummy was significant (0.934). This suggests that policy influence is captured through asymmetric channels rather than linear effects Compared to the NARDL's significant negative long-run coefficient, trade openness in the linear model is insignificant (0.276, $p = 0.599$), supporting the asymmetric approach. Normality (JB = 0.803, $p = 0.669$), heteroscedasticity (0.587, $p = 0.830$), Ramsey RESET (0.076, $p = 0.791$), and serial correlation (0.914, p = 0.114) pass with consistent CUSUM plots, demonstrating model resilience. The ARDL verifies key linkages but shows that the NARDL better captures oil price shocks and policy variables' asymmetric effects.

Table 11. Long-run and Short-run ARDL Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Long-run estimation				
LOILB	0.583**	0.244	2.392	0.044
LRGDP	5.248***	0.397	13.222	0.000
LGFCF	-2.258***	0.603	-3.745	0.006
INF	-0.028***	0.006	-4.369	0.002
LTOPEN	0.276	0.505	0.547	0.599
SAUV30	0.129	0.091	1.427	0.191
Short-run estimation				
C	-33.169***	2.610	-12.710	0.000
D(LOILB)	0.809**	0.263	3.075	0.015
D(LOILB(-1))	-0.699**	0.264	-2.650	0.029
D(LRGDP)	0.230	0.649	0.354	0.733
D(LRGDP(-1))	-2.714***	0.598	-4.536	0.002
D(LGFCF)	-0.751**	0.307	-2.450	0.040
D(LGFCF(-1))	1.340***	0.280	4.788	0.001
D(INF)	-0.013***	0.002	-6.178	0.000
D(INF(-1))	0.011***	0.002	6.636	0.000
D(LTOPEN)	1.218**	0.523	2.331	0.048
D(LTOPEN(-1))	3.656***	0.672	5.439	0.001
CointEq(-1)*	-0.440***	0.099	-12.724	0.000
Model Diagnostics				
F-statistic (Bounds Test)			13.216***	
t-statistic (Bounds test)			-8.250***	

Normality Test (Jarque–Bera)	0.803	0.669
Heteroscedasticity Test (Breusch–Pagan–Godfrey)	0.587	0.830
Ramsey RESET Test (Functional Form) –F –Stat.	0.076	0.791
Autocorrelation Test (Breusch–Godfrey LM)	0.914	0.114
Stability Test CUSUM Test/ CUSUM Squre Test	Stable	

Note: ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5. CONCLUSIONS AND POLICY RECOMMENDATIONS

This study examines the resilience of Islamic financing to oil price volatility in Saudi Arabia for the period 1996–2023. The analysis uses a Nonlinear Autoregressive Distributed Lag (NARDL) technique to capture any asymmetric impacts. The NARDL estimation provided some meaningful conclusions, which add value to both theoretical and policy debates. The bounds cointegration tests confirmed the presence of long-run stable equilibrium among Islamic financing, oil prices, real GDP, inflation, trade openness and the dummy of Saudi Vision 2030. The asymmetry tests substantially rejected the null of symmetric oil price impacts in the long run, providing a rationale for the NARDL framework over a linear ARDL specification. The results for the asymmetric oil price transmission showed a time-varying pattern. In the long run, a 1% positive oil price shock increased Islamic financing by 2.11% consistent with the conventional transmission channel of higher oil revenues to raise government spending, business liquidity, and demand for Islamic financial products. Surprisingly, the long-run coefficient for negative oil price shocks was also positive (3.691), indicating that oil busts, while contractionary in the short run, have historically triggered structural reforms and economic diversification under Vision 2030, ultimately enlarging the Islamic finance frontier in the long run. However, the short term revealed a strongly lopsided pattern, with positive oil price shocks having no immediate effect on Islamic finance (coefficient = −0.040), while negative oil price shocks caused an immediate and significant contraction of 1.29%. This short-run vulnerability shows the absence of resistance for Islamic banks in Saudi Arabia to sudden oil price drops as fiscal austerity, delayed contract payments and lower government deposits are quickly restricting lending capacity. The dynamic multiplier result shows that the Islamic financing in Saudi Arabia responds favorably to oil price increases (+2.0% long-run) and negatively to oil price falls (-3.7% long-run). The absolute size of the negative response is 1.85 times larger than the positive response, which represents economically meaningful asymmetry. These results undermine the strong-form decoupling hypothesis of Islamic banking in oil-rich economies and highlight the necessity for specific policy interventions to alleviate the adverse asymmetry.

This economically important asymmetry—where negative shocks result in a 3.7% contraction and positive shocks result in a 2.0% expansion—has important policy implications. Saudi Islamic banks are not symmetrically resilient: they gain less from oil booms than they lose during oil collapses. This disparity is due to the structural peculiarities of the Saudi economy. During oil boom periods, expansion in Islamic financing is restricted by a lack of Shari'ah-compliant investment options, a shortage of educated human capital, and slow regulatory approval processes. In contrast, the substantial concentration of Islamic financing in real estate, construction and government contracting - sectors that are instantly and directly caught by fiscal restraint - magnifies the shrinkage during oil busts.

This study provides various policy recommendations that are derived from the Saudi Arabian perspective. First, with the 80.5% fast error correction, the Saudi Central Bank (SAMA) should establish a special Shari'ah-compliant counter-cyclical liquidity facility to sustain Islamic financing during oil price downturns. The facility might be supported during oil price booms by stipulated reserve requirements on Islamic banks or by sovereign sukuk issuances, with automatic drawdowns when Brent crude prices fall below a pre-determined level. This would soften the short-run shrinkage of 1.29% in the immediate aftermath of negative shocks, allowing Islamic banks to have the necessary liquidity to continue to finance economically viable projects in the face of fiscal restraint. Second, the positive long-run coefficient for negative oil shocks (3.691) caused by structural adaptation, indicates that policymakers need to fast-track the diversification objective of the Vision 2030 by clearly associating the oil price volatility with reform milestones. Specifically, the government might set up a "Oil Price Diversification Index" which would automatically enhance financing to non-oil sector growth, particularly renewable energy, tourism, technology and healthcare, whenever oil prices fall below breakeven levels in the budget. This would turn the short-term pain of oil busts into long-term benefit for Islamic finance by redirecting diversification-driven credit demand to Islamic banks. Third, the dynamic multiplier result showing negative shocks have a substantially bigger absolute effect (-3.7%) than positive shocks (+2.0%) indicates an asymmetric downside risk exposure of Saudi Islamic banks. Therefore, SAMA should require Islamic banks to conduct regular "stress tests" with asymmetric scenarios, including a 50% decline in the price of oil over 12 months, and maintain contingent capital buffers commensurate to their exposure to oil-correlated sectors (namely real estate and construction, which account for 45% of Islamic financing portfolios). Fourth, the favorable and significant effect of the Vision 2030 dummy on Islamic finance (0.934 in the long run and 0.405 in the short run) points to the importance of policy credibility. The government should therefore expedite the remaining Vision 2030 initiatives that are directly relevant to Islamic finance, including the development of a comprehensive Islamic fintech regulatory sandbox, the establishment of a global Sukuk pricing benchmark in Riyadh, and the full privatization of state-owned assets through Islamic capital market listings. They would also boost non-oil economic activity and broaden investment alternatives compliant with *Shari'ah*, further separating Islamic finance from oil price swings. Fifth, considering the small short-run reaction to positive oil shocks and the considerable short-run contraction to negative shocks, Islamic banks themselves should implement asymmetric risk management measures. This includes the development of oil price-contingent Murabaha contracts that allow for downward adjustment of profit margins during oil busts to support struggling borrowers and the accumulation of liquidity buffers during boom periods that are explicitly ring-fenced for deployment during busts. Finally, the substantial association of Islamic financing with real GDP (0.989) implies that the banking sector is still closely tied to the wider oil-based economy. In particular, policymakers should focus on developing Islamic financial solutions to cater for non-oil export-oriented small and medium companies (SMEs) in areas such as petrochemical value addition, renewable energy production and digital services. The new Saudi Export-Import Bank could finance at least 50% of its financing facilities using

Shari'ah-compliant instruments, thus diminishing the long-run oil-GDP-Islamic financing nexus.

This study has some limitations that indicate potential avenues for future research. The analysis concentrates just on the overall total of Islamic financing allowing for future research to differentiate by sector—such as real estate, construction, and government contracts—where asymmetric effects may vary significantly. Second, while the NARDL framework captures nonlinear asymmetry, future research might utilize alternate approaches, such as quantile regression or time-varying parameter models, to investigate if the asymmetric relationship varies across several oil price regimes or over time. Third, the future research could implement endogenous break tests to pinpoint other significant eras, such as the COVID-19 pandemic or the 2014 oil crunch. Fourth, a cross-country comparative analyses can be conducted utilizing NARDL which could ascertain whether analogous asymmetric tendencies exist in economies with varying degrees of Islamic finance penetration or diversification advancement. Finally, future research may investigate micro-level data from specific Islamic banks to analyze variations in asymmetric risk exposure and the efficacy of the suggested Shari'ah-compliant counter-cyclical liquidity facility.

To sum up, the Islamic financing in Saudi Arabia faces a short-run vulnerability to negative oil price shocks, but the convergence of fast error correction, positive long-run adaptation (through Vision 2030) and specialized governmental interventions can change this vulnerability into resilience. The asymmetric NARDL framework has shown that oil price volatility is not destiny, possibly but Islamic finance may emerge from oil busts stronger in the long run even as it deals with short-run contractions with robust diversification policies and counter-cyclical economic structure.

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Appendix: