IJEEP
INTERNATIONAL JOURNAL OF ENERGY ECONOMICS AND POLICY
EJ EconJournals
ISSN: 2146-4553

International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2024, 14(6), 641-650.

EJ EconJournals

Investment Amid Uncertainty: Exchange Rates and Oil Price Dynamics in Saudi Arabia

Noura Abu Asab*

Department of Business Economics, School of Business, The University of Jordan, Amman, Jordan. *Email: n.abuasab@ju.edu.jo

Received: 13 July 2024 **Accepted:** 21 October 2024 **DOI:** https://doi.org/10.32479/ijeep.17315

ABSTRACT

This study examines the impact of real effective exchange rates and oil price on private investment in Saudi Arabia, focusing on the role of economic uncertainty in this dynamic relationship. Using quarterly data from 2007 to 2022, this research applies the ARDL, error correction model, and nonlinear ARDL, to capture both short- and long-term effects. GARCH and EGARCH models assess the conditional variance, serving as indicators of economic uncertainty. The analysis reveals that oil prices and real effective exchange rates significantly enhance private investment in the long run, whereas exchange rate uncertainty proves to be negligible. Conversely, short-term volatility in oil prices has a pronounced negative effect. Notably, EGARCH findings indicate that positive exchange rate shocks induce greater subsequent conditional variance than negative shocks, while oil price shocks remain symmetric. The nonlinear ARDL model further shows that favorable exchange rate changes and elevated oil prices stimulate investment, highlighting the resilience of Saudi Arabia's investment landscape. This research fills a critical gap by illustrating how the country's fixed exchange rate system and oil production capacity mitigate external uncertainties, offering valuable insights for policymakers seeking to bolster economic stability in similar contexts.

Keywords: Investment, Oil Price Uncertainty, Uncertainty, Exchange Rate, ARDL Modelling
JEL Classifications: C32, E22, E58, F31, F41, Q43

1. INTRODUCTION

In today's interconnected global economy, external uncertainties such as fluctuating exchange rates and volatile oil prices are critical factors influencing macroeconomic performance. These uncertainties are particularly impactful in oil-dependent economies like Saudi Arabia, where the dynamics of exchange rates and oil prices play a key role in shaping economic outcomes. The ability of private investors to navigate these uncertain market conditions is crucial for maintaining stable economic growth and fostering domestic investment.

International macroeconomics and finance have long emphasized the challenges posed by these uncertainties. For instance, market uncertainty can lead to unpredictable investment costs and profitability, complicating investment decisions for firms (Obstfeld and Rogoff, 1998; Suh and Yang, 2021). Such uncertainty can distort pricing strategies and consumer behavior, ultimately affecting domestic consumption and economic growth (Oseni, 2016). Real exchange rate uncertainty can create ambiguity about future inflation levels, potentially reducing consumer demand and negatively impacting the traded goods sector (Iyke and Ho, 2017; Sugiharti et al., 2020). This issue is especially pressing in emerging economies, where imported capital investments are vulnerable to exchange rate fluctuations (Servén, 2002; Ejaz et al., 2021; Khan and Ahmed, 2024).

The relationship between exchange rate uncertainty and investment decisions is nuanced and may depend on the reversibility of investment projects. Neoclassical models propose that increased uncertainty could stimulate investment when decisions are reversible, as uncertainty might enhance the expected profitability of capital (Hartman, 1972; Caballero, 1991; Abel, 1983; Shaoping, 2008). However, in scenarios where investments are irreversible, uncertainty tends to have a negative impact, discouraging new investment projects (Dixit and Pindyck, 1994). Although some studies have reported neutral or positive effects, empirical evidence generally points to negative consequences of uncertainty on investment that persist over time (Goldberg, 1993; Soleymani and Akbari, 2011).

Oil price volatility further complicates the investment landscape, especially for countries with significant energy-intensive industries. Rising oil prices can increase production costs and inflation rates, often due to the depreciation of exchange rates (Cao et al., 2020). The impact of oil prices varies asymmetrically, depending on whether a country is an oil exporter or importer (Loungani, 1986; Shin et al., 2018; Altunöz, 2022; Mandal and Datta, 2024). For Saudi Arabia, as an oil-exporting country, understanding these dynamics is essential for developing effective economic policies.

This study investigates the relationship between external uncertainties and domestic investment in Saudi Arabia, focusing on the interplay between exchange rates, oil prices, and investment spending under a fixed exchange rate regime. The primary aim is to fill gaps in the existing literature, which has predominantly focused on the impact of uncertainties on foreign direct investment, neglecting the influence of external uncertainties on aggregate domestic private investments. Previous research has often emphasized the role of oil prices and exchange rates in shaping economic growth and output levels, overlooking their effects on private investment within a soft-pegged exchange rate system.[1] Additionally, there has been limited exploration of how adopting currency pegs can mitigate the effects of monetary and real uncertainties on investment expenditure.[2] This study addresses these gaps, focusing on a Gulf State, which are frequently overlooked despite their substantial oil reserves and rapidly developing economies. By providing an analysis of how oil prices and real effective exchange rate uncertainties influence private investment, this research offers valuable insights for policymakers aiming to enhance the investment climate in oil-exporting countries. The findings underscore the importance of stable macroeconomic policies.

The remainder of this paper is organized as follows: The second section presents the theoretical foundation and literature review, the third section describes the methodology utilized, the fourth section provides the results, and the fifth section concludes the paper with key findings and policy recommendations.

1. The riyal has been pegged to the dollar since 1986 at a rate of SAR 3.75/$.
2. Despite ongoing efforts to diversify its economy, oil has continued to contribute approximately 40% of Saudi Arabia's real GDP in recent years, down from nearly 45% a decade earlier. According to an IMF report on Saudi Arabia (Arabia, 2022), as part of Vision 2030, the Saudi authorities have implemented extensive fiscal reforms over the last few years to improve fiscal management and reduce reliance on oil. These reforms have included non-oil revenue mobilization, particularly the introduction and subsequent raising of VAT rates and revenue administration reforms; energy price reforms, although gasoline prices were capped in the middle of 2021; a move toward a Treasury Single Account; more systematic fiscal risk assessment; improved budget disclosure; and strengthened debt management.

2. LITERATURE REVIEW AND THEORETICAL BACKGROUND

The relationship between market uncertainty and investment spending decisions is a crucial area of research in international macroeconomics and finance, especially in the context of oil-exporting nations like Saudi Arabia. In such economies, uncertainties in exchange rates and oil prices can profoundly influence economic activity and investment environment. Classical investment theories, including those developed by Hartman (1972) and Abel (1983), suggest that the effects of uncertainty on investment can vary depending on the nature of the investments and the characteristics of the firms involved. They argued that, under certain conditions, uncertainty could lead risk-averse firms to increase their investment. Specifically, they proposed that when the marginal product of capital has a convex relationship to prices, an increase in price uncertainty, can raise the expected return on a marginal unit of capital, making investment more enticing (Carruth et al., 2000). However, these theories assume that investment decisions are made with certainty, neglecting important factors like irreversibility and the option to delay investments (Pindyck, 1986). Uncertainty in real exchange rates can create uncertain conditions for investment decisions, causing investors to delay investments to gain more information about real exchange rates (Pindyck, 1986).

In this context, firms may choose to delay investment as a viable strategy, waiting for more better conditions before taking decisions. The model developed by Dixit and Pindyck (1994) emphasizes the option value of investment, highlighting that making an irreversible investment prematurely forfeits the opportunity to invest when better information becomes available. This perspective is crucial for understanding investment behavior under uncertainty and underscores the complex dynamics that firms navigate in uncertain environments (Darby et al., 1999).

Exchange rate uncertainty is a significant factor affecting investment decisions, particularly in economies heavily engaged in international trade and oil exports. Real exchange rate volatility can create uncertain conditions that lead investors to delay or alter investment plans (Dixit and Pindyck, 1994). Research by Davis and Byrne (2003) and Servén (2003) indicates that exchange rate uncertainty negatively impacts investment, as firms perceive investment akin to a financial option, where the decision is deferred until economic conditions stabilize. This relationship is further supported by empirical studies such as those by De Vita and Abbott (2004) and Banik and Roy (2021), who demonstrate the adverse effects of exchange rate volatility on trade flows and exports in the United States and SAARC, respectively. In the context of Saudi Arabia, exchange rate uncertainty is particularly relevant given the country's fixed exchange rate regime pegged to the US dollar.

A significant body of literature has examined the impact of exchange rate uncertainty on investment in various contexts. Nickell (1977) and Craine (1989) demonstrated that increased uncertainty could lead to reduced investment by risk-averse firms. Cartea and Jaimungal (2017) extended this understanding by showing that volatility could deter investment activities, emphasizing the role of uncertainty in shaping economic decisions. Other studies, such as Greenwald et al. (1984), Ferderer (1993), Jin and Zhung (2019), and De Silva et al. (2023), suggest that credit rationing also increases with high uncertainty. Erdal (2012) theoretically showed that real exchange rate uncertainty decreases investment spending in both import-oriented and export-competitive businesses. By employing option pricing techniques, the study uncovers the suppressive effects of real exchange rate uncertainty on investment spending. In addition, a study by Pradhan et al. (2004) examined the relationship between private investment and real exchange rate uncertainty in several Southeast Asian countries using a GARCH-based measure of uncertainty. Their findings indicate that the significance and direction of this relationship varied across the countries analyzed. However, much of literature does not adequately address the specific context of oil-exporting nations like Saudi Arabia, where fixed exchange rate regimes may help mitigate some of these adverse effects.

Recent research has also highlighted the nonlinear relationship between investment and uncertainty, characterized by threshold effects (Sakar, 2000). Initially, as uncertainty increases, investment risk rises, but eventually decreases after a certain threshold is reached. That is, once reaching a certain threshold, the relationship turns negative, forming an inverted U-shaped curve (Clausen, 2008). Studies by Servén (2003) and Harchaoui et al. (2005) support this nonlinear dynamic, challenging classical linear investment criteria and suggesting that, if irreversibility exists, the relationship between investments and other fundamentals should be detected using appropriate empirical representations (Carruth et al., 2000). Additionally, the selection of an exchange rate regime is crucial in shaping investment decisions. Aizenman (1992) argued that fixed exchange rate systems could be more conducive to foreign direct investment due to reduced uncertainty and greater expected profitability. This is supported by Davis and Byrne (2003), who find that investment is negatively impacted by short-term exchange rate volatility. This regime provides a measure of stability, yet the economy remains vulnerable to fluctuations in oil prices, which can indirectly influence real exchange rates and investment decisions.

Indeed, oil price fluctuations introduce additional layers of uncertainty, impacting production costs and business planning alike (Cao et al., 2020). Kamin and Rogers (2000) demonstrated that an increase in oil prices causes the exchange rate to depreciate by driving up domestic prices, leading to higher input costs. However, the effects differ for oil-exporting and oil-importing countries. For example, Abid and Alotaibi (2020) found a significant positive relationship between oil prices and Saudi Arabia's GDP. In contrast, rising oil prices can negatively affect private investment in oil-importing countries (Mallick et al., 2018; Sun et al., 2022) but tend to have positive outcomes in oil-exporting nations (Mensi et al., 2018).

Therefore, in oil-exporting countries, such as Saudi Arabia, rising oil prices generally enhance government revenues and economic growth. However, the uncertainty associated with oil prices can discourage private investment by increasing the unpredictability of upcoming returns. Studies by Loungani (1986) and Elder and Serletis (2010) highlight the asymmetric impacts of oil price changes on economic performance, depending on whether a country is an oil exporter or importer. Elder and Serletis (2010)'findings reveal that investment, durable consumption, and total production have been adversely affected by the volatilities of oil prices, as evidenced by a significant negative correlation. Yoon and Ratti (2011) investigated the impact of energy price uncertainty on firm-level investments in the United States and found that increased energy price volatility, as indicated by the GARCH conditional variance, dampens the elasticities of investments to sales growth. This decline in investment confidence underscores the importance of stable energy prices in promoting investment.

However, there is a lack of focused research on how a fixed exchange rate regime interacts with oil price and exchange rate uncertainties to affect investment in oil-dependent economies. In addition, despite the extensive research on oil price impacts, there is a notable scarcity of studies examining how these uncertainties specifically affect domestic private investment in oil-exporting countries, highlighting a significant research gap.

Some studies have explored the implications of exchange rate and oil price uncertainties separately within the context of Saudi Arabia. Recent research by Ejaz et al. (2021) examined a panel dataset of 34 developing countries, including Saudi Arabia, from 1978 to 2015. They utilized GARCH models to assess exchange rate volatility, finding that such volatilities negatively impact both foreign direct investment and foreign portfolio investments. This suggests that exchange rate volatility creates uncertainty for foreign capital investments in developing countries, emphasizing the need for stable economic policies to attract investment. This finding aligns with the work of Suh and Yang (2021), who investigated the impact of exchange rate volatility on investment in emerging markets. They pointed out that uncertainty can disrupt pricing strategies and influence consumption and investment decisions. They stressed the importance of managing exchange rate fluctuations to maintain a stable investment environment, particularly in oil-dependent economies like Saudi Arabia. Abid and Alotaibi (2020) examined the influence of rising oil prices on private investment and whether government investment in oil-rich countries crowds in or crowds out private investment. The researchers used an ARDL model to test for the presence of a long-run relationship between private investment and its drivers, including domestic investment, private sector credit, economic growth, oil price, and gross saving. The primary findings indicate that public spending has a negative impact on private investment, while crude oil prices have a considerable and favorable effect on private investment. It could be argued that oil price uncertainty and exchange rate uncertainty are significant determinants of investment (Cherkasova and Piankova, 2019). Despite the wealth of research on investment under uncertainty, several gaps persist in understanding these dynamics within the context of Saudi Arabia's unique economic environment as there is a need for research tailored to the specific economic conditions of oil-exporting countries like Saudi Arabia, which operate under fixed exchange rate regimes. Existing studies frequently generalize the effects of exchange rate and oil price uncertainties, failing to address the unique vulnerabilities and opportunities inherent in these economies.

The interplay between exchange rate regimes and investment decisions in oil-exporting countries is not well-documented. Investigating how fixed exchange rate systems can mitigate the effects of monetary and real uncertainties offers valuable insights for policymakers.

This study aims to address these gaps by examining the interplay between exchange rate and oil price uncertainties on private investment in Saudi Arabia.

3. METHODOLOGY

3.1. Data Collection

The data used in this study comprises quarterly observations of the real effective exchange rate, oil prices, and private investment in Saudi Arabia. The time span of the data is from Q1 2007 to Q2 2022. Data sources include the Central Bank of Saudi Arabia, the FRED database by the Federal Reserve Bank of St. Louis, and the IMF international financial databases. The choice of quarterly data helps in capturing the dynamic nature of the variables under consideration.

3.2. Stationary of Variables

To assess the stationarity of the variables, we employed Dickey and Fuller (1979) (ADF) and Phillips and Perron (1988) (PP) tests, with and without a trend, respectively. In addition, we utilized the Zivot and Andrews (2002) (ZA) test, which allows the detection of structural breakpoints.

3.3. GARCH and EGARCH Models

To model the uncertainty of the real effective exchange rate and oil prices, we employ GARCH and EGARCH (Exponential GARCH) models. These models capture the conditional variances of the series, providing insights into the uncertainties associated with exchange rate and oil prices.

In fact, most studies show that exchange rate uncertainty follows the GARCH model (McKenzie, 1999). Exchange rate and oil price uncertainty were calculated by estimating the GARCH (1,1) model. The model provides an estimation of the time-varying variance of the residuals, which estimates the uncertainties of the exchange rate and oil price. The specifications for the exchange rate and oil price can be represented as follows:

- The mean equation:

$$REER_t = \phi_0 + \sum_{j=1}^{p} \beta_j REER_{t-i} + \varepsilon_t \qquad (1)$$

$$OIL_t = \phi_0 + \sum_{j=1}^{p} \beta_j OIL_{t-i} + \varepsilon_t$$

- The variance equation:

$$\sigma_t = \delta + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-1}^2 + \sum_{j=1}^{q} \beta_j \sigma_{t-j} \qquad (2)$$

Where $REER_{t-i}$ and OIL_{t-i} are lagged log effective exchange rate and lagged log crude oil price, respectively, and ε_t represents the error term, with unconditional mean of zero and a conditional variance of σ_t. However, it's important to note that the conditional variance of REER and OIL, as estimated by the GARCH model, reflects only the magnitude of shocks, and does not capture the direction of innovations. Thus, to account for asymmetric responses to positive and negative shocks, the EGARCH is employed.

This can be expressed as follows:

$$\log \sigma_t^2 = \varphi + \beta_1 z_{t-1} + \beta_2 z_{t-1} + \beta_3 \log u_{t-1}^2 \qquad (3)$$

Where z_{t-1} is $\frac{\varepsilon_{t-1}}{\sigma_{t-1}}$. A significantly negative β_2 suggests that a negative shock amplifies uncertainties more than an equivalent positive shock.

Monthly data on the real effective exchange rate (REER) and oil price covering the period from January 2004 to June 2022, extracted from the Fred database, were used to estimate the conditional variance of REER and OIL. The quarterized conditional variances of REER and oil prices were calculated as proxies for exchange rate uncertainty and oil price uncertainty, respectively.

3.4. Autoregressive Distributed Lag Model

The ARDL model is utilized to capture both short- and long-term dynamics in the relationship between private investment and the independent variables (real effective exchange rate and oil prices).

The ARDL bounds testing approach is used to determine the presence of long-term relationships among the variables. This involves testing whether the variables in the ARDL model are cointegrated, implying a long-term equilibrium relationship.

The ARDL bound-testing approach developed by Pesaran et al. (2001) was employed to assess whether variables were integrated in the long run. This approach is effective in finite samples and eliminates the need to test the variables for unit roots, thereby avoiding testing bias (Iyke and Ho, 2017). This makes it an accurate method, even when the variables are fractionally integrated or have a mixed order of integration.

The following model integrating short-term and long-run dynamics can be derived as follows:

$$\Delta y_t = c_0 + c_1 t + \pi_y y_{t-1} + \pi_x x_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta y_{t-i} + \sum_{j=1}^{q-1} \delta_j \Delta x_{t-j} + \gamma \Delta x_t + \varepsilon_t \qquad (4)$$

Where c_0 is a constant component, and π_y and π_x are the long-run coefficient matrices for y_{t-1} and x_{t-1}, respectively. Is captured by Δy_{t-i} and Δx_{t-j}, which sets up to ensure the residuals, ε_t, are white noise errors.

The limits of the test were established using two adjusted critical values. If the F-statistic exceeds the upper critical value, a long-term relationship is assumed to exist. Conversely, if the F-statistic falls below the lower critical value, the null hypothesis of no cointegration cannot be rejected. The test is considered inconclusive if the F-statistic falls within the specified boundaries. According to Banerjee et al. (1998), a negative and statistically significant Error Correction Term (ECT) can be used to demonstrate the long-term relationship between variables. The domestic investment functions are expressed as follows:

$$GCF_t = f(REER_t, REERunc_t, OIL_t, OILunc_t) \quad (5)$$

$$GCF_t = f(REER_t, REERunc_t, OIL_t, OILunc_t, PEXP_t) \quad (6)$$

The variables used in this analysis include GCF, which represents the log of the nominal general fixed capital formation; REER, which is the log of the real broad effective exchange rate and is used to measure a country's global competitiveness; REERunc, which is the conditional variance of the real effective exchange rate; OIL, which is the log of crude Brent oil in Saudi riyals per barrel deflated by the consumer price index; and PEXP, which represents the log of nominal general government final consumption expenditure. The REER data were obtained from the International Monetary Fund's International Financial Statistics, and the remaining data were extracted from the FRED database by the Federal Reserve Bank of St. Louis, covering the quarterly period from Q1 2007 to Q2 2022. The start date of the sample period is determined by the availability of data for most variables. The data for GCF and PEXP are in domestic currency and log form and were seasonally adjusted using the Hodrick-Prescott filter.

3.5. Nonlinear ARDL (NARDL) Model

The NARDL model extends the ARDL framework to capture potential asymmetries in the relationships between the variables. This model accommodates the possibility that positive and negative changes in the independent variables may have differing effects on the dependent variable. This can be expressed as follows:

$$posREER_t = \sum\nolimits_{s=1}^{t} REER_s^{+} = \sum\nolimits_{s=1}^{T} \max\left(REER_s, 0\right) \quad (7)$$

$$negREER_t = \sum\nolimits_{s=1}^{t} REER_s^{-} = \sum\nolimits_{s=1}^{T} \min\left(REER_s, 0\right) \quad (8)$$

$$posOIL_t = \sum\nolimits_{s=1}^{t} OIL_s^{+} = \sum\nolimits_{s=1}^{T} \max\left(OIL_s, 0\right) \quad (9)$$

$$negOIL_t = \sum\nolimits_{s=1}^{t} OIL_s^{-} = \sum\nolimits_{s=1}^{T} \min\left(OIL_s, 0\right) \quad (10)$$

4. RESULTS

Stationarity was tested using the ADF and PP tests before examining the cointegration relationship between the variables. The ZA test was employed to verify the robustness of the unit root test results in the presence of structural breaks and the test model (c) was utilized. The structural breaks for domestic investment, REER, REERunc, oil, OILunc, and PEXP were identified for the period under examination, specifically in 2019:04, 2014:04, 2009:04, 2014:04, 2011:02, and 2011:03, respectively. The structural break for domestic investment is quite recent, as evidenced by the implementation of the new strategy for private investment attraction, as well as the initiation of Saudi Vision 2030 and the Neom megaproject (The Arab Gulf States Institute in Washington by Robert Mogielnicki, 2019). The ADF unit root test results indicate that all variables except REER and OIL are stationary at level. The PP test shows that GCF and PEXP are integrated of order one, with a constant and trend for the latter. Moreover, the ZA test confirms that GCF and PEXP are nonstationary at level, while the other variables are I(0) with a break. The tests provided mixed results regarding the stationarity of the variables considered.

To determine the uncertainties associated with the exchange rate and crude oil price, an ARMA model was employed based on the Akaike and Schwarz information criteria and the Q-statistics of Box George et al. (1976). The use of autoregressive terms results in the most parsimonious model specifications. Consequently, benchmark mean specifications were established using the chosen AR procedure as follows:

REER: $REER_t = \gamma_0 + \gamma_1 REER_{t-1} + \gamma_2 REER_{t-2} + \gamma_3 REER_{t-7} + \gamma_4 REER_{t-10} + u_t$

OIL: $OIL_t = \gamma_0 + \gamma_1 OIL_{t-1} + \gamma_2 OIL_{t-2} + u_t$

The Breusch-Godfrey test for serial correlation was performed prior to the ARCH effects test to confirm that the residuals were white noise. As presented in Table 1, the residuals of REER and OIL were found to be serially independent and conditionally heteroscedastic.

Table 1 displays the benchmark specifications of the mean equations and presents the best model specification results. The conditional variance is correctly specified, as evidenced by the GARCH results in Table 2, with a positive and statistically significant mean at the 1% level of significance. The lagged square residuals and conditional variance are both non-negative, and their sum is less than one, indicating that uncertainty shocks persist. No evidence of ARCH effects was found in the data. Notably, the conditional variance of oil prices surpasses that of REER, which may be attributed to an unparalleled increase in oil prices over the past 15 years. As revealed by the EGARCH uncertainty estimates reported in Table 2, positive shocks to the exchange rate exhibit higher conditional variance in the subsequent period than negative shocks, whereas shocks to oil prices are indifferent.

After analyzing the unit root tests presented in Table 3, it is evident that the variables exhibit a mixed integration pattern, specifically, I(0) and I(1). Thus, the ARDL bound-testing approach is an appropriate method for examining the dynamic relationships between these variables.

Table 1: OLS estimates of REER and OIL conditional mean

Coefficients	REER	OIL
γ0	120.228***	297.285***
	(28.42)	(35.976)
γ1	1.205***	1.367***
	(0.067)	(0.062)
γ2	0.201***	−0.408***
	(0.075)	(0.062)
γ7	−0.104**	
	(0.043)	
γ10	0.094***	
	(0.033)	
ARCH (1)	9.536***	3.615*
ARCH (4)	2.787***	5.981***
Breusch-Godfrey LM	0.428	0.307

***,**,* Significance is denoted at the 1%, 5%, and 10% levels, respectively. The t-statistics are provided in the Breusch-Godfrey LM test data, where the null hypothesis states that there is no autocorrelation up to the specified lag order (p). Engle's ARCH effect test, a Lagrange multiplier test, has a null hypothesis that assumes homoscedasticity

Table 2: Conditional mean and conditional variance for uncertainties

Coefficient Conditional mean	REER GARCH	OIL GARCH	REER EGARCH	OIL EGARCH
γ0	1143.659	321.165***	307.315	375.930***
			(3699.55)	(66.635)
γ1	1.153	1.178***	0.894***	1.239***
			(0.083)	(0.082)
γ2	−0.134	−0215**	0.134	−0.268***
			(0.087)	(0.081)
γ7	−0.146		0.145***	
			(0.048)	
γ10	0.126***		0.116***	
			(0.036)	
Conditional variance				
ϕ	0.145	142.650***	0.123	1.278**
			(0.080)	(0.576)
α1	0.106***	0.421***		
β1	0.794***	0.309**	0.277**	0.633***
			(0.123)	(0.209)
B2			0.145**	0.066
			(0.066)	(0.112)
B3			0.727***	0.705***
			(0151)	(0.096)
Diagnostic test				
ARCH (1)	0. 660	0.353	1.066	0.310
ARCH (4)	0.653	0.862	0.364	1.092

***,**, and * represent significance at the 1%, 5%, and 10% levels, respectively

To investigate the long-run dynamic influence of REER, OIL, and their uncertainties on domestic private investments, two models were developed, and the best-performing models were selected. To eliminate insignificant determinants, we employed backward regression, which necessitates adopting a general-to-specific model-building approach to minimize the bias induced by missing variables (Hendry, 1995). We endeavored to incorporate various elements that, according to theoretical concepts, can influence domestic investments. Specifically, we utilized proxies such as the cost of capital, the real interest rate, credit to the non-financial private sector, and the log of seasonally adjusted GDP, which were sourced from the Central Bank of Saudi Arabia and Fred. While accelerator theories of investment assert that output plays a crucial role in determining investment, our findings indicate that it is statistically insignificant in all models. Moreover, as previously discussed in the literature review section, Abid and Alotaibi (2020) found that the effects of the growth rate and interest rate on investment were not statistically significant in their study on Saudi Arabia.

Thus, the selected parsimonious models are as follows:

$$\Delta GCF_t = \beta_0 + \beta_2 GCF_{t-1} + \beta_3 REER_{t-1} + \beta_4 REERunc_{t-1} + \beta_5 oil_{t-1} + \beta_6 oilunc_{t-1} + \beta_{t-1} PEXP_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta GCF_{t-i} + \sum_{j=1}^{q-1} \delta_j \Delta REER_{t-j} + \sum_{j=1}^{q-1} \delta_j \Delta REERunc_{t-j} + \sum_{j=1}^{q-1} \delta_j \Delta OIL_{t-j} + \sum_{j=1}^{q-1} \delta_j \Delta OILunc_{t-j} + \mu_t \quad (11)$$

$$\Delta GCF_t = \beta_0 + \beta_2 GCF_{t-1} + \beta_3 REER_{t-1} + \beta_4 REERunc_{t-1} + \beta_5 oil_{t-1} + \beta_6 oilunc_{t-1} + \beta_{t-1} PEXP_{t-1} + \sum_{i=1}^{p-1} \varphi_i \Delta GCF_{t-i} + \sum_{j=1}^{q-1} \delta_j \Delta REER_{t-j} + \sum_{j=1}^{q-1} \delta_j \Delta REERunc_{t-j} + \sum_{j=1}^{q-1} \delta_j \Delta OIL_{t-j} + \sum_{j=1}^{q-1} \delta_j \Delta OILunc_{t-j} + \sum_{j=1}^{q-1} \delta_j \Delta PEXP_{t-j} + \mu_t \quad (12)$$

The Akaike information criterion was used to determine the optimal lag length in Models 1 and 2. As indicated in equations (11) and (12), the best possible model for Model 1 is ARDL (4, 3, 0, 2, 3), and for Model 2, it is ARDL (4, 2, 0, 2, 2, 2). The findings are presented in Tables 4 and 5, which shows the short- and long-term results.

The results reveal that the ECT is both negative and statistically significant, indicating that the feedback mechanism is highly effective, although slow, in stabilizing investment imbalances in the country. An examination of the cointegration test statistics shows that the computed value of the F-statistic is greater than the critical value of the upper limit. The ARDL approach confirms the long-term relationship between the variables in equations (11) and (12), as shown in Tables 4 and 5, respectively. The F-statistic was greater than the upper-bound critical value at 1%, indicating the presence of cointegration and convergence, and the calculated error correction term was negative and statistically significant.

Model 2 evaluates the long- and short-term impacts of the real effective exchange rate, oil price uncertainty, and government expenditure on domestic investment in Saudi Arabia. According to the data presented in Table 6, there is a statistically significant and positive nexus between private investment and REER in both long- and short-term models. However, this relationship is only weakly significant and has a relatively small magnitude in the short run. This positive long-term relationship between REER and investment may be attributed to the pegged exchange rate system, in which a strong Saudi Riyal reduces import prices and keeps inflation low (Alkhareif and Qualls, 2016). Conversely, REERunc appears to have a small impact in both models, which may be due to the current monetary regime.

Table 3: Unit root tests

Variable	ADF		PP		ZA	
	Constant	Constant and trend	Constant	Constant and trend	t-statistic	Break
GCF	−4.163**	−4.953***	−3.637***	−2.636	−4.448	2019:04
REER	−1.736	−2.996	−1.365	−2.203	−4.066***	2014:04
REERunc	−5.968***	−5.917***	−5.854***	−5.798***	−6.866***	2009:04
Oil	−1.562	−3.001	−1.662	−2.685	−3.920***	2014:04
Oilunc	−4.899***	−4.825**	−4.921***	−4.811**	−6.024**	2011:02
PEXP	−2.59*	−3.283*	−6.938***	−2.110	−4.615*	2011:03

At the 1%, 5%, and 10% levels of significance, the asterisks ***, **, * signal rejection of the null hypothesis, that is, the presence of a unit root for the ADF and PP tests and a unit root with no break for the ZA test. Findings at first difference-not reported for all tests reveal that none of the variables are I (2)

Table 4: ARDL Bound test for model 1

Model 1	Lower bound	Upper bound
1%	3.07	4.44
5%	2.26	3.48
10%	1.90	3.01
F-statistic	7.672	K=4

The decision is made as follows: if the F-statistic exceeds the upper bound, cointegration is present; if it falls between the bounds, the conclusion is inconclusive; and if it is below the lower bound, there is no cointegration

Table 5: ARDL bound test for model 2

Model 2	Lower Bound	Upper Bound
1%	3.06	4.15
5%	2.39	3.38
10%	2.08	3.00
F-statistic	7.413	K=5

The decision is made as follows: if the F-statistic exceeds the upper bound, cointegration is present; if it falls between the bounds, the conclusion is inconclusive; and if it is below the lower bound, there is no cointegration

Table 6: Results of short and long-term ARDL model

Dependent variable: GCF		
Variables	Model 1	Model 2
Long-term		
REER	1.630***	0.343**
REERunc	0.007	0.001
Oil	0.297***	0.025
Oilunc	−4.5E-05**	−0.001*
PEXP		0.660***
Short-term		
ΔREER	−0.001*	−0.001*
ΔOIL	−0.001**	−4.01E-5**
ΔOILunc	−9.38E-08**	−0.0901**
ΔPEXP		0.005***
ECT	−0.002***	−0.004***
R^2	0.989	0.998
DW	2.20	1.91
F-statistic	418335.7***	139505.1***
Diagnostic tests		
Test	F-statistic	
Hetero	0.850	0.734
RAMSET	0.654	2.599
Serial	0.849	0.630

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. The RESET test examines the null hypothesis of correct model specification. The significance of the F-statistic reflects the joint significance of the coefficients of the lagged levels, representing the long-run coefficient. The RESET test's null hypothesis asserts that the model has the correct functional specification

In addition, the impact of oil prices on domestic investment in the short run is negligible but negative, as indicated by estimation equations (11) and (12), as shown in Table 6. However, the results from equation (11) suggest that a 1% increase in the oil price has a considerable and positive long-run effect on private investment, leading to a 30% increase. This could be attributed to the increase in global crude oil prices during the analyzed period, which boosts investor confidence in the Saudi economy and results in increased capital investment and production demand. Other studies conducted in Saudi Arabia have yielded similar results (Abid and Alotaibi, 2020; Mensi et al., 2018; Jawadi and Ftiti, 2019). However, the uncertainty of oil prices has a detrimental impact on domestic investment, with the most significant negative effect observed in Model 2, where a 1% increase in short-term uncertainty resulted in a 9% negative impact on domestic investment.

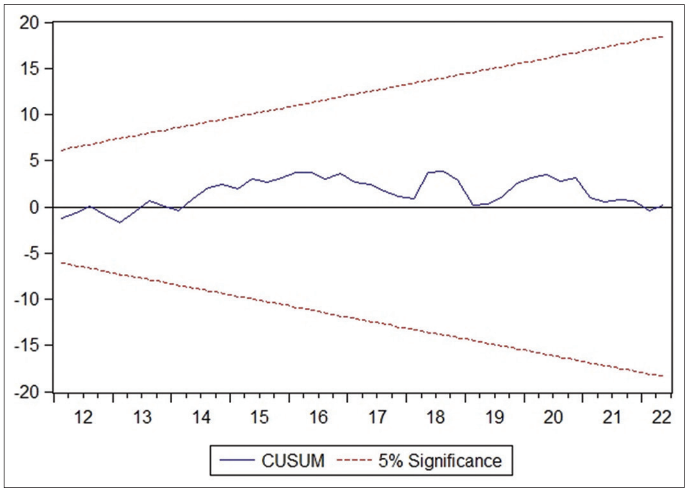
When the model is expanded to include government consumption to analyze the crowding-out effect, long-term findings indicate that a 1% increase in public expenditure leads to a 66% increase in private investment in Saudi Arabia. The positive crowding-in effect of private investment on public investment has been demonstrated in Saudi Arabia. These results contradict those of Alotaibi and Abid and Alotaibi (2020), who examined a different period.

We conducted a variety of diagnostic tests, including the Lagrange Multiplier (LM) test, Breusch-Pagan-Godfrey Test for Heteroskedasticity, Ramsey's Regression Equation Specification Error Test (RESET), and CUSUM test. As shown in the bottom portion of Table 6, our investment model displays structural stability, lacks autocorrelation and heteroskedasticity, and is not functionally misspecified. Additionally, as depicted in Figures 1 and 2, the CUSUM test demonstrates that the cumulative sum is entirely stable, as the statistic of the recursive residuals of the cumulative sum falls within the critical lines. Consequently, we conclude that our estimated private investment ARDL models are stable.

Furthermore, this study investigates the nonlinear impact of the real exchange rate and oil price on investment spending. The Nonlinear ARDL (NARDL) model is constructed as follows:

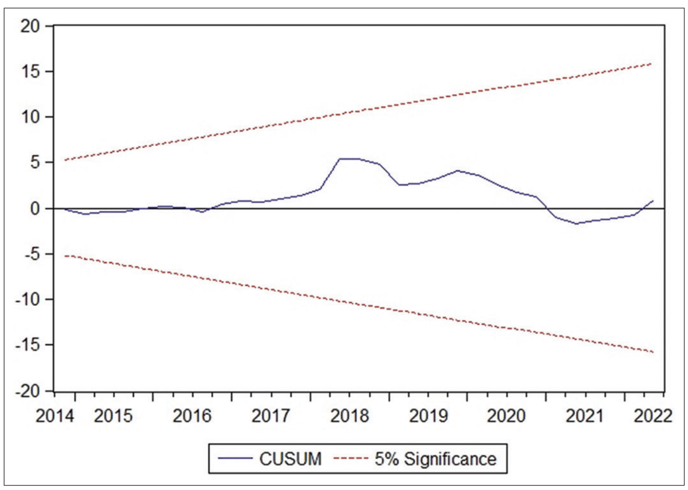
$$\Delta GCF_t = \beta_1 + \beta_2 GCF_{t-1} + \beta_3^{+} REER_{t-1} + \beta_4^{-} REER_{t-1} + \beta_5 REERunc_{t-1} \beta_6^{+} OIL_{t-1} + \beta_7^{-} OIL_{t-1} + \beta_8 oilunc_{t-1} + \sum_{i=1}^{p-1} \varphi_i \text{Ä}GCF_{t-i} \sum_{j=1}^{q-1} \delta_j \Delta REERunc_{t-j} + \sum_{j=1}^{q-1} \delta_j^{+} \Delta REER_{t-j} + \sum_{j=1}^{q-1} \delta_j^{-} \Delta REER_{t-j} + \sum_{j=1}^{q-1} \delta_j \Delta OILunc_{t-j} + \sum_{j=1}^{q-1} \delta_j^{+} \Delta OIL_{t-j} + \sum_{j=1}^{q-1} \delta_j^{-} \Delta OIL_{t-j} + \mu_t \quad (13)$$

Figure 1: CUSUM for model 1



The CUSUM test is based on the residual sum. This sum is plotted against 5% critical lines, which serve as a benchmark for stability. If the resulting curve deviates outside the critical zone defined by these two lines, it suggests that the model parameters are unstable, indicating potential changes in the underlying data or model misspecification

Figure 2: CUSUM for model 2



The CUSUM test is based on the residual sum. This sum is plotted against 5% critical lines, which serve as a benchmark for stability. If the resulting curve deviates outside the critical zone defined by these two lines, it suggests that the model parameters are unstable, indicating potential changes in the underlying data or model misspecification

$$\Delta GCF_t = \beta_1 + \beta_2 GCF_{t-1} + \beta_3^{+} REER_{t-1} + \beta_4^{-} REER_{t-1}$$
$$+\beta_5 REERunc_{t-1} + +\beta_6^{+} OIL_{t-1} + \beta_7^{-} OIL_{t-1} + \beta_8 oilunc_{t-1}$$
$$+\sum_{i=1}^{p-1} \varphi_i \ddot{A}GCF_{t-i} + \sum_{j=1}^{q-1} \delta_j \Delta REERunc_{t-j} + \sum_{j=1}^{q-1} \delta_j^{+}$$
$$\Delta REER_{t-j} + \sum_{j=1}^{q-1} \delta_j^{-} \Delta REER_{t-j} + \sum_{j=1}^{q-1} \delta_j \Delta OILunc_{t-j}$$
$$+\sum_{j=1}^{q-1} \delta_j^{+} \Delta OIL_{t-j} + \sum_{j=1}^{q-1} \delta_j^{-} \Delta OIL_{t-j} + \sum_{j=1}^{q-1} \delta_j PEXP_{t-1} + \mu_t \quad (14)$$

Table 7: Results of long-term NARDL model

Dependent variable: GCF		
Variable	Model 1	Model 2
	ARDL (4,2,0,2,2,0,0,2)	ARDL (4,2,0,2,2,2,0)
	Long-term	
REER_pos	0.792**	0.147
REER_neg	0.744**	0.315***
REERunc	0.012*	0.001
Oil_pos	0.231***	0.088**
Oil_neg	0.060	−0.063***
Oilunc	−2.06E-05***	−4.77E-06
PEXP		0.546***
MODEL 1	**Lower Bound**	**Upper Bound**
1%	2.88	3.99
5%	2.27	3.28
10%	1.99	2.94
F-statistic	6.76	K=6
MODEL 2	**Lower Bound**	**Upper Bound**
1%	2.73	3.90
5%	2.17	3.21
10%	1.92	2.89
F-statistic	7.496	K=7

Where δ_j^{+} and δ_j^{-} are the asymmetric distributed lag parameters.

The NARDL results presented in Table 7 suggest that real exchange rate appreciation has a positive effect on investment or is not significantly related, whereas depreciation appears to have a positive impact in both models. Additionally, an oil price decline seems to have a negative or minimal positive impact on investment. It is worth noting that higher oil prices tend to stimulate more investment, as demonstrated by the two NARDL models. Furthermore, similar to the linear results, uncertainty in oil prices does not appear to have a significant negative impact on domestic investment, whereas uncertainty in exchange rates appears to have no effect on investment. The NARDL method confirmed the long-term relationship between the variables, as indicated by the F-statistic exceeding the upper-bound critical value of 1% in Table 7, indicating that the variables were cointegrated.

5. CONCLUSION

This study investigates the impact of the real effective exchange rate, oil prices, and their uncertainties on private investment in Saudi Arabia from Q1 2007 to Q4 2022. GARCH and EGARCH models were used to gauge conditional variance as a measure of uncertainty. The outcomes of the unit root tests were inconsistent, leading to the development of two ARDL-based models that illustrate the short- and long-term dynamics. The ARDL bound test confirmed a long-term relationship between the variables in both models, with a negative and significant error correction term.

The long-term outcomes indicate that an appreciation in the real effective exchange rate has a positive effect on private investment, whereas an increase in oil prices raises investment levels. However, oil uncertainty negatively impacts private investment in the long run, while the uncertainty of the real effective exchange rate does not affect private investment. Given that Saudi Arabia maintains a fixed exchange rate, the real effective exchange rate appears to have a positive and significant impact on investment in the long run, while this effect is negative and weak in sign and magnitude in the short run.

The impact of government spending on investment appears to be substantial and positive, with a significant long-term crowd-in effect observed. Furthermore, the findings suggest that a pegged exchange rate system can mitigate the risk of uncertainty, and contrary to popular belief, an increase in oil prices can boost investment in this oil-exporting country. However, oil price uncertainty negatively affects investment in both the short and long run, with the negative effect being more pronounced in Model 2 in the short term.

When using the NARDL model, the results indicate that real exchange rate appreciation has either a negligible or positive effect on investment, whereas depreciation appears to have a positive impact in both models. Additionally, oil price declines seem to have a negative or marginally unfavorable impact on investment. Both NARDL models suggest that positive oil prices are conducive to investment in Saudi Arabia, consistent with other studies; however, interestingly, oil price uncertainty does not seem to impact domestic investments.

The models exhibit the absence of autocorrelation and heteroskedasticity and are not functionally misspecified. The analysis suggests that increased oil prices could enhance investors' confidence, underscoring the significance for policymakers in formulating and implementing strategies to reduce dependence on oil while preserving the favorable influence of the prevailing monetary system on exchange rate pass-through.

This study provides valuable insights into the impact of the real effective exchange rate, oil prices, and their uncertainties on private investment in Saudi Arabia. The results highlight the importance of maintaining a stable exchange rate and managing oil price volatility to foster a conducive investment environment. Additionally, the significant positive effect of government spending on private investment underscores the role of fiscal policy in stimulating economic growth. However, this study has some limitations. First, the use of aggregate data may obscure sector-specific dynamics and variations in investment behavior. Second, the study period encompasses significant economic events such as the global financial crisis and the COVID-19 pandemic, which may have influenced the results.

REFERENCES

Abel, A.B. (1983), Optimal investment under uncertainty. The American Economic Review, 73(1), 228-233.

Abel, A.B. (1984), Effects of uncertainty on investment and expected long-run capital stock. Journal of Economic Dynamics and Control, 7(1), 39-53.

Abid, M., Alotaibi, M.N. (2020), Crude oil price and private sector of Saudi Arabia: Do globalization and financial development matter? New evidence from combined cointegration test. Resources Policy, 69, 101774.

Aizenman, J. (1992), Exchange rate flexibility, volatility, and domestic and foreign direct investment. IMF Staff Papers, 39(4), 890-922.

Alkhareif, R.M., Qualls, J.H. (2016), Saudi Arabia's Exchange Rate Policy: Its Impact on Historical Economic Performance. SAMA Working Paper No. 16/4. Riyadh, Saudi Arabia: Saudi Arabia Monetary Agency.

Altunöz, U. (2022), The nonlinear and asymetric pass-through effect of crude oil prices on inflation. OPEC Energy Review, 46(1), 31-46.

Arabia, F. (2022), Fiscal Rules in Saudi. The Need for a Fiscal Anchor and Potential Fiscal Rules in Saudi Arabia, the IMF.

Banerjee, A., Dolado, J., Mestre, R. (1998), Error-correction mechanism tests for cointegration in a single-equation framework. Journal of Time Series Analysis, 19(3), 267-283.

Banik, B., Roy, C.K. (2021), Effect of exchange rate uncertainty on bilateral trade performance in SAARC countries: A gravity model analysis. International Trade, Politics and Development, 5(1), 32-50.

Box George, E.P., Jenkins Gwilym, M., Reinsel Gregory, C., Ljung Greta, M. (1976), Time Series Analysis: Forecasting and Control. San Francisco: Holden Bay.

Cao, H., Guo, L., Zhang, L. (2020), Does oil price uncertainty affect renewable energy firms' investment? Evidence from listed firms in China. Finance Research Letters, 33, 101205.

Carruth, A., Dickerson, A., Henley, A. (2000), What do we know about investment under uncertainty? Journal of Economic Surveys, 14(2), 119-154.

Cartea, A., Jaimungal, S. (2017), Irreversible investments and ambiguity aversion. International Journal of Theoretical and Applied Finance, 20(07), 1750044.

Cherkasova, V.A., Piankova, Y.M. (2019), Macro-drivers and over-investment of Russian companies. St Petersburg University Journal of Economic Studies, 35(4), 658-681.

Clausen, B. (2008), Real Effective Exchange Rate Uncertainty, Threshold Effects, and Aggregate Investment: Evidence from Latin American Countries. IWP Discussion Paper No. 2008/2.

Craine, R. (1989), Risky business: The allocation of capital. Journal of Monetary Economics, 23(2), 201-218.

Darby, J., Hallett, A.H., Ireland, J., Piscitelli, L. (1999), The impact of exchange rate uncertainty on the level of investment. The Economic Journal, 109(454), 55-67.

Davis, E.P., Byrne, J. (2003), Panel Estimation of the Impact of Exchange Rate Uncertainty on Investment in the Major Industrial Countries. National Institute of Economic and Social Research. Discussion Paper No. 208.

De Silva, A., Duong, H.N., Nguyen, M., Nguyen, Y.N. (2023), Bank risk in uncertain times: Do credit rationing and revenue diversification matter? Journal of Business Finance and Accounting, 50(7-8), 1240-1273.

De Vita, G., Abbott, A. (2004), Real exchange rate volatility and US exports: An ARDL bounds testing approach. Economic Issues, 9(1), 69-78.

Dickey, D.A., Fuller, W.A. (1979), Distribution of the estimators for autoregressive time series with a unit root. Journal of the American Statistical Association, 74, 427-431.

Dixit, A., Pindyck, R. (1994), Investment Under Uncertainty. Princeton: Princeton University Press.

Ejaz, M., Shahzad, M., Khan, R.E.A. (2021), Exchange rate volatility and capital inflows in developing economies. Asian Development Policy Review, 9(1), 24-32.

Elder, J., Serletis, A. (2010), Oil price uncertainty. Journal of Money, Credit and Banking, 42(6), 1137-1159.

Erdal, B. (2012), Investment decisions under real exchange rate uncertainty. Central Bank Review, 1(1), 25-47.

Ferderer, J.P. (1993), The impact of uncertainty on aggregate investment spending: An empirical analysis. Journal of Money, Credit and Banking, 25(1), 30-48.

Goldberg, L.S. (1993), Exchange rates and investment in United States industry. Review of Economics and Statistics 75, 575-589.

Greenwald, B.C., Stiglitz, J.E., Weiss, A. (1984), Informational Imperfections in the Capital Market and Macro-economic Fluctuations. NBER Working Papers No. 1335. National Bureau of Economic Research.

Harchaoui, T., Tarkhani, F., Yuen, T. (2005), The Effects of the Exchange Rate on Investment: Evidence from Canadian Manufacturing Industries Staff Working Papers No. 2005-22. Bank of Canada.

Hartman, R. (1972), The effects of price and cost uncertainty on investment. Journal of Economic Theory, 5(2), 258-266.

Hendry, D.F. (1995), Dynamic Econometrics. United Kingdom: Oxford University Press on Demand.

Iyke, N.B., Ho, S.Y. (2017), Exchange rate uncertainty and domestic investment in Ghana. Cogent Economics and Finance, 5(1), 1362157.

Jawadi, F., Ftiti, Z. (2019), Oil price collapse and challenges to economic transformation of Saudi Arabia: A time-series analysis. Energy Economics, 80, 12-19.

Jin, Y., Zhang, S. (2019), Credit rationing in small and micro enterprises: A theoretical analysis. Sustainability, 11(5), 1330.

Kamin, S.B., Rogers, J.H. (2000), Output and the real exchange rate in developing countries: An application to Mexico. Journal of Development Economics, 61(1), 85-109.

Khan, M.M., Ahmed, A. (2024), The effects of exchange rate fluctuation on Bangladeshi exports: An ARDL bound testing technique. International Journal of Economics and Financial Issues, 14(3), 125-131.

Loungani, P. (1986), Oil price shocks and the dispersion hypothesis. The Review of Economics and Statistics, 1986, 536-539.

Mallick, H., Mahalik, M.K., Sahoo, M. (2018), Is crude oil price detrimental to domestic private investment for an emerging economy? The role of public sector investment and financial sector development in an era of globalization. Energy Economics, 69, 307-324.

Mandal, K., Datta, R.P. (2024), Oil price dynamics and sectoral indices in India - Pre, post and during COVID pandemic: A comparative evidence from wavelet-based causality and NARDL. International Journal of Economics and Financial Issues, 14(4), 18-33.

McKenzie, M.D. (1999), The impact of exchange rate volatility on international trade flows. Journal of Economic Surveys, 13(1), 71-106.

Mensi, W., Shahzad, S.J.H., Hammoudeh, S., Al-Yahyaee, K.H. (2018), Asymmetric impacts of public and private investments on the non-oil GDP of Saudi Arabia. International Economics, 156, 15-30.

Nickell, S. (1977), Uncertainty and lags in the investment decisions of firms. The Review of Economic Studies, 44(2), 249-263.

Njindan Iyke, B., Ho, S.Y. (2018), Real exchange rate volatility and domestic consumption in Ghana. The Journal of Risk Finance, 19(5), 513-523.

Obstfeld, M., Rogoff, K. (1998), Risk and exchange rates. NBER Working Papers No. 6694, National Bureau of Economic Research.

Oseni, I.O. (2016), Exchange rate volatility and private consumption in Sub-Saharan African countries: A system-GMM dynamic panel analysis. Future Business Journal, 2(2), 103-115.

Pesaran, M.H., Shin, Y., Smith, R.J. (2001), Bounds testing approaches to the analysis of level relationships. Journal of Applied Econometrics, 16(3), 289-326.

Phillips, P.C., Perron, P. (1988), Testing for a unit root in time series regression. Biometrika, 75(2), 335-346.

Pindyck, R.S. (1986), Irreversible Investment, Capacity Choice, and the Value of the Firm". NBER Working Paper series No. 1980.

Pradhan, G., Schuster, Z., Upadhyaya, K. (2004), Exchange rate uncertainty and the level of investment in selected south-East Asian countries. Applied Economics, 36, 2161-2165.

Sakar, S. (2000), On the investment-uncertainty relationship in a real options model. Journal of Economic Dynamics and Control, 24, 219-225.

Servén, L. (2002), Real Exchange Rate Uncertainty and Private Investment in Developing Countries. Vol. 2823. Washington, DC: World Bank Publications.

Servén, L. (2003), Real-exchange-rate uncertainty and private investment in LDCs. Review of Economics and Statistics, 85(1), 212-218.

Shaoping, W. (2008), Uncertainty and investment evidence from a panel of Chinese firms. Structural Change and Economic Dynamics, 19(3), 237-248.

Shin, C., Baek, J., Heo, E. (2018), Do oil price changes have symmetric or asymmetric effects on Korea's demand for imported crude oil? Energy Sources, Part B: Economics, Planning, and Policy, 13(1), 6-12.

Soleymani, M., Akbari, A. (2011), The relationship between exchange rate uncertainty and investment in some of Sub-Saharan African Countries. International Journal of Business and Public Management, 1(1), 51-57.

Sugiharti, L., Esquivias, M.A., Setyorani, B. (2020), The impact of exchange rate volatility on Indonesia's top exports to the five main export markets. Heliyon, 6(1), e03141.

Suh, H., Yang, J.Y. (2021), Global uncertainty and global economic policy uncertainty: Different implications for firm investment. Economics Letters, 200, 109767.

Sun, Z., Cai, X., Huang, W.C. (2022), The impact of oil price fluctuations on consumption, output, and investment in China's industrial sectors. Energies, 15(9), 3411.

The Arab Gulf States Institute in Washington by Robert Mogielnicki. (2019), Saudi Arabia Takes Steps to Assure Foreign Investors. Available from: https://agsiw.org/saudi-arabia-takes-steps-to-assure-foreign-investors

Yoon, K.H., Ratti, R.A. (2011), Energy price uncertainty, energy intensity and firm investment. Energy Economics, 33(1), 67-78.

Zivot, E., Andrews, D.W.K. (2002), Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. Journal of Business and Economic Statistics, 20(1), 25-44.