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Comparing the Impact of Crude Oil Trade and Economic Growth on the Real Exchange Rate in Iran

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Highlights

- Fluctuations in crude oil exports and imports have a significant impact on the exchange rate.
- Variations in the exchange rate influence the volume of crude oil transactions and affect the GDP of nations.
- Iran is dependent on oil revenues, so fluctuations in oil revenues affect the real exchange rate through the nominal exchange rate.
- The effects of oil trade and economic growth on the real exchange rate in Iran are investigated and compared.

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Abstract

This work examines the relationship between crude oil trade, economic growth, and the real exchange rate in Iran from 1979 to 2023, utilizing the autoregressive distributed lag (ARDL) approach. The findings indicate that crude oil exports have a negative and statistically significant influence on the real exchange rate. Conversely, crude oil imports have a positive and significant effect on the real exchange rate. Additionally, the budget deficit from the previous period has positively impacted the real exchange rate. Gross domestic product (GDP) also has a significant positive effect on the real exchange rate. In contrast, the monetary base has shown a significant negative effect on the real exchange rate. Long-term analyses reveal that oil export variables negatively affect the real exchange rate, while crude oil imports contribute to it positively. Over the long term, GDP maintains a significant positive effect on the real exchange rate, whereas the budget deficit and monetary base variables do not significantly influence the real exchange rate. Short-term dynamics suggest that the real exchange rate from the previous period should positively and significantly affect the current real exchange rate. Moreover, the budget deficit variable in the current period negatively and significantly impacts the real exchange rate, and the monetary base has a significant negative effect on it. Central Bank assets have been utilized as a proxy for the monetary base.

Keywords: ARDL approach, Oil exports, Oil imports, Real exchange rate

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1. Introduction

The exchange is a critical factor influencing national economies. The international monetary system first scrutinized exchange rate movements in 1973, with substantial documentation provided by Frenkel in 1983 (Branson, 1981). There are notable distinctions between governmental policymaking and the various determinants of exchange rates. A depreciated exchange rate could stimulate economic growth.

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Dollar, Sachs, and Warner demonstrated a robust correlation between exchange rates and economic growth (Rodrik, 2008). Thus, economic growth constitutes a key variable influencing exchange rates and consequently affects the value of the domestic currency. A principal determinant of gross domestic product (GDP) growth is energy resources which can play a pivotal role in economic growth.

One of the most significant factors influencing energy dynamics is fossil fuels, particularly oil. Consequently, economies rely heavily on oil and its derivatives to drive production and foster economic growth. Hence, the oil trade is a critical variable within economics. Fluctuations in oil prices impact the value of domestic currencies and exchange rates. Oil is a crucial energy source for industrial and oil-producing nations, underpinning all production activities (Turhan et al., 2012). Given the pervasive dependence on oil and its derivatives, crude oil undoubtedly ranks among the most traded commodities. Despite the historical significance of oil-dependent industries and the growing volatility of oil prices, which has spurred optimism regarding the development of alternative energy resources (Li et al., 2016), the high costs associated with establishing alternative energy infrastructure continue to ensure that crude oil remains predominant in the economic activities of nations (Eugene, 2016).

Studies indicate that fluctuations in oil prices have a substantial impact on the economy, manifesting in various dimensions such as rising production costs for goods and services. This, in turn, affects inflation rates, consumption levels, financial markets, and ultimately the valuation of national currencies (Hossein et al., 2012). Given the critical role of oil in national economies, annual budgets in many countries are often structured around the parameters of crude oil production, revenue, and trade. Consequently, the overall performance of a nation's budget and its entire economy tend to be significantly sensitive to crude oil prices (Eugene, 2016). Additionally, research conducted by Hamilton in 1983 identified escalating oil prices as a primary contributor to the economic recession in the United States following World War II. Furthermore, energy costs in the United States constituted 14% of GDP in 1980. As rising oil prices typically result in a contraction of GDP, variations in oil prices can also lead to fluctuations in exchange rates (Delgado et al., 2018).

Consequently, fluctuations in oil prices can yield substantial revenue for oil-exporting nations, thereby enhancing economic activities through heightened demand and influencing domestic currency value via exchange rate variations. As the US dollar appreciates, the value of crude oil tends to decline against other currencies, and the reverse holds as well. However, in the oil price surge of 1979, the inverse pattern was generally observed. By 1980, this trend once again shifted, with rising oil prices increasing the dollar's value (Li et al., 2016; Golube, 1983).

Fluctuations in crude oil exports and imports have a significant impact on the exchange rate. Variations in the exchange rate also influence the volume of crude oil transactions and affect the GDP of nations (Li et al., 2016). Thus, oil price volatility plays a critical role in determining the exchange rate via its oil exports and imports, which in turn induce exchange rate fluctuations. Research indicates that changes in oil prices and the real exchange rate exhibit a negative long-term relationship with the gross domestic product. Specifically, oil price shocks can lead to a decline in the unofficial exchange rate in the long run, implying that while lower oil prices might hurt the economy, they also influence currency valuation negatively. Because Iran is also dependent on oil revenues, fluctuations in oil revenues affect the real exchange rate through the nominal exchange rate. This study investigates and compares the effects of oil trade and economic growth on the real exchange rate in Iran from 1979 to 2023. Data are sourced from the Central Bank of Iran, and the autoregressive distributed lag (ARDL) approach is employed. This study is structured as follows: Section 2 presents literature review, and section 3 describes methodology and model description; the analysis of results and the concluding remarks are presented in sections 4 and 5.

2. Theoretical literature

The oil price exerts a considerable influence on economic growth. Empirical studies have established that economic growth is often mirrored in oil price fluctuations. Research indicates that the oil-to-GDP ratio equals 4%, indicating that variations in oil price significantly impact production costs and the pricing of other commodities (Vochozka et al., 2020). Consequently, the role of crude oil in fostering economic growth underscores its profound effect on both the nominal exchange rate and the real exchange rate, as well as the valuation of the domestic currency.

The real exchange rate is defined by the comparative prices of goods and services across two countries while accounting for disparities in price levels. This measure is a tool for assessing the purchasing power of one currency compared to another.

2.1. Relationship between crude oil trade and real exchange rate

The economic literature has extensively analyzed the relationship between crude oil trade and real exchange rates. While most studies indicate a link between the two, a consensus on a direct correlation is lacking. Krugman's (1980) seminal study highlighted the impact of oil prices on the dollar's value, implying that exchange rate fluctuations related to oil prices could have significant economic effects. Research from the 1980s found that rising oil prices increased import costs. Krugman argued that higher oil prices might strengthen the dollar in the short term but could weaken it in the long term. Since then, further studies have continued to investigate the relationship between oil prices and exchange rates.

Amano and Norden demonstrated that an increase in the real price of crude oil was associated with an appreciation of the US dollar (Akram, 2009). Lizardo and Mollick in 2010 indicated that a rise in the real price of crude oil corresponded with a depreciation of the dollar in oil-exporting nations (Turhan, 2012). Conversely, a study analyzing countries impacted by the 2008 financial crisis revealed that a decline in oil prices resulted in a decrease in the value of the domestic currency (Vochozka et al., 2020). Additionally, Singhal et al. (2019) identified a negative correlation between oil prices and exchange rates in Mexico. Overall, the spot price and trade dynamics of crude oil significantly influence exchange rates through mechanisms such as supply and demand, trade channels, and wealth effects.

1- Supply and demand channel: A study conducted by Coudert et al. (2007) revealed that fluctuations in the dollar exchange rate significantly affected the prices received by oil producers and consumers outside the United States, resulting in shifts in the supply and demand dynamics for oil. From a demand perspective, it is crucial to recognize that the price of a barrel of oil is denominated in US dollars, with transactions conducted in this currency. Consequently, the demand for oil in importing countries is influenced by the price per barrel when converted into their local currencies, a figure that is subject to change due to variations in exchange rates. On the supply side, Coudert et al. (2007) also explored how these exchange rate fluctuations impacted the market. In their analysis, several transmission mechanisms were identified. The primary mechanism indicates that oil companies utilize the currencies of oil-producing nations to cover production costs, such as employee salaries and taxes. However, these currencies are predominantly linked to the US dollar, given that most oil-producing countries operate under a fixed exchange rate regime. As a result, fluctuations in the dollar price influence the revenues received by producers although this effect is less pronounced than the impact on prices faced by oil-importing nations (Suleiman and Abaid, 2020).

The second mechanism pertains to the relationship between drilling activities and fluctuations in oil prices. Specifically, when oil price rises, certain regions may transition into unprofitable territories, subsequently prompting an increase in production capacity. Additionally, the depreciation of the US dollar can exacerbate inflation and diminish the revenue of oil-exporting countries as their currencies

are closely tied to the US dollar's value. Consequently, a decline in the exchange rate can lead to a reduction in oil supply. In this context, Coudert et al. (2007) noted that short-term supply and demand exhibited low elasticity, while demand remained inelastic due to the scarcity of viable oil substitutes. Hence, it is imperative to assess the elasticity of oil supply and demand from a long-term perspective (Suleiman and Abaid, 2020).

2- Trade channel: Numerous studies indicate that fluctuations in oil price influence exchange rates through two key channels: trade and wealth. This section focuses on the trade channel. In the context of this trade channel, both oil-exporting and oil-importing nations experience varying impacts from changes in oil product prices. Research examining the connection between oil price and exchange rates demonstrates that increased oil trade can exert pressure on the balance of payments, resulting in exchange rate volatility. This is primarily because oil price fluctuations are viewed as significant shocks to exchange rates (Basher et al., 2016). For instance, in oil-exporting countries, a positive shock in terms of trade may give rise to the Dutch disease phenomenon, characterized by an escalation in non-tradable prices and a strengthening of the real exchange rate (Suleiman and Abaid, 2020). Studies have identified that the relationship between oil price and the trade balance manifests in two ways:

- The trade channel, where crude oil serves as a principal determinant of trade, distinguishing between non-tradable and tradable sectors. A study conducted in 1998 indicated that when the non-tradable sector exhibited a greater dependence on crude oil compared to the tradable sector, an increase in crude oil price would result in an appreciation of the real exchange rate. Conversely, if the tradable sector demonstrated a higher sensitivity to fluctuations in oil price than to the non-tradable sector, the domestic currency would experience depreciation.
- The other is the wealth channel.

3- Wealth transfer channel: The wealth channel, introduced by Krugman and Golub (1983), shows that when oil price increases, wealth transfers from oil importers to oil exporters due to an increase in the price of crude oil, oil importers have to pay more money, and the value of their currency decreases against the dollar (Ji et al., 2020; Beckman and Czudaj, 2020). Theoretically, Amano and Norden (1983) concluded that trade regulations affected oil importers and exporters differently. For example, a positive shock to trade often leads to an increase in non-tradable food and an increase in the real exchange rate of oil exporters (Ji et al., 2020). However, a study by Fratzscher et al. (2014) showed that with an increase in oil price, the value of the domestic currency decreased because this led to a weakening of the trade balance in crude oil importing countries. The difference between exporters and importers mainly seems to be related to when the transmission of oil shocks is considered through the wealth effect channel (Ji et al., 2020). Therefore, the literature concludes that with an increase in oil price, the transfer of wealth from oil-importing countries to oil-exporting countries is intensified, thereby leading to a real increase (decrease) in the exchange rate of oil exporters (oil importers) (Ji et al., 2020). Further, empirical studies through the cointegration technique show that an increase in oil price can lead to an increase in the value of the dollar (Basher, 2016).

2.2. Concept of export

International trade activities stimulate domestic demand, thereby fostering the growth of substantial manufacturing sectors supported by stable political frameworks and adaptable social institutions (Jufrianto, 2023). Consequently, as articulated in Todaro's (2009) study, exports are indicative of international trade activities that can propel nations in the progression of global trade growth. This suggests that developing countries possess the potential to attain economic advancement comparable to that of more developed nations. A critical determinant of export performance is a country's capacity to produce goods that are competitive in international markets (Purnama et al., 2024).

2.3. Concept of import

Imports refer to the acquisition of goods and services from foreign nations, typically involving a cooperative agreement among two or more countries. The importation of sizeable goods often necessitates the intervention of customs authorities in both the exporting and importing countries. Imports play a vital role in the framework of international trade (Purnama et al., 2024). Figure 1 shows the exchange rate changes from 1979 to 2023, and Figure 2 delineates the changes in Iran's oil exports from 1979 to 2023.

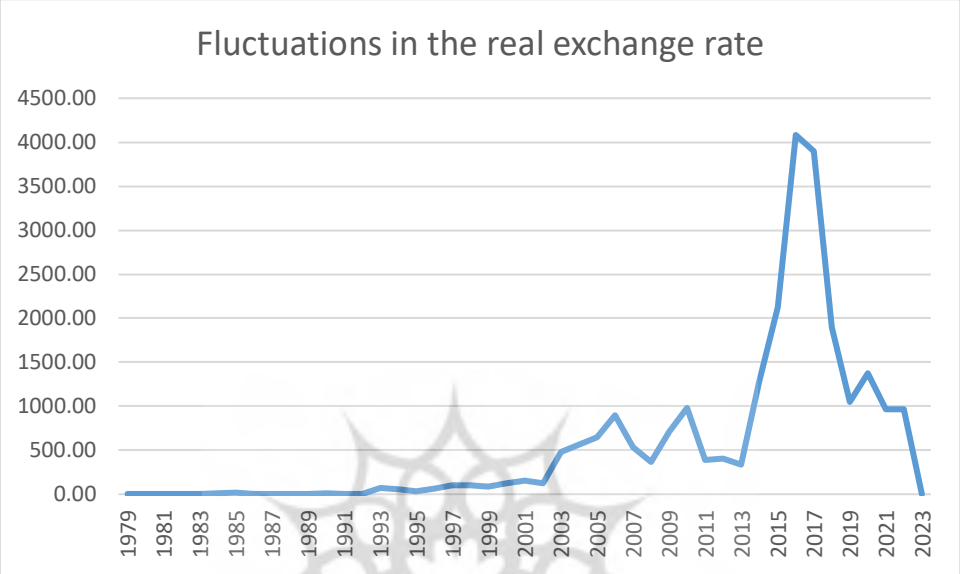

Figure 1

The variations in exchange rates (Iran's Central Bank Time Series Database)

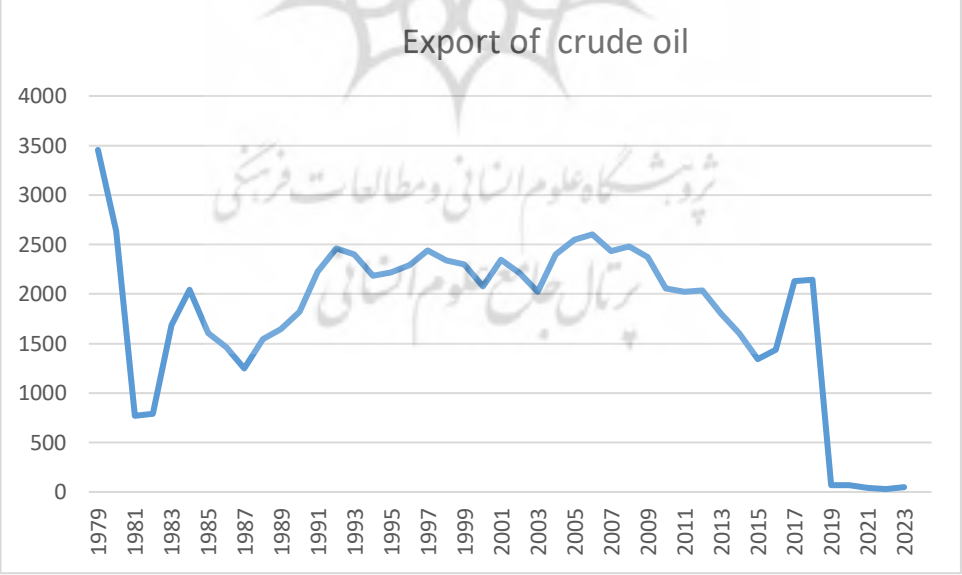

Figure 2

The changes in Iran's oil exports from 1979 to 2023 (Iran's Central Bank Time Series Database)

As the chart shows, the highest oil exports were before 1980, and the lowest in 2021 and 2022. Figure 3 depicts the fluctuations in Iran's oil imports.

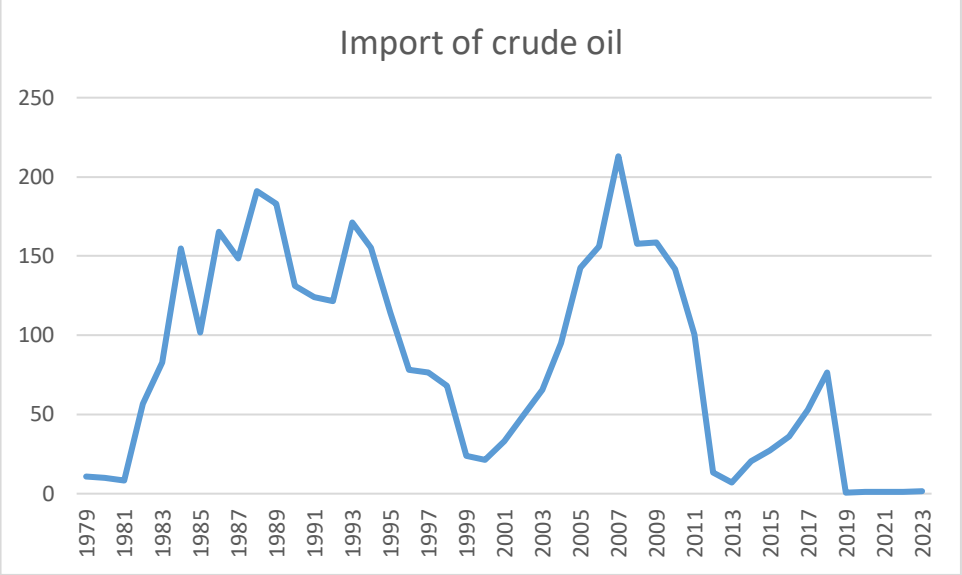

Figure 3

Fluctuations in Iran's oil imports (Iran's Central Bank Time Series Database)

2.4. Relationship between budget deficit and real exchange rate

Studies have demonstrated that budget deficits significantly impact various macroeconomic variables, particularly exchange rates. The relationship between budget deficits and exchange rates is complex and multifaceted, indicating that budget deficits can lead to both depreciation and appreciation of the exchange rate due to the wealth effect associated with changing financial conditions. As a result, the influence of budget deficits on exchange rates can yield different outcomes: certain scenarios may lead to strengthening of the currency, while in other situations, they may cause the currency to weaken.

For example, a reduction in a country's budget deficit can lead to a more robust and stable exchange rate. This strengthening often occurs alongside a decrease in interest rates, which is typically a result of lower demand for credit within the economy (Saysombath and Kyophilavong, 2013). In this context, a smaller budget deficit helps improve investor confidence, thereby enhancing the currency's value. On the other hand, an increase in the budget deficit can have similar effects on various macroeconomic variables, including the exchange rate itself. Specifically, when a government turns to domestic borrowing as a way to finance its deficit, it often results in increased yield on domestic assets. This increase underscores a comparative advantage over the returns available on foreign assets, making the domestic currency more attractive to foreign investors. Consequently, this influx of investment can lead to an increased value of the domestic currency as it attracts foreign capital flow while simultaneously generating an oversupply of foreign exchange.

The Ricardo equivalence hypothesis offers a theoretical perspective on the relationship between budget deficits and currency values. According to this hypothesis, financing a budget deficit through domestic borrowing does not alter the value of the domestic currency. This conclusion is based on the principle that an uptick in government borrowing is primarily a consequence of inadequate government savings; thus, an increase in private savings does not necessarily translate into a change in total overall savings across the economy. As such, there is no resulting impact on real interest rates or foreign capital inflows, maintaining the value of the domestic currency in a stable state (Eldepcy, 2002). Conversely, research focusing on the effects of fiscal policies on budget deficits in Canada has produced findings implying that budget deficits do not have a significant or demonstrable effect on exchange rate fluctuations

(Darrat and Suliman, 1991). This highlights the variation in outcomes regarding how budget deficits interact with exchange rates across different economic contexts and frameworks.

2.5. Relationship between economic growth and real exchange rate

Economic growth is often correlated with an increase in the demand for goods and services. This heightened demand can lead to an increased appetite for the nation's currency, ultimately resulting in a decline in the real exchange rate. However, it is important to note that robust GDP growth frequently coincides with heightened inflationary pressures. When the rate of GDP growth outpaces the growth of the money supply, this imbalance can contribute to a decrease in the real exchange rate. In essence, if inflationary levels within a country exceed those of its trading partners, the result will be a depreciation of that country's real exchange rate.

Notably, the post-Keynesian literature has tended to overlook this relationship. Within the domain of balance of payments, Thirlwall's constrained growth models, developed in 1979, posited that the long-term growth rate was contingent upon the income elasticity of both exports and imports, as well as the income growth rates of other nations. It is generally assumed that fluctuations in real exchange rates do not effectively drive long-term growth, supported by empirical evidence indicating that the price elasticity of exports and imports is relatively low. This suggests that the impact of real exchange rate depreciation on the growth rates of exports and imports should be minimal and that the terms of trade do not exhibit a systematic tendency toward appreciation or depreciation of the exchange rate over the long term (McCombie and Roberts, 2002).

In neoclassical growth models, the real exchange rate significantly influences long-term economic growth through its impact on income distribution and capital accumulation. An indirect argument regarding capital accumulation, via the investment function, posits that growth is contingent upon capacity utilization and profit margins. When the profit accumulation process prevails, a decline in the real exchange rate can result in enhanced productivity and elevated capital levels, thereby causing a reduction in wages. This, in turn, leads to an increase in the marginal profits of firms, which positively influences investment (Missio, 2013). Conversely, a reduction in real wages stemming from a decrease in the real exchange rate may diminish capital productivity, negatively affecting the rate of investment and economic growth through an acceleration effect. Thus, it can generally be asserted that variations in exchange rates—through the reallocation of the income distribution function and fluctuations in capital stock—impact the investment rate and overall economic growth rate. This influence is contingent upon the characteristics of the accumulation process, which, as noted in the research of Dosi et al. (1990), can also affect a nation's international competitiveness (Missio, 2013).

2.6. Relationship between monetary base and real exchange rate

The monetary base encompasses the total supply of money within an economy, which consists of currency held by the public, as well as reserves maintained by financial institutions at the central bank. This monetary base serves as a critical source of liquidity within the banking system and is managed through the central bank's monetary policy framework. Academic literature established three primary variables influencing exchange rates: money supply, price levels, and trade balances. Empirical studies imply that the impact of the monetary base on the real exchange rate can be attributed to several key factors as follows:

- A rise in the monetary base may stimulate demand for goods and services. This heightened demand can contribute to upward pressure on prices and potentially result in inflationary outcomes. Conversely, as inflation rates ascend, the real value of money may diminish, adversely affecting individuals' purchasing power.

- As the monetary base expands, it may contribute to inflationary pressures, resulting in a depreciation of the real exchange rate. Consequently, individuals must allocate more domestic currency to acquire foreign goods. Additionally, an increase in the monetary base can lead to heightened volatility in the exchange rate since the foreign exchange market is highly responsive to shifts in economic conditions and monetary policy.
- A depreciating domestic currency can elevate import costs and diminish the competitiveness of exports. While this phenomenon may be advantageous for exporting countries, it can result in a balance of payment deficit. Nonetheless, despite the established correlations between the monetary base and the exchange rate, Dornbusch (1980) posited that monetary disturbances did not exert influence on the real exchange rate. Consequently, studies within this domain yield divergent conclusions, indicating that monetary shocks manifest varied impacts on the exchange rate. Existing theories indicate that an increase in the money supply leads to a decline in both the central bank interest rate and the value of the domestic currency. Conversely, contractionary monetary policies tend to attract investors by elevating interest rates as the returns on domestic assets become more favorable relative to foreign assets. This ultimately contributes to the appreciation of the domestic currency, which corresponds with a decrease in the exchange rate (Ali and Nazar, 2017).

Studies show a relationship between money supply, interest rates, and real exchange rates and showed that an unexpected increase in money supply due to speculation led to an increase in exchange rates and interest rates. When the money supply increases due to expansionary policies, if investors believe that a contractionary monetary policy will be implemented soon, they increase their demand for currency, which in turn causes an increase in the exchange rate (Ali and Nazar, 2017).

2.7. Literature review

Domak (1997) showed that an unexpected decrease in the real exchange rate could increase GDP. Bilgili's (2000) study of Turkey from 1978 to 1998 showed that there was no positive or negative relationship between the economic growth rate and the real exchange rate. This study does not consider the long-term and short-term relationship between exchange rates and economic growth.

In 2004, Sriviyal and Venkata studied the effects of variables such as money supply, economic growth, and budget deficit on the real exchange rate in India. Their results showed that there was a direct relationship between the government budget deficit and the real exchange rate. This study did not examine the impact of crude oil trade on the real exchange rate.

Basher et al. (2012), in their study on the effect of oil price on the exchange rate using the vector autoregression (VAR) approach, indicated that oil shocks led to a decrease in the value of the dollar in the short run. This study only examined the short-term relationship between oil prices and nominal exchange rates and did not consider the real exchange rate.

Reboredo (2012) used a time-varying approach to study the asymmetric and asymmetric relationship between oil price and nominal exchange rate among developing countries and emerging oil-exporting and importing economies. The findings showed that this relationship was weak in normal conditions, but, during the 2008 crisis, it became stronger and oil prices had a negative effect on the exchange rate.

Nusair and Kisswani (2015) investigated the relationship between real exchange rates and oil prices in Korea, Japan, Indonesia, Malaysia, and the Philippines. Their findings revealed a significant long-run relationship between these two variables for Japan and the Philippines; however, for Thailand and Malaysia, this relationship was observed to be indirect. Notably, no correlation was identified for Korea.

Similarly, Ali et al. (2015) explored the influence of the monetary base, inflation, and interest rates on real exchange rates in Pakistan, employing an autoregressive distributed lag approach with monthly data spanning from 2000 to 2009. Their analysis indicated that a heightened monetary base contributed to increased volatility in exchange rates over the long term. Furthermore, they found that rising inflation also correlated with greater exchange rate volatility. This study did not examine the impact of economic growth and crude oil trade on the real exchange rate.

Dissanayake (2016) carried out a study in Sri Lanka, examining the relationship between the budget deficit and the real exchange rate utilizing the ARDL approach. The results demonstrated an absence of a long-run relationship between these two variables.

Basher et al. (2016) assessed the impact of oil shocks on exchange rates among both oil-importing and oil-exporting nations using a Markov switching methodology. Their findings indicated that oil supply shocks directly influenced the rate of price change, and shocks stemming from fluctuations in global economic demand significantly affected exchange rates in both categories of countries.

Eugene (2016) conducted an empirical investigation in Nigeria focusing on the interplay between oil shocks, exchange rates, and stock markets. The findings revealed a positive correlation between crude oil prices and exchange rates. However, the application of the Granger causality test indicated that this relationship turned negative over the long term.

In a subsequent study in 2018, Kong explored the differential effects of oil shocks on exchange rates in China compared to the United States, employing the structural vector autoregression (SVAR) methodology. His findings indicated a detrimental impact of oil shocks on the value of the US dollar.

In the same year, Barbosa et al. (2018) carried out a study that concentrated on developing countries and emerging economies. This research aimed to assess the influence of the monetary base on real exchange rates within these nations. Utilizing economic data and statistical modeling, the authors examined the relationship between shifts in the monetary base and fluctuations in real exchange rates. The results indicated that an increase in the monetary base typically correlated with a decline in the real value of the currency in the countries analyzed, a phenomenon potentially driven by heightened domestic demand and inflationary pressures.

A study conducted by Nouira (2019) investigated the relationship between crude oil prices and real exchange rates within Middle East and North Africa (MENA) countries. The findings indicated that, in Tunisia and Saudi Arabia, fluctuations in oil prices significantly influenced real exchange rates, leading to corresponding variations in exchange rates driven by oil market dynamics.

In a separate study, Vasani et al. (2019) explored the relationship between economic growth and real exchange rates, examining variables such as inflation, trade balance, and economic growth. Their results demonstrated a positive correlation between economic growth and real exchange rates in the long term, while no significant relationship was observed in the short term.

Ji et al. (2020) analyzed the impact of dynamic structural shocks arising from oil exports and imports on exchange rates in Japan and the United Kingdom, utilizing a structural VAR approach. The findings revealed that shocks originating from oil exports exerted a more substantial negative effect on exchange rates compared to those caused by oil imports. Conversely, it was noted that increases in oil prices tended to elevate exchange rates.

Suleiman and Abaid (2020) investigated the relationship between crude oil prices and the exchange rate in Saudi Arabia utilizing the ARDL method. Their findings indicated that, in the short term, an indirect relationship existed between these two variables. However, in the long term, while this indirect

relationship persisted, it became evident that an increase in the exchange rate correlated with heightened demand for oil purchases and exports. This increased demand exerted upward pressure on prices, consequently leading to a decline in the real exchange rate. Hossein et al. (2023) determined that the oil import variable exerted a positive and significant influence on the nominal exchange rate, whereas the export variable did not significantly impact the dependent variable. Additionally, the variable representing economic growth demonstrated a negative and significant effect on the nominal exchange rate, whilst the inflation variable did not exert any significant impact on the dependent variable.

Purnama et al. (2024) conducted a study focusing on Indonesia and evaluating the influence of oil exports and imports on foreign exchange reserves utilizing the ordinary least squares methodology. Their findings indicated that both crude oil exports and imports did not exert any significant impact on Indonesia's foreign exchange reserves. This implies that the trade of crude oil, along with oil and gas products, does not enhance the country's foreign exchange reserves.

Amani et al. (2010) investigated the effects of oil price shocks on various quantiles of real exchange rates among selected Organization of Petroleum Exporting Countries (OPEC) member countries (specifically Iran, Nigeria, Algeria, and Saudi Arabia) from 1993 to 2018 using the quantile regression approach. Their results revealed an asymmetric response to both positive and negative oil price shocks across different quantiles of real exchange rates, influenced by varying market conditions. An increase in oil prices resulted in strengthening of the US dollar against the domestic currencies of Iran, Nigeria, and Algeria at lower and middle quantiles of the real exchange rate, attributed to central bank interventions and heightened imports of industrial and semi-industrial goods. Conversely, at upper quantiles, oil price fluctuations did not affect the real exchange rate in any of the four assessed countries. Additionally, a decline in oil prices solely contributed to the depreciation of the Saudi Riyal at lower levels of the real exchange rate when measured against the US dollar.

Khanbabaei and Shahbazi (2021) investigated the relationship between the real effective dollar rate and OPEC crude oil prices employing a nonlinear asymmetric cointegration methodology. Their analysis utilized monthly data from OPEC member countries covering the period from January 2003 to November 2017. Their findings indicated a significant cointegration between the variables, which was validated under both symmetric and asymmetric frameworks. The results indicated that the dollar rate exhibited weak exogeneity, and a negative relationship between the dollar rate and oil prices was established in the long term. Further, the study revealed that this relationship was s asymmetric in the long run; however, no significant relationship was observed between these variables in the short run.

3. Model and data

This section designs the following model using the models of Purnama et al. (2023) for Indonesia and Kia (2013) for Canada. The relevant data were extracted from the Central Bank from 1979 to 2023. The approach used in this research is the ARDL approach.

$$rexchange = f(\beta_0.\beta_1 export_{1t}.\beta_2 import_{2t}.\beta_3 GDP_{2t}.\beta_4 netAsset_{2t}.\beta_5 BD_{2t}) \quad (1)$$

where, the dependent variable (*rexchange*) is the real exchange rate; the export variable represents oil exports, while the import variable corresponds to oil imports; GDP refers to the gross domestic product excluding the oil sector; *net asset* denotes the monetary base which utilizes the net assets of the central bank; *BD* represents the government budget deficit, and εt is the model error term.

ARDL approach: Theoretically, economic analyses indicate a long-run relationship between the variables under examination within the economy. However, it is common for economists to overlook the inherent dynamic properties of most time series during the process of time series analysis and the

formulation of traditional regression models. It is typically assumed that the underlying time series are stationary around a specific trend and exhibit a long-run relationship (Enkoro and Uko, 2016).

Consequently, it is conventional to formulate econometric models under the assumption that the mean and variance of the variables are stationary and not time-dependent. The estimated models have been utilized to analyze theories developed at an abstract level and to predict, evaluate, and inform policy decisions. Nevertheless, recent advancements in econometrics have demonstrated that the majority of time series are nonstationary, indicating that different time series may not share identical characteristics. As a result, some time series may exhibit tendencies to diverge from their mean over time, while others may display convergence toward their mean.

Time series that tend to diverge from their mean over time are classified as nonstationary. Consequently, traditional estimation methods applied to variables characterized by this relationship may yield misleading inferences or result in spurious regressions (Enkoro and Uko, 2016).

To address the challenges posed by nonstationary time series and the limitations associated with the lagged structure of models, econometric analysis of time series data has increasingly focused on the concept of cointegration. This approach is particularly valuable as it provides a robust framework for identifying the existence of a steady-state equilibrium between variables. Cointegration has thus become a fundamental prerequisite for any economic model that utilizes nonstationary time series data. In instances where variables are not cointegrated, the risk of spurious regression arises, rendering the obtained results nearly meaningless. Conversely, when variables exhibit cointegration, a meaningful long-term relationship is established.

In the field of applied econometrics, the methodologies proposed by Granger (1981) and Engel and Granger (1987), the cointegration of the ARDL technique, and the convergence bound test (Pesaran and Shin, 1999; Pesaran et al., 2001), along with the integration techniques developed by Jocelius and Johansson (1990), have emerged as effective solutions for determining the long-term relationships among nonstationary time series. Furthermore, these methodologies facilitate the reparameterization of such relationships into an error correction model (Ncoro and Eko, 2016). In distributed lag autoregressive models, the dependent variable is expressed as a function of its lagged values, while explanatory variables may also include lags from the same period at time *t*. This approach is particularly applicable when cointegration exists between the variables (Persiren et al., 2016).

Therefore, this approach can be used to perform long-term and short-term estimates in the model. The aforementioned approach was presented by Pesran (2001), and its advantages include:

- The ARDL approach is not sensitive to sample size, so it is suitable for small samples. Nevertheless, larger samples are needed to trust the results of the Johansson approach.
- The degree of cointegration must be the same to use other cointegration methods, while the autoregressive approach with a distributed lag with a different degree of cointegration (cointegration of order (I(0) and I(1)) can also be used.
- In the aforementioned approach, it is possible to consider different optimal lags at various stages of estimation, while this is not possible in other cointegration approaches.
- The estimates obtained from this method are unbiased and efficient due to the avoidance of problems such as autocorrelation and endogeneity. Moreover, this method accurately captures the long-term and short-term relationships between the dependent variable and other explanatory variables of the model (Montezeri Shorkchali, 2019).

This methodology is applicable to conducting both long-term and short-term estimations within the model framework. The approach, initially proposed by Pesaran (2001), offers several notable advantages:

- The autoregressive distributed lag approach demonstrates robustness to sample size, making it suitable for small sample analyses, whereas larger sample sizes are typically required to yield reliable results using the Johansen approach.
- While other cointegration methods necessitate uniformity in the degree of cointegration, the ARDL methodology accommodates varying degrees of cointegration, specifically allowing for the coexistence of the I(0) and I(1) series.
- The aforementioned approach permits the consideration of distinct optimal lags throughout different phases of estimation, a flexibility not afforded by other cointegration techniques.
- The estimates derived from this method are both unbiased and efficient, effectively mitigating issues such as autocorrelation and endogeneity. Furthermore, this methodology proficiently delineates the long-term and short-term relationships between the dependent variable and other explanatory variables within the model. Simultaneous estimates are supported (Montezeri Shorkchali, 2019).

In light of the preceding discussion, this study employs the ARDL approach to investigate the long-term relationship between the variables. The selection of the lag length is critical for this methodology, and employing information criteria such as the Akaike information criterion (AIC) and Schwarz Bayesian criterion (SBC) is recommended. Both criteria utilize the sum of squared residuals, with the model yielding the lowest values of AIC and SBC being preferred.

Error correction approach: To analyze both long-term and short-term relationships between the dependent variable and other explanatory variables within the model, cointegration methods, including the Engle-Granger method and error correction models, can be employed. However, the Engle-Granger method has notable limitations; for instance, the marginal distribution of the least squares estimators is non-normal. Furthermore, this method cannot be applied to small sample sizes as it neglects the short-term dynamic responses among the variables, leading to biased estimators. Consequently, hypothesis testing using conventional statistics, such as the *t*-test, lacks validity in this context. Therefore, ARDL estimates are unbiased and efficient due to the avoidance of problems such as autocorrelation and endogeneity (Kripfganz and Schneider, 2018).

Following the work of Sons et al. (2001), the existence of a long-run relationship between the variables introduced in Equation 1 is investigated, and a conditional error correction model is estimated using the ARDL approach:

$$\begin{aligned} rexchange = {} & C_0 + \sum_1^m \beta \Delta exchange_{t-i} + \sum_1^i \gamma \Delta export_{t-i} + \sum_1^i \nu \text{import} + \sum_1^i \delta \text{GDP} + \\ & \sum_1^i \theta \text{netASSET} + \sum_1^i \rho \text{BD} + \alpha_1 rexchange_{t-i} + \\ & \alpha_2 export_{t-i} + \alpha_3 import_{t-i} + \alpha_4 GDP_{t-i} + \alpha_5 NetASSET_{t-i} + \alpha_6 BD_{t-i} + \varepsilon_t \end{aligned} \quad (2)$$

where Δ is the first-order differential operator, and *m* and *i* are the optimal pauses determined based on the penalty functions.

3.1. Band test

The ARDL method presents an opportunity to estimate coefficients pertinent to long-run equilibrium. However, it is imperative to assess whether the long-run equilibrium coefficients obtained are spurious. To this end, the autoregressive model with distributed lags is initiated utilizing the limit approach to summation, as described by Pesaran et al. (2001).

The band test serves as the preliminary step in the autoregressive framework with distributed lags to evaluate the existence of a long-run relationship between variables. In conducting the band test, Equation 2 is estimated employing the ordinary least squares method, and the existence of a long-run relationship between the variables is tested using the *F*-statistic or Wald test statistic. This methodology establishes two critical limits: the upper limit corresponding to time series I(1) and the lower limit pertaining to time series I(0) (Montezeri Shorkchali, 2018).

Should the *F*-statistic values derived from the unconstrained error correction model estimated in Equation 4 exceed the upper limit, the null hypothesis—which posits the absence of a long-run relationship between the variables—is rejected. Conversely, if the calculated *F*-value falls below the lower bound, the null hypothesis is not rejected. In instances where the *F*-statistic value resides between the lower and upper bounds, a definitive conclusion cannot be drawn without further knowledge of the degree of cointegration (Montezeri Shorkchali, 2018).

$$rexchange_t=C_0+\sum_i^m \alpha_1 exchange_{t-i}+\sum_1^{t1} \alpha_2 export_{t-i}+\sum_1^{t2} \alpha_3 import_{t-i}+ \\ +\alpha_4 GDP_{t-i}+\alpha_5 NetASSET_{t-i}+\alpha_6 BD_{t-i}+\varepsilon_t \quad (3)$$

The error correction framework for the aforementioned long-run relationship is expressed as follows:

$$Exchange_t=C_0+\sum_1^m \beta exchange_{t-i}+\sum_1^i \gamma \Delta export_{t-i}+\sum_1^i \nu import_{t-i}+\sum_1^i \delta \mathrm{GDP}_{t-1}+ \\ \sum_1^i \theta \mathrm{NetASSET}_{t-1}+\sum_1^i \rho \mathrm{BD}_{t-1}+\sigma ECM_{t-i}+\varepsilon_t \quad (4)$$

where, coefficients β, γ, ν, δ, θ, and ρ denote the short-term coefficients, while the error correction variable reflects the speed at which the long-term relationship reverts to its equilibrium state following a short-term disturbance.

3.2. Parameter stability test

This test assesses the stability of coefficients in a time series regression over time. The test statistic is derived from the cumulative sum of the residuals (Ibid.)

4. Analysis of findings

This study analyzes data on Iran, derived from the Central Bank for the years between 1978 and 2023, to estimate the impact of oil exports and imports on the nominal exchange rate utilizing an autoregressive approach with a distributed lag.

4.1. Examining unit root

A prerequisite for employing the autoregressive approach with a distributed lag is that the series must be of order 0 or 1. To assess this condition, we conducted the Dickey–Fuller test to determine the presence of a unit root in the selected variables. The results of the test indicated that the oil export and import variables exhibited a unit root, which became stationary upon differentiation.

Furthermore, another essential condition for implementing the autoregressive approach with a distributed lag is the non-violation of classical assumptions. To address this, a test for classical assumptions was performed, and the results demonstrated that none of the classical assumptions were rejected.

Table 1

Unit root

Variables	Statistics	Differentiation	Level
Real Exchange rate	–4.96	-	I(0)
Export	–2.14	–5.57	I (1)
Import	–1.83	–6.34	I(1)
BD	2.014	–7.02	I(1)
GDP	0.80	–6.055	I(1)
Net asset	2.49	–6.10	I(1)

4.2. Determining length of lag using information criteria

The unconstrained error correction model analyzes the long-term cointegration relationships between variables. Before the estimation of the model using this method, it is essential to establish the appropriate length of the lag based on information criteria. This study employed the Schwartz–Bayesian information criterion for this purpose.

Table 2

Determining the length of the lag using information criteria

Lag	GDP	Net asset	BD	Oil import	Oil export	Real exchange rate
1	10.11	7.06	6.33	10.09	15.03	
2					-	19.76

4.3. Results of ARDL

The findings derived from the model indicate that the distributional lag of crude oil exports exerts a negative and statistically significant influence on the real exchange rate. Specifically, a one-unit increase in crude oil exports correlates with a decrease of 0.25 units in the real exchange rate. This relationship implies that an escalation in crude oil exports and subsequent foreign exchange inflows into the nation enhances foreign exchange earnings. Consequently, this results in a strengthened monetary base and an appreciation of the domestic currency. Given the stability of both domestic and foreign price indices, this interplay leads to a decline in the real exchange rate. Conversely, a study conducted by Purnama et al. (2024) in Indonesia determined that oil exports did not significantly impact foreign exchange reserves.

The variable related to oil imports demonstrates a positive and significant impact on the real exchange rate in Iran. Specifically, a one-unit increase in crude oil imports correlates with an increase of 1.56 units in the real exchange rate. This relationship occurs as rising crude oil imports increase foreign exchange demand, resulting in an outflow of foreign exchange from the country, which in turn drives up the exchange rate. Assuming that the commodity price index remains constant both domestically and internationally, this increase in crude oil imports is associated with a rise in the real exchange rate. Conversely, Pournama et al. (2024) indicated that this variable had no significant effect on the exchange rate in their analysis of the influence of oil exports and imports on foreign exchange reserves in Indonesia. Nevertheless, the research conducted by Hossein et al. (2024) affirmed the positive effect of imports on the nominal exchange rate in their examination of the impact of crude oil and gas exports and imports on Indonesia's nominal exchange rate.

The budget deficit variable from the previous period exerts a positive influence on the real exchange rate. When examining this positive relationship, it can be asserted that if the government refrains from

financing its budget deficit through domestic borrowing, the interest rate will remain stable. Consequently, this stability will prevent capital inflows into the country, leading to a reduction in the real exchange rate despite an increase in the budget deficit under these conditions. This finding aligns with the conclusions drawn by the study of Srivyal and Venkata (2004) on the relationship between budget deficits and real exchange rates in India. However, the impact of the budget deficit variable in the current period on the real exchange rate has not been substantiated. In contrast, a study conducted by Darat (1991) in Canada supports this conclusion.

Further, the GDP variable, which represents economic growth in the model, has a positive and significant effect on the real exchange rate in Iran. With an increase of one unit in the aforementioned variable, the real exchange rate increases by 0.0006 units. The reason for the positive relationship between these two variables can be stated as follows. With an increase in the GDP, exports increase, which raises the inflow of foreign exchange into the country; due to the wealth effect, the demand for purchasing goods and services increases too, which leads to an increase in printing money. As this trend continues, the value of the domestic currency gradually decreases, resulting in an increase in the real exchange rate. Moreover, it can be stated from another perspective that when the GDP of a country is growing if economic growth is through increased demand and production, it may lead to controlled inflation. However, if economic growth leads to a decrease in the unemployment rate and an increase in purchasing power, it may create inflationary pressures. High inflation increases the real exchange rate by raising the exchange rate and declining the value of the domestic currency. This result is in line with the findings of Vasani et al. (2019) in India.

The GDP variable, significantly influences the real exchange rate in Iran, exhibiting a positive correlation. Specifically, a unit increase in GDP corresponds to a rise of 0.0006 units in the real exchange rate. This positive relationship can be attributed to several factors. As GDP expands, there is a corresponding increase in exports, enhancing the inflow of foreign currency into the nation. The resultant wealth effect stimulates demand for goods and services, thereby leading to an increase in money supply. As this process continues, the value of the domestic currency tends to decline, which ultimately results in a heightened real exchange rate. Furthermore, it can be argued from an alternative perspective that when a country experiences GDP growth, if this growth is driven by augmented demand and production, it may foster controlled inflation. Conversely, if the growth leads to a decline in unemployment and an enhancement of purchasing power, it may generate inflationary pressures. Elevated inflation, in turn, escalates the real exchange rate by raising the nominal exchange rate and diminishing the domestic currency's value. This finding aligns with the conclusions of a study conducted by Vasani et al. (2019) in India.

The monetary base variable has a significant negative effect on the real exchange rate in the current period. As stated in the introduction of the model, the net assets of the central bank are used as a proxy for the monetary base variable in this study. According the results, a one-unit increase in the aforementioned variable reduces the real exchange rate by 0.004 units. The reason for this event can be stated as follows. With an increase in the net assets of the central bank, the monetary base resources are strengthened, which causes an increase in the money supply if the increase in the money supply leads to production and exports; if the price index of goods and services abroad and domestically is constant, an increase in the monetary base leads to a decrease in the real exchange rate. The study of Ali et al. (2015) in Pakistan confirms this result. However, the study of Vasani et al. (2019) approves the positive effect of the monetary base on the real exchange rate.

The monetary base variable exerts a significant negative influence on the real exchange rate in the current period. The results indicate that a one-unit increase in the aforementioned variable leads to a reduction of the real exchange rate by 0.004 units. This can be attributed to an increase in the Central

Bank's net assets that enhances the monetary base resources, subsequently leading to an expansion of the money supply. If this increase in the money supply stimulates production and exports, and if we assume that the price indices of goods and services, both domestically and internationally, remain constant, an augmentation of the monetary base consequently results in a decline in the real exchange rate. The findings of Ali et al. (2017) in Pakistan corroborate this outcome. Conversely, the research conducted by Vasani et al. (2019) supports the notion of a positive effect of the monetary base on the real exchange rate.

Table 3

The results of the ARDL approach

Variables	Coefficient	Standard error	|t|	*P*-value
$exchange_{t-1}$	0.45	0.28	1.60	0.12
Export	–0.25	0.12	2.07	0.05
Import	1.56	0.68	2.27	0.032
BD	–0.002	0.001	1.55	0.34
BD_{t-1}	0.003	0.001	2.71	0.012
GDP	0.0006	0.002	3.60	0.001
Net asset	–0.004	0.001	2.71	0.012
Net $asset_{t-1}$	0.004	0.001	2.65	0.014

4.4. Bound test

It is imperative to conduct a bounds test to investigate the potential existence of a long-term relationship between the variables. If the *F*-statistic values derived from the estimated unconstrained error correction model presented in Equation 4 exceed the upper bound threshold, we reject the null hypothesis of this test, which postulates the absence of a long-run relationship between the variables. Conversely, if the calculated *F*-value is below the lower bound, the null hypothesis remains unchallenged. In cases where the *F*-statistic falls between the lower and upper bounds, no definitive conclusions can be drawn without assessing the degree of cointegration (Montezeri-Shurkachali, 2018). The results from the bound test indicate the presence of a long-term relationship between the variables.

Table 4

The bound test

H0: No levels relationship	*F = 11.178*	*t* =–4.25

Critical Values (0.1–0.01), *F*-statistic, Case 3

	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]	[I_0]	[I_1]
	L_1	L_1	L_0.5	L_0.5	L_0.025	L_0.025	L_0.01	L_0.01
k_4	3.15	4.42	3.86	4.81	4.25	5.49	5.14	6.36

reject if F > critical value for I (1) regressors

4.5. Results of error correction model

The findings derived from the aforementioned model reveal significant long-term relationships and short-term dynamics between the pertinent variables. The long-term analysis demonstrates that oil export variables exert a negative and statistically significant impact on the real exchange rate in Iran. Specifically, a one-unit increase in crude oil exports corresponds to a reduction of 0.21 units in the real exchange rate. This outcome is consistent with several studies, including Kong's (2018) research on China and the United States, which established that oil shocks, such as price increases driven by rising oil exports, contributed to a decline in the exchange rate. Additionally, Krugman's (1980) study indicated that, in the long term, an upsurge in crude oil prices due to heightened exports resulted in a depreciation of the dollar's value.

The findings of the study underscore the importance and positive impact of crude oil imports on the real exchange rate in Iran. A one-unit increase in crude oil imports corresponds to an increase of 1.35 units in the real exchange rate. This relationship arises from the heightened demand for foreign exchange associated with increased imports, which subsequently diminishes the value of the domestic currency and elevates the exchange rate. Assuming constancy in the price indices both domestically and internationally—an aspect that influences the calculation of the real exchange rate—an increase in the nominal exchange rate results in a corresponding rise in the real exchange rate. These findings align with the results reported by Hossein et al. (2023) for Indonesia although Purnama et al. (2024) did not substantiate the influence of crude oil imports on the nominal exchange rate in their research about Indonesia.

The GDP variable exerts a positive and significant influence on the real exchange rate over the long term. Specifically, a one-unit increase in the GDP correlates with an increase of 0.0006 units in the real exchange rate. This GDP growth, indicative of economic expansion, enhances the country's export levels, thereby stimulating foreign exchange inflows and subsequently boosting foreign exchange earnings. Conversely, an expanded monetary base contributes to a decline in the nominal exchange rate. In alignment with the prevailing currency regime, the Central Bank may increase the money supply to mitigate the appreciation of the domestic currency and safeguard export levels. This action may induce demand-pull inflation, and it ultimately increases the real exchange rate according to the established formula for the real exchange rate.

Table 5

The results of the error correction model approach

Variables	Coefficient	Standard error	|t|	*P*-value
Export	–0.21	0.10	2.15	0.042
Import	1.35	0.57	2.36	0.027
BD	0.001	0.001	0.97	0.342
GDP	0.0006	0.002	4.31	0.000
Net asset	0.0003	0.0003	0.10	0.919

4.6. Results of short-term dynamics

The findings of the study indicate that the short-term dynamics of the real exchange rate from the preceding period exert a positive and statistically significant influence on the real exchange rate in the current period. Conversely, the budget deficit variable for the current period exhibits a negative and statistically significant effect on the real exchange rate. Analyzing this outcome indicates that when the

government encounters a budget deficit in the short term, addressing the budget deficit through domestic borrowing likely raises interest rates. This, in turn, would enhance the return on assets, thereby attracting greater capital inflows into the country. Consequently, the value of the domestic currency is expected to appreciate, resulting in a decrease in the nominal exchange rate and, subsequently, the real exchange rate, if we assume that the price index remains constant both domestically and internationally. However, in the estimation of the long-term relationship, the budget deficit and monetary base variables do not have a significant effect on the real exchange rate.

In the analysis of the short-term dynamics of the monetary base, a negative and statistically significant relationship with the real exchange rate in Iran is observed. Given that the net assets of the Central Bank serve as a proxy for the monetary base in this study, it can be concluded that an increase in the Central Bank's assets, which are utilized as monetary base resources, leads to the appreciation of the domestic currency. Consequently, this appreciation reduces the nominal exchange rate, which in turn causes a decrease in the real exchange rate.

Table 6

The results of the short-term dynamics approach

Variables	Coefficient	Standard error	|t|	*P*-value
$rexchange_{t-1}$	0.61	0.27	2.21	0.037
BD_{t-1}	–0.003	0.001	2.71	0.012
Net $Asset_{t-1}$	–0.004	0.001	2.65	0.014

4.7. Result of stability test

According to the ARDL approach, it is imperative to conduct a stability test of the parameters. The CUSUM test was employed to examine the presence or absence of structural failure in the estimated model residuals. Given that the pertinent graph remains within the gray area, it can be concluded that the relationship between the dependent variable and the independent variables exhibits a stable behavior over time. The findings are illustrated in Figure 4.

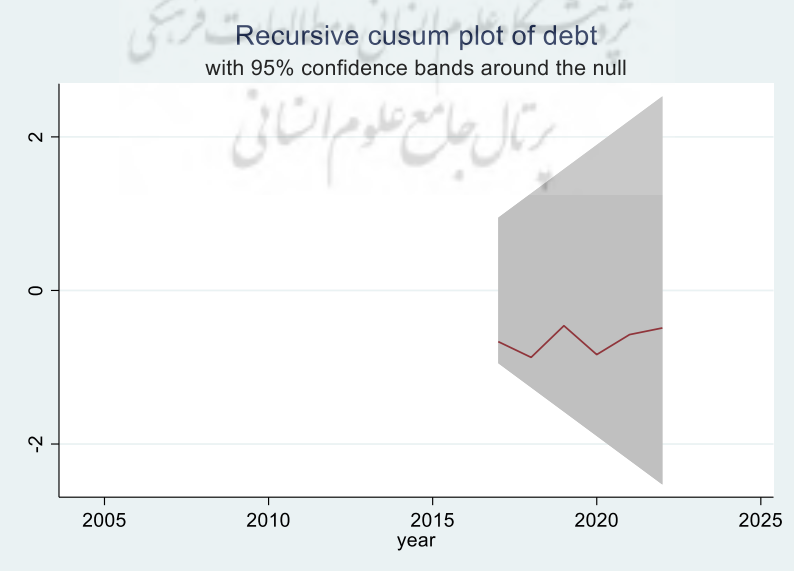

Figure 4

The stability of parameters

5. Conclusions

The findings indicate that crude oil exports exert a significant negative effect on the real exchange rate. Conversely, the variable representing oil imports demonstrates a significant positive impact on the real exchange rate in Iran. The previous period budget deficit positively influences the real exchange rate, contributing to its increase. Furthermore, the GDP variable, shows a significant positive effect on the real exchange rate in Iran. Finally, the monetary base variable for the current period has a significant negative influence on the real exchange rate.

The long-term analysis reveals that oil export exerts a significant negative impact on the real exchange rate in Iran, the findings indicate a significant positive influence of crude oil imports on the real exchange rate in Iranian economy. Additionally, the GDP variable demonstrates a significant positive relationship with the real exchange rate over the long term. Notably, the budget deficit and monetary base variables do not exhibit a significant effect on the real exchange rate in the long-term relationship.

Examining the short-term dynamics indicates that the previous period real exchange rate has a significant positive effect on the current period's real exchange rate. Furthermore, the current period budget deficit has a significant negative impact on the real exchange rate.

In short-term dynamics, the monetary base exerts a significant negative impact on the real exchange rate in Iran. It can be inferred that an increase in the Central Bank's assets leads to the strengthening of the domestic currency. This results in a reduction of the nominal exchange rate, which in turn declines the real exchange rate. The results indicate that the influence of crude oil exports on the real exchange rate surpasses that of economic growth. Accordingly, it is recommended that policymakers should enhance oil production through targeted investments and incentives aimed at attracting investors, thereby bolstering exports of this commodity. Such measures are anticipated to elevate the value of the domestic currency, thereby lowering the nominal exchange rate and, subsequently, the real exchange rate. Furthermore, considering that the budget deficit positively affects the exchange rate in the long term, it is advisable to explore alternatives to monetary expansion for addressing the budget deficit, thereby preserving the value of the domestic currency and mitigating an increase in the exchange rate. Finally, future research should investigate the causal relationships between the independent variables examined in this study and the real exchange rate.

Nomenclature

ARDL	Autoregressive distributed lag stationarity model
GDP	Gross domestic product
OPEC	Organization of Petroleum Exporting Countries
RER	The real exchange rate

References

Akram, Q. F. (2009). Commodity prices, interest rates, and the dollar. Energy Economics, 31(6), 838–851.

Ali, S and Nazar, R.(2017). Impact of Foreign Capital Inflows and Money Supply on Exchange Rate: A Case Study of Pakistan. Review of Economics and Development Studies,3(1),83–90. DOI: https://doi.org/10.26710/reads.v3i2.167

Ali, T.M., Mahmud, M.T., Bashi, T.(2015). Impact of Interest Rate, Inflation and Money Supply on Exchange Rate Volatility in Pakistan. World Applied Sciences Journal,33(4),620–630

Amani, M., Shahbazi, K., and Mohseni Zonouzi, S. J. (2020). Quantile regression approach in investigation of the effects of oil price shocks on exchange rates of selected OPEC member countries. Journal of Econometric Modelling, 5(4), 33–62. Doi: 10.22075/jem.2021.21699.1516

Barbosa, S, Jayme Jr, F.G and Missio, F.J.(2018). Determinants of the real exchange rate in the long-run for developing and emerging countries: a theoretical and empirical approach. International Review of Applied Economics.32(1),12–25. https://doi.org/10.1080/02692171.2017.1332017

Bars, W.H.(1981). Macroeconomic Determinants of Real Exchange Rates. Working F. Per (801). National Bureau of Economic Research 1050 Massachusetts Avenue Cambridge MA 02138.,1–60.

Basher, S.A., Haug, A.A., and Sadorsky, P. (2016). The impact of oil shocks on exchange rates: A Markov-switching approach. Energy Economics,54(4).11–23. dx.doi.org/10.1016/j.eneco.2015.12.004

Basher, S.A., Haug, A.A., Sadorsky, P., 2012. Oil prices, exchange rates, and emerging stock markets. Energy Econ. 34(1), 227–240.

Beckmann, J., Czudaj, R., and Arora, Arora, V.(2020). The Relationship between Oil Prices and Exchange Rates. The International Ruhr Energy Conference,1–38.

Bilgili, E. (2000) Reel Döviz Kuru ve Ekonomik Büyüme, İktisat İşletme ve Finans, 176, 56–73

Cornell, B. (1982). Money Supply Announcements, Interest Rates, and Foreign Exchange. Journal of International Money and Finance, 1, 201–208.

Darrat, A. F., and Sulaman, M. O. (1991). Have budget deficit and money growth caused changes in interest rates and exchange rates in Canada. North American Review of Economics and Finance, 2(1), 69–82. https://doi.org/10.1016/1042-752X(91)90014-Qonomic Development, 22(2), 145–163

Delgado, N., Delgado, F., and Saucedo, F.(2018). The Relationship between Oil Prices, the Stock Market and the Exchange Rate: Evidence from Mexico. The North American Journal of Economics and Finance,45(3), 266–275.DOI: 10.1016/j.najef.2018.03.006

Dissanayake, D. M. S. B. (2016). Identifying the relationships between budget deficit and selected macroeconomic variables: A study of Sri Lanka during the post-liberalization era. Paper presented at the 13th International Conference on Business Management. https://doi.org/10.2139/ssrn.2910354

Domac, I., (1997) Are Devaluations Contractionary? Evidence from Turkey, Journal of EC

Eldepcy, M.A. (2022). The Budget Deficit Financing Impact on the Real Exchange Rate in Egypt (1975–2020). International Journal of Economics and Finance,14(3),84–99. doi:10.5539/if. v14n3p84

Eugene, I. (2016). Dynamic Relationship between Crude Oil Price, Exchange Rate and Stock Market Performance in Nigeria. An International Multidisciplinary Journal, Ethiopia,10(43),224–240. DOI: http://dx.doi.org/10.4314/afrrev.v10i4.16

Hussain, M., Firmansyah, R., Amalia Lubis, F.R., and Basia, l.(2023). Analysis of Oil and Gas Exports Imports on the Indonesian Rupiah Exchange Rate in 1980–2020. Journal of Asset Management and Public Economy (JAMPE),2(1),19–27

Ji, Q., Shahzad, S., Bouri, E., and Tahir Suleman, M.(2020). Dynamic structural impacts of oil shocks on exchange rates: lessons to learn. Journal of Economic Structures, 9(20).1–19 https://doi.org/10.1186/s40008-020-00194-5

Khanbabaei F, Shahbazi K. Investigating the impact of real effective Dollar rate on OPEC oil prices: non-linear asymmetric cointegration approach. QEER 2022; 18 (73):171–196

Kripfganz, S., and Schneider, D. C. (2018). ARDL: Estimating Autoregressive Distributed Lag and Equilibrium Correction Models. Proceedings of the 2018 London Stata Conference, London, 6–7

Krugman P., (1980) Oil and the Dollar, NBER Working Paper Series No. 554

Kyophilavong, P. (2009). Evaluation of Macroeconomic Policy in Laos, Discussion Paper. Economic Research Center, Graduate School of Economics, Nagoya University,171(1),

Li, J., Lu, X., and Zhou, Y. (2016). Cross-correlations between crude oil and exchange markets for selected oil-rich economies, Elsevier,453(1),131–143. http://dx.doi.org/10.1016/j.physa.2016.02.039

Mccombie, J. S. L, Roberts, M. (2002) The role of the balance of payments in economic growth. In Setterfield, M. (org.). The Economics of Demand Led-Growth. Edward Elgar: Aldershot.s

Missio, F. J. (2013). A Thesis Submitted for the Degree of PhD in Economics at the Center for Regional Planning and Development (Cedeplar) of the Universidade Federal de Minas Gerais (UFMG), 2012.

Nkoro, E., and Uko, A. (2016). Autoregressive Distributed Lag (ARDL) cointegration technique: application and interpretation. Journal of Statistical and Econometric Methods, Sciences Ltd, 5(4), 1–3.

Nouira R, Hadj Amor T and Rault C (2019) Oil price fluctuations and exchange rate dynamics in the MENA region: Evidence from non-causality-in-variance and asymmetric non-causality tests. The Quarterly Review of Economics and Finance 73: 159–171.

Nusair SA and Kisswani KM (2015) Asian real exchange rates and oil prices: A cointegration analysis under structural breaks. Bulletin of Economic Research 67(1): 1–25

Purnama, I., Putra., Sapura., Yani, F., and Eddy, P. (2024). The Influence of The Value of Oil and Gas Exports and Imports on The Country's Foreign Exchange from 2010–2017. Landscape of Business Administration, 2(1),59–70. DOI: https://doi.org/10.61230/luxury.v2i1.68

Reboredo, J.C., 2012. Modeling oil price and exchange rate co-movements. J. Policy Model 34, 419–440

Saysombath, P., and Kyophilavong, P. (2013). Budget Deficit and Real Exchange Rate: Further Evidence from Cointegration and Causality Test for in the Lao PDR. World Applied Sciences Journal (Economic, Finance and Management Outlooks),28(3),43–51.

Srivyal, V., and Venkata, S. (2004). Budget deficit and other macroeconomic variables in India. Applied Econometrics and International Development, 4(1), 37–54

Suleiman, T.H., and Abid, M. (2020). The impacts of oil price on exchange rates: Evidence from Saudi Arabia. Energy Exploration and Exploitation, 38(5), 2037–2058. https://doi.org/10.1177/0144598720930

Turhan, I., Hacihasanoglu, E., and Soytas, U. (2012). Oil prices and emerging market exchange rates. Central Bank of the Republic of Turkey, Working Paper,12(1),1–28.

Vasani, S., Selvam, M., and Kathiravan. (2019). Relationship between real exchange rate and economic growth in India. International Journal of Business Economics and Management Research,9(3),19–35

Vochozka, Z., Petr Suler, R, Marousek, J. (2020). The influence of the international price of oil on the value of the EUR/USD exchange rate. Journal of Competitiveness,2(12)167–190. doi.org/10.7441/joc.2020.02.10