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RESEARCH PAPER

Exchange Rate and Inflation in Iran: Cause or Consequence

Teymur Rahmani[*,a], **Mehdi Darabi**[a], **Hossein Mohammad Khanlou**[a]

a. Faculty of Economics, University of Tehran, Tehran, Iran.
* Corresponding author.

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Abstract

The present study addresses a contentious issue within the theoretical and empirical discourse on exchange rate and inflation. While the monetary theory posits that the long-term drivers of exchange rate appreciation and the general price level are the growth of broad money, influenced by fiscal dominance, some researchers argue that the exchange rate serves as the cause of price level changes and even broad money growth. Others contend that, although the long-term determinant of inflation is broad money growth, exchange rate shocks play a significant role in inflationary surges. This study focuses on examining whether what may be interpreted as semi-exogenous exchange rate shocks are the drivers of inflationary surges. To this end, the impact of the deviation of the exchange rate from its filtered value, and also from its value derived from a revised monetary theory, is estimated as an exogenous exchange rate shock on the deviation of inflation from its filtered value. Empirical results for the period 1984–2023 indicate that the deviation of the exchange rate from its filtered value has a significant effect on the deviation of inflation from its filtered value, whereas the deviation of the exchange rate from the value based on the revised monetary theory does not exhibit a significant impact. Consequently, these findings cast doubt on the notion that exogenous exchange rate deviations are the primary drivers of inflationary surges in Iran.

Keywords: Exchange Rate, Inflation, Inflationary Surges, Monetary Model, Oil Rents.
JEL Classification: E31, E52, F31.

1. Introduction

The Iranian economy has undergone a significant shift toward high and double-digit inflation since approximately 1971, experiencing one of the most persistent high-inflation episodes globally. Over this period, only six years have recorded single-digit inflation, three of which were near 9 percent. Notably, there has been

no sustained indication of inflation declining over time. As many economists have emphasized, the dynamics of inflation are far too complex to identify, predict, or control with certainty. Inflation has persisted across periods of abundant oil revenues and times of restricted oil income, though it has proven more challenging to manage during the latter. A key observation is that, since 1971, broad money growth has remained consistently high, significantly exceeding real economic growth. Moreover, trend extraction methods reveal that inflation exhibits an upward trend independent of the method of filtering, mirroring the upward trajectory of broad money growth. However, the relationship between broad money growth and inflation is not a straightforward process wherein the central bank determines money supply growth, which then stimulates aggregate demand through conventional channels, subsequently driving up prices. Instead, a substantial portion of broad money growth stems from what is termed fiscal dominance, or more precisely in the Iranian context, "Generalized Fiscal Dominance". This dominance manifests as heightened demand for goods and services, compelling the central bank—within the prevailing political economy—to accommodate this demand, ultimately validating price increases.

This study focuses not on a detailed exposition of inflation dynamics across various periods but on the relationship between exchange rate and inflation. It should be insisted that this study is not about the determinants of inflation, is not about the long run behavior of inflation, and is not about exchange rate pass-through. The study somehow tests the contention that exchange rate surges are the main determinant of deviation of inflation from its trend. Among some Iranian economists, there exists a claim that not only do exchange rate surges contribute to inflationary episodes, but also the entirety of inflation may be attributed to exchange rate increases. Occasionally, conspiracy theories emerge, suggesting that governments deliberately raise exchange rate—or at least acquiesce to such increases—to benefit specific interest groups, thereby shaping inflation. While no economic theory or proposition regarding the exchange rate-inflation nexus is flawless, some models are deemed more plausible, necessitating continuous refinement. Nevertheless, the accumulation of data and detailed trend analysis can provide analysts with a degree of confidence that, in Iran, a singular underlying force—generalized fiscal dominance—drives both inflation and exchange rate appreciation, ultimately reflected in high broad money growth, although this issue is not addressed here. However, researchers may arrive at divergent conclusions depending on the period studied and statistical methods employed, particularly if influenced by preconceived judgments.

Focusing on the underlying force behind both inflation and exchange rate movements in the long run allows for a relatively preferred analytical framework. The simple narrative is that generalized fiscal dominance generates demand for goods and services far exceeding the economy's productive capacity or real growth. As Iran's economy relies on natural resource rents, these rents have enabled policymakers to maintain inflation well below the gap between broad money growth and economic growth at times, misleading some analysts into underestimating the role of money growth in driving inflation. This reliance on resource rents has cast doubt on the validity of monetary theory for both inflation and exchange rate, particularly in the short term, though its relevance holds in the long run. During periods when exogenous factors—such as declining oil prices or sanctions—curtail access to these rents, exchange rate and inflationary surges emerge, leading many analysts to conclude that exchange rate shocks significantly influence or even primarily cause inflationary spikes. Yet, restricted access to resource rents facilitates price corrections for goods, services, and exchange rate based on their fundamental drivers. Given the asset-like nature of currency and the absence of price stickiness, exchange rate surges occur more rapidly and precede inflationary jumps, prompting econometric studies to suggest that exchange rate shocks cause inflationary surges.

This study endeavors to provide an analysis grounded in monetary theory, accounting for Iran's resource-rent-based economy, to explain the formation and realization of inflation. It also derives an exchange rate based on the monetary model, using deviations of the unofficial market exchange rate from this model-derived rate as an exogenous exchange rate shock. The impact of this shock on deviations of inflation from its trend is then empirically examined. The second section reviews theoretical analyses of inflation and briefly surveys empirical literature. The third section discusses the theoretical determination of exchange rates, focusing on the inflation-exchange rate nexus. The fourth section analyzes Iranian economic data, while the fifth presents empirical estimation and analysis. The study concludes with a summary and findings. Given that the primary aim is to clarify the exchange rate-inflation relationship, the paper is rooted in existing theoretical literature without intending to advance new theory.

2. Review of Theoretical Analysis of Inflation

It is a fundamental principle that no price increases spontaneously, regardless of whether the market structure is competitive or monopolistic. In competitive markets, the forces of supply and demand—beyond the control of any single buyer

or seller and reflected in shifts of supply and demand curves—underlie price increases. In monopolistic structures, a monopolist adjusts prices based on cost-benefit considerations, provided there are changes in demand or cost structures. If inflation represents the average growth rate of goods and services prices, and if, during periods of inflation—especially high inflation—nearly all prices rise simultaneously and this trend persists over time, while random shifts in supply, demand, or firm costs leading to sustained price increases across all goods and services are highly improbable, it can be inferred that an identifiable phenomenon drives these concurrent structural changes in demand and supply. Macroeconomic theory has approached this issue from the outset of inflation's emergence as a topic with this perspective.

In identifying this overarching factor behind rising goods and services prices, economic analysis—both theoretical and data-driven—has demonstrated that no general price increase can occur or persist without being accompanied by the growth of monetary variables, such as broad money. This conclusion holds irrespective of the causal role assigned to any specific variable. Consider a scenario where consumers decide to increase their expenditures, a key component of aggregate demand, thereby pressuring prices, without any other changes, including monetary variable growth. The persistence of such behavior would imply lower savings and future welfare, rendering sustained price increases impossible. Similarly, if firms boost investment—another component of aggregate demand—pressuring goods and services prices without altering other variables, including monetary ones, the absence of increased savings would raise interest rates, reducing net investment returns and halting this behavior. Moreover, if the demand for goods and services spurred by this investment fails to materialize, it diminishes investment returns, further obstructing continued investment and price pressure. Suppose government spending, another aggregate demand component, rises, increasing demand and prices without changes in other variables, including monetary ones. This would necessitate financing the deficit, pushing up interest rates and curbing other demand components, thus preventing sustained demand growth from government spending and subsequent inflation. Finally, if net exports—the last aggregate demand component—increase, driving demand and price pressures without altering other variables, including monetary ones, the likelihood of sustained net export growth is low. Persistent net export increases would lead to balance-of-payments surpluses, pressuring the exchange rate to depreciate and raising the relative price of domestic goods, which would undermine further net export growth. Thus, no mechanism for sustained aggregate

demand growth capable of driving prolonged price increases exists without accompanying monetary variables growth.

Turning to the supply side and production cost increases, consider a wage hike pressuring goods and services prices without changes in other variables, including monetary ones. Such increases would lead to layoffs, gradually swelling unemployment and creating a significant barrier to further wage demands, rendering sustained price growth unfeasible. This is why Davidson and Weintraub (1973) post-Keynesian cost-push analysis—the most coherent framework for cost-driven inflation—only permits price increases from wage hikes when accompanied by monetary variables growth. Now, imagine a key input price, such as oil, rises, increasing production costs and pressuring prices without changes in other variables, including monetary ones. While sustaining this for decades is implausible, even if possible, production methods would adapt, finding substitutes and preventing continuous oil price increases, thus halting inflation from this source—though this is largely irrelevant to Iran's economy. Evidently, exogenous production cost changes, while capable of causing inflationary shocks and playing a significant short-term role in explaining inflation, cannot sustain price increases or inflation over time. In Iran, where wage increases in the formal sector do not lead to unemployment, this is because wages typically respond to inflation rather than initiate it, and subsidized bank loans and other production factors—essentially monetary variables growth—facilitate this.

Based on the above, various factors can temporarily pressure goods and services prices and act as inflation drivers, but none of those mentioned can sustain this capacity over long periods, especially beyond five decades. Moreover, it is highly improbable—or, in statistical terms, nearly impossible—for a country to face a sequence of these events without monetary variables growth, enabling persistent inflation. Even repeated such episodes, eroding the purchasing power of monetary variables, would negate this possibility. Thus, a proposition for inflation emerges: "Sustained inflation is only possible if accompanied by monetary variables growth, even if the initial price increase is not driven by such growth." This perspective explains why mainstream macroeconomic texts, when examining long-run (steady-state) behavior, attribute price growth or inflation to money supply growth (in Iran, broad money growth), requiring little further discussion (e.g., Kurlat, 2020; Walsh, 2017). Attributing inflation to money supply growth may serve as a simplification, avoiding details, implying that only with money supply growth can price increases and inflation persist beyond a transient nature. This view does not suggest that money supply changes are entirely exogenous or

fully controlled by monetary policymakers. The fiscal dominance literature (e.g., Sargent & Wallace, 1981), originally developed for advanced economies like the U.S. rather than developing ones, highlights how money supply growth becomes endogenously inevitable. Similarly, the fiscal theory of price level determination, (see for example Cochrane (2023) and Woodford (1995, 1998)), does not imply that inflation can occur or persist without money supply growth; rather, it explains price levels and inflation as contingent on the government budget constraint alongside money market equilibrium conditions. Consequently, no economic analysis asserts that sustained price increases are possible without money supply growth.

Excluding temporary inflation fluctuations, which may stem from various factors including supply-side shocks—irrelevant to Iran's persistent inflation problem—we can address the dominant theory explaining inflation in Iran, offering a theoretical framework not unique to the country. This dominant theory, known in macroeconomic literature as fiscal dominance, is better termed generalized fiscal dominance for Iran. This concept is consistent with monetary explanations of inflation, rooted in modern macroeconomic theory, and aligns with empirical data.

What does the generalized fiscal dominance mean? Its simplest and most recognized form occurs when the government runs a budget deficit, financed through bank borrowing, ultimately from the central bank. Another manifestation involves government-owned companies and institutions, whose revenues and expenditures are not reflected in the public budget, incurring deficits financed via bank borrowing and the central bank. A further example is when the government mandates banks to provide low-cost loans for support programs unrelated to the public budget. Additionally, generalized fiscal dominance occurs when banks or credit institutions, technically insolvent under accounting principles or commercial law, are prevented from bankruptcy, necessitating money creation to sustain operations. In essence, any direct or indirect government authorization of expenditure reliant on money creation constitutes generalized fiscal dominance. Such spending directives pressure goods and services prices and the exchange rate, naturally driving price increases. Given Iran's reliance on natural resource rents and foreign exchange earnings unlinked to goods and services production, these revenues have enabled exchange rate stabilization and mitigated severe price pressures during abundant periods, though even then, inflation persisted. Reliance on resource rent-derived foreign exchange activates a mechanism pressuring the fundamental exchange rate, rendering long-term control of the exchange rate and

inflation via these revenues unfeasible. This mechanism first weakens the tradable sector, heightening import reliance to manage inflation. For instance, if $40 billion initially sufficed for relative exchange rate control, progressively larger sums become necessary, which is unsustainable. Second, it boosts the non-tradable sector, leading to sharp price increases, exemplified by the significant rise in housing prices. Stabilizing the exchange rate and rising domestic housing costs make property purchases abroad relatively cheaper for Iranians, accelerating capital flight—evident in the widespread migration to California in the 1970s and Canada in the 2000s. This capital outflow further pressures the exchange rate, increasing the foreign exchange needed for control, which is naturally unattainable. Once a fundamental force for exchange rate appreciation emerges, any disruption in exports or foreign exchange earnings undermines exchange rate and inflation control. Given the currency's asset-like nature and lack of price stickiness in liquid asset markets, it responds rapidly, triggering exchange rate surges. With diminished capacity to control inflation through foreign exchange, prices of goods and services—especially in the tradable sector—begin to rise. Due to price stickiness in some goods and services, inflation lags behind exchange rate surges, leading to the perception that exchange rate jumps cause inflationary spikes. However, the core issue is that reduced foreign exchange earnings eliminate the ability to sustain price control, prompting price adjustments toward fundamental levels. The tradable sector's quicker response to exchange rate surges stems from this dynamic. Rahmani et al (2023) demonstrate that exchange rate surges increase inflationary inequality, largely due to significant food price rises—key tradable goods with a high share in lower-income deciles' consumption baskets—highlighting this phenomenon.

It should be noted that the causal relationship between inflation and exchange rates, both originating from a common source, does not negate the well-established exchange rate pass-through (ERPT) effect in the literature. ERPT remains relevant whether inflationary forces or exchange rate changes are deemed the fundamental driver. In other words, ERPT focuses on the statistical relationship between exchange rate changes and inflation, not on theoretically tracing the cause of exchange rate shifts. Numerous studies on ERPT and inflation exist, requiring no comprehensive review. For instance, Ha et al. (2020) examined ERPT's impact on consumer prices, emphasizing the source of exchange rate changes across 50 countries, finding that monetary policy shocks exhibit stronger pass-through than other domestic shocks. They also noted that ERPT is lower in countries with credible floating exchange rate and inflation-targeting regimes, suggesting that

shock nature must be considered—a statistical take on ERPT. Similarly, Kwon and Shin (2023) explored the nonlinear ERPT using survey-based inflation expectations in Korea under varying monetary policy credibility, finding stronger short-term pass-through in less credible regimes, implying that monetary policy credibility is crucial for controlling inflation and price stability amid exchange rate changes. This study focuses on pass-through intensity, not the underlying cause of exchange rate shifts. Falckadouro (2024), focusing on Canada—a commodity-exporting economy—identified a contrasting ERPT effect. While standard analysis suggests exchange rate appreciation increases domestic prices, Falckadourofound that positive commodity demand shocks appreciate the domestic currency, reducing the exchange rate, yet this demand surge pressures goods and services prices. The study concludes that ERPT depends on shock origin and economic structure. Nasir et al. (2020), using monthly data from 1999–2018 for the Czech Republic—the first developing country to adopt inflation targeting—analyzed ERPT's impact on inflation expectations, showing its significant influence, though expectations are heavily shaped by past and current inflation, suggesting adaptive expectations. This study, despite considering other factors, underscores ERPT's role, focusing on statistical relationships. Anderl and Caporale (2023) investigated nonlinear ERPT in five inflation-targeting and three non-targeting countries from 1993–2021 using monthly data, finding stronger pass-through in nonlinear models and during high future inflation expectations, concluding that anchoring expectations via monetary policy reduces ERPT.

In Iran, numerous studies have explored the inflation-exchange rate nexus, including ERPT. For example, Ebrahimi and Madanizadeh (2016) examined ERPT in Iran over the time period 1992–2014, estimating it at 30–40 percent, finding that trade openness increases ERPT while reduced inflation and exchange rate volatility decrease it, affirming monetary policy's role in inflation control. Barakchian et al. (2021) analyzed the causal relationship between exchange rates and the consumer price index from 1991–2020, showing that during currency crises, exchange rates significantly drive price dynamics in both short and long terms, with causality from exchange rates to prices confirmed. They also noted weakened ERPT during oil revenue booms, with surges re-emerging during exchange rate shocks. Sadat Hoseyni et al. (2018) found ERPT depends on the inflationary environment, using quarterly data from 1988–2015 and a smooth transition regression model, concluding that pass-through to import price indices is higher in high-inflation regimes.

In summary, empirical studies yield varied results on the inflation-exchange rate relationship, with most focusing on ERPT—a statistical linkage. A notable number of studies highlight the importance of monetary policy and its credibility in determining ERPT magnitude.

3. Empirical Evidence on the Monetary Model of Exchange Rate

This section examines the impact of oil rents on Iran's commodity and asset markets, as well as those of other oil-exporting countries. The objective is to empirically demonstrate how oil rents mitigate the inflationary effects of money supply growth. To achieve this, based on the monetary theory of exchange rates, the variables of inflation and money supply growth are analyzed within the framework of the purchasing power parity (PPP) exchange rate and the monetary model of exchange rate determination. The primary rationale for this approach is the critical role of the exchange rate channel in the relationship between money supply growth and inflation, as natural resource rents from oil exports influence inflation through their effect on exchange rates and, consequently, imports.

3.1 Monetary Theory and Exchange Rates

This section examines the long-term relationship among exchange rates, the general price level, and broad money in Iran, drawing comparisons with other oil-exporting countries. To better understand the interplay of these three nominal variables, it is essential to first align them using the "exchange rate determination" literature. For this purpose, the relative Purchasing Power Parity (PPP) relationship is employed to compare the trend of the general price level with that of the exchange rate, while the monetary model of exchange rate determination is used to align the trend of broad money with the exchange rate.

Following the post-World War I reevaluation of national currencies to restore the gold standard, Cassel (1921; 1922) proposed PPP as a practical solution (Rogoff, 1996). This study adopts the relative PPP framework, utilizing the Consumer Price Index (CPI) as the price index (P), as depicted in Equation (1).

$$E_t = \frac{P_t/P_0}{P_t^*/P_0^*} E_0 = \frac{CPI_t/CPI_0}{CPI_t^*/CPI_0^*} E_0 \quad (1)$$

Here, E_t represents the exchange rate, with the asterisk (*) denoting the foreign country (the United States) and the subscript 0 indicating base-year values. Equation (1) suggests that the gross growth of the exchange rate relative to the base year equals the ratio of gross price level growth in the domestic country to that in the foreign country. In a monetary context, PPP is considered an equilibrium

relationship, though it was initially treated as a behavioral one in early empirical applications.

The monetary model of exchange rate determination extends the PPP framework. It treats PPP as an equilibrium condition, positing that both inflation and exchange rate growth result from excess money supply growth over output growth domestically relative to abroad. If broad money growth and output growth proxy for aggregate demand and supply growth, respectively, the monetary model attributes exchange rate and inflation growth to excess aggregate demand over aggregate supply. Simply put, as shown in Equation (2), the monetary model replaces CPI in Equation (1) with the ratio M/Y (broad money to real GDP).

$$E_t = E_0 \times \left(\frac{M_t/Y_t}{M_t^*/Y_t^*}\right) \Big/ \left(\frac{M_0/Y_0}{M_0^*/Y_0^*}\right) \quad (2)$$

Equation (2) represents the baseline monetary model (see Mark, 1995; Mark and Sul, 2001; Rapach and Wohar, 2002), derived from Lucas (1982) general equilibrium models and Obstfeld and Rogoff (1995) frameworks (Rapach and Wohar, 2002). This equation is used to analyze the long-term relationship between exchange rates, broad money, and output. Empirical literature supports the reliability of the PPP relationship over long horizons, particularly in high-inflation countries where prices adjust more rapidly, shortening the long-run period (Caves et al., 2007). Darabi et al. (2024), in an empirical study of 153 countries (excluding those without World Bank data) from 1980 to 2021, confirmed the high accuracy of both PPP and the baseline monetary model.

3.2 Trends in Exchange Rates, PPP-Based Exchange Rates, and Monetary Model Exchange Rates in Iran

As previously noted, this study examines the long-term trends of exchange rates, the general price level, and broad money by converting the latter two into exchange rate equivalents using the PPP relationship and the monetary model. Accordingly, the PPP-based exchange rate trend represents the general price level trend, while the monetary model exchange rate trend reflects the broad money trend (net of output).

From 1984 to 2000, real oil prices remained stable. As shown in **Error! Reference source not found.**, the real value of Iran's oil exports during this period stabilized at approximately $35 billion. The Figure 1 illustrates that all three trends—exchange rate, PPP-based exchange rate, and monetary model exchange rate—align closely. This convergence indicates that the growth trends of exchange rates, inflation, and broad money are proportionate. Figure 2 reveals that this

pattern is not unique to Iran, having been observed in 26 major oil-exporting countries. With the global oil price surge in the 2000s, the real value of oil exports rose, peaking in 2011 before declining in 2012. During this period, divergence emerged among the three exchange rate measures. Broad money growth significantly outpaced inflation, which in turn exceeded exchange rate growth. If broad money growth proxies aggregate demand growth, this suggests that, despite excess aggregate demand over supply (averaging about 20%), exchange rates and price levels did not grow proportionately. This discrepancy arose because excess demand was met through oil revenue-driven imports. The concept of rent is used here, as oil revenue growth resulted from global price increases rather than value-added from labor or capital (see World Bank (2010)). Figure 2 indicates that other oil-exporting countries experienced similar patterns, with divergence intensifying in the 2000s, corresponding to Iran's 1980s.

As depicted in Figures 1 and Figure 2, following the oil export decline, the three trends converged again. The monetary model exchange rate remaining above the other two reflects the persistent rise in real oil export values since the 1990s. The divergence during 2014–2017, however, was not solely due to oil rents; high real deposit interest rates also contributed significantly to this gap (Rogoff, 1996), cites interest rate changes as a factor disrupting PPP relationships.

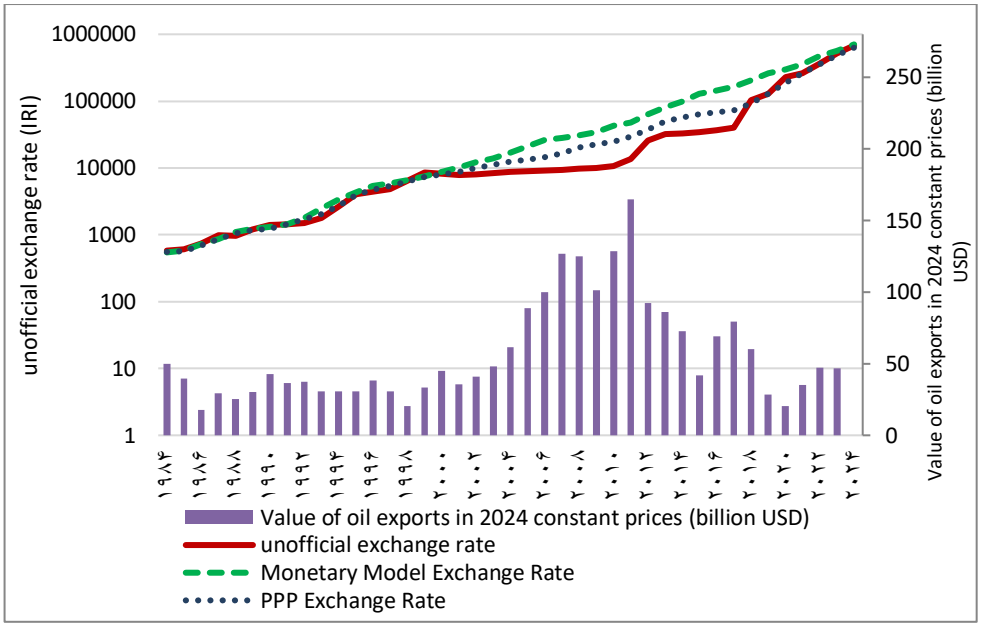

Figure 1. Annual Trends of Unofficial Exchange Rate, Monetary Model Exchange Rate, PPP-Based Exchange Rate, and Real Value of Oil Exports in Iran
Source: Research finding.

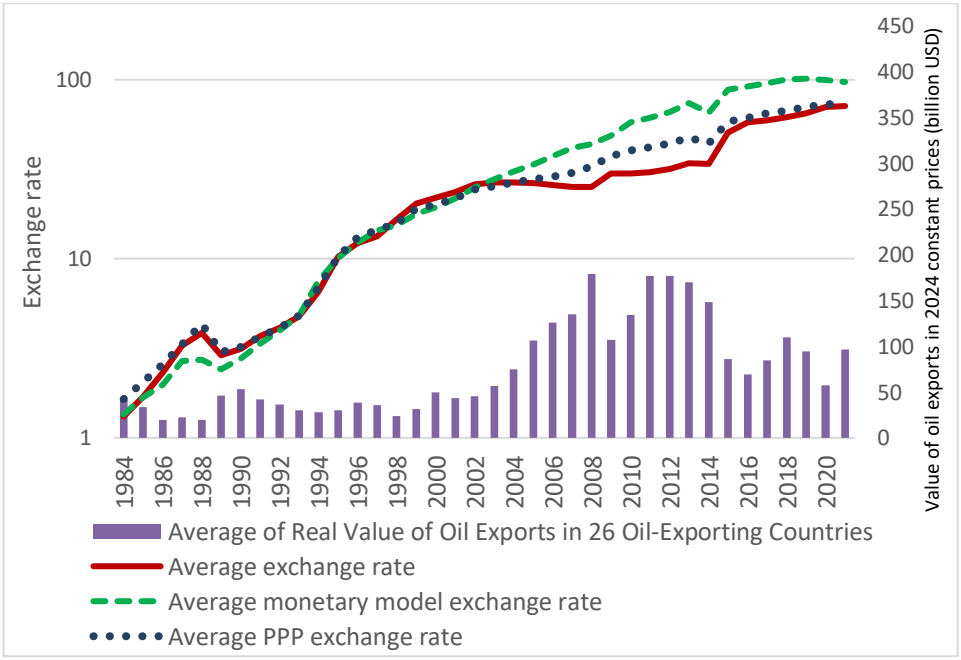

Figure 2. Annual Trends of Average Exchange Rate, Average Monetary Model Exchange Rate, Average PPP-Based Exchange Rate, and Average Real Value of Oil Exports in 26 Oil-Exporting Countries (1984–2021). A weighted geometric mean is applied, with each country's share based on production volume. 1971 is selected as the base year.

Source: Research finding.

Divergence between the exchange rate and PPP-based exchange rate reflects a change in the real exchange rate level, with literature attributing this to shifts in the terms of trade (TOT) due to changes in real oil export values (Amano and Van Norden, 1998a; 1998b; Caves et al., 2007). As shown in Figure 3, Iran's real exchange rate trend inversely mirrors the real value of oil exports. The disconnection between these trends during 2014–2017 resulted from high real deposit interest rates.

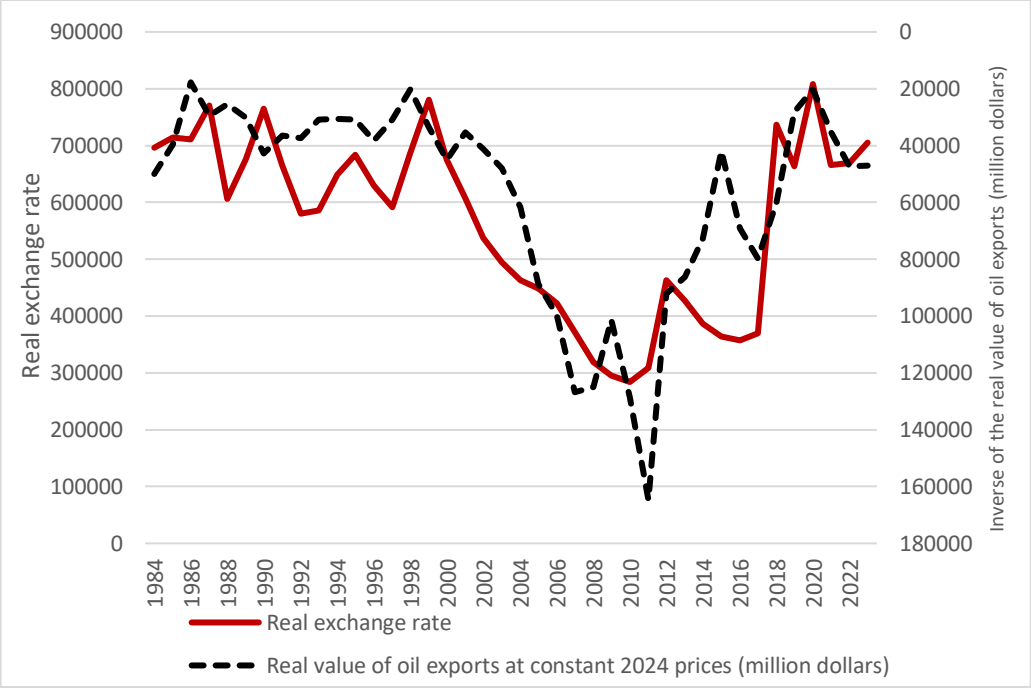

Figure 3. Real Exchange Rate at Constant 2024 Prices and Inverse of Real Value of Oil Exports at Constant 2024 Prices. The real exchange rate is calculated as: $\boldsymbol{Real\ Exchange\ Rate_t = Nomianl\ Exchange\ Rate_t \times \frac{CPI_t^{us}}{CPI_t^{IR}} \times \frac{CPI_{2024}^{IR}}{CPI_{2024}^{US}}}$.

Source: Research finding.

3.3 Revised Monetary Model Incorporating Oil Rents

A key limitation of the monetary model of exchange rate determination is its failure to account for oil rents and supply shocks related to oil. Oil rents exert a stronger influence than other natural or non-natural rents—typically distributed more evenly across countries—due to their highly uneven distribution and wide price volatility. Consequently, Darabi et al. (2024) revised the monetary model in Equation (2). Figure 4 illustrates the trends of the unofficial exchange rate,

monetary model exchange rate, revised monetary model exchange rate, and real oil export values for Iran, suggesting that the revised model substantially addresses the explanatory shortcomings of the original monetary model. Figure 5 presents similar findings for other oil-exporting countries. The disconnection between the monetary model exchange rate and the unofficial exchange rate during 2014–2016 is attributable to high real deposit interest rates. As Darabi et al. (2024) demonstrates, the exchange rate maintains a significant long-term relationship with the right-hand side of Equation (2) (baseline monetary model), oil rents, and interest rates. Thus, exchange rate surges, particularly in 2012, 2018, and 2020, stem from fundamental factors—broad money, output, interest rates, and oil exports—and the monetary model, as a structural framework based on economic fundamentals, effectively explains these dynamics.

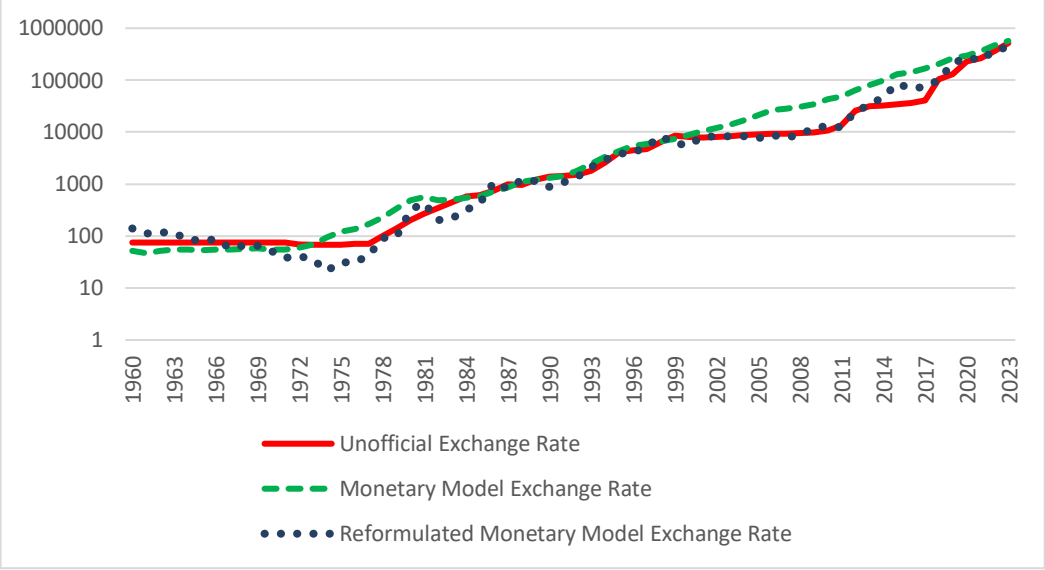

Figure 4. Unofficial Exchange Rate, Monetary Model Exchange Rate, and Reformulated Monetary Model Exchange Rate in Iran, 1960–2023.
Source: Darabi et al. (2024).

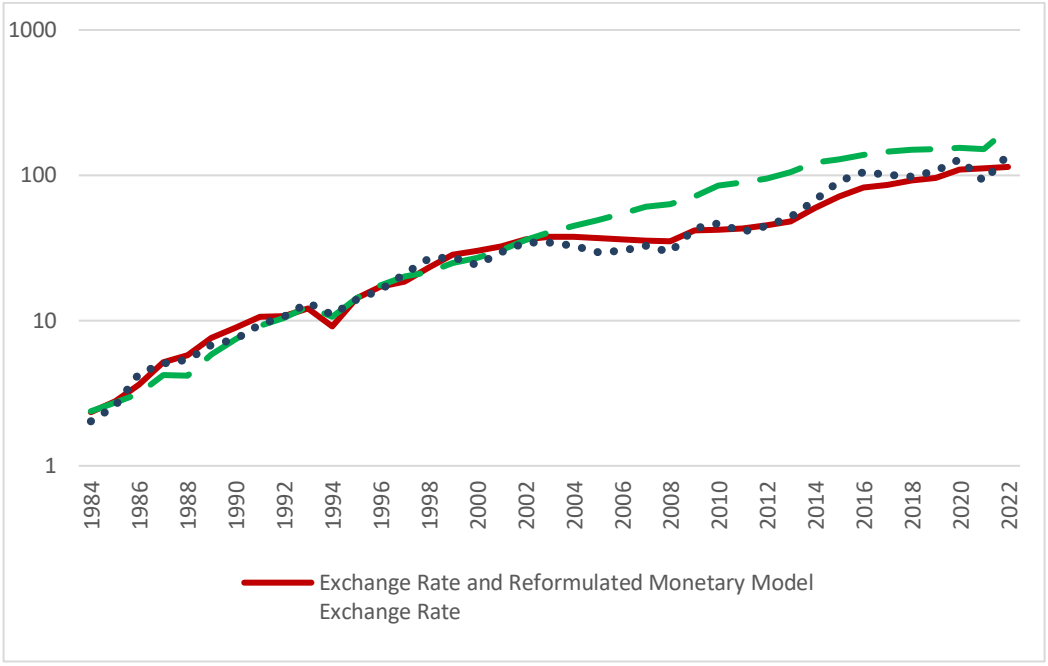

Figure 5. Average of Exchange Rate and Reformulated Monetary Model Exchange Rate in 26 Oil-Exporting Countries, 1984–2022
Source: Darabi et al. (2024)

4. Data Analysis of Iran's Economy Based on Theoretical Foundations

As demonstrated in the previous section, the monetary model of exchange rate determination, particularly in its reformulated form, effectively explains the behavior of the informal market exchange rate in Iran. Therefore, this section does not focus on the determinants of the exchange rate but rather aims to show that, in the long run, inflation in Iran is predominantly driven by sustained high money supply growth far exceeding real economic growth. This high money supply growth is influenced by the generalized fiscal dominance of the government, as discussed earlier. Accordingly, this section analyzes data trends to provide the basis for the model estimation in the subsequent section.

Figure 6 illustrates the difference between the growth rate of money supply and the growth rate of gross domestic product (GM2-GGDPF) alongside the inflation rate (INF) over the extended period of 1960–2025. According to the monetary theory, assuming a constant velocity of money, it is expected that, in the long run, the difference between money supply growth and GDP growth should equate to the inflation rate.

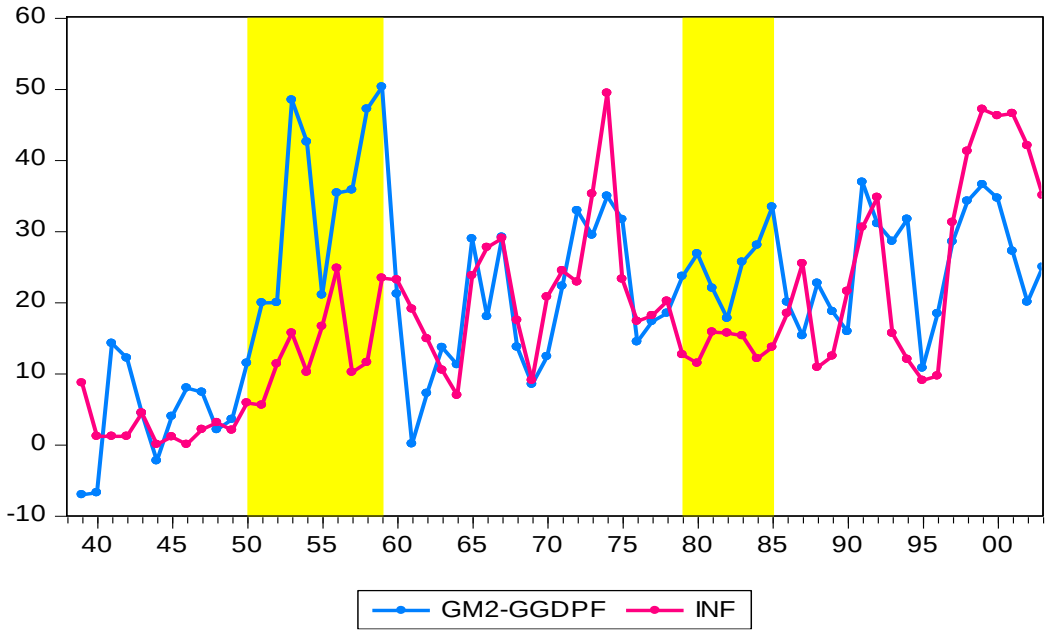

Figure 6. Relationship between the Difference in Money Supply and Economic Growth and Inflation, 1960–2025
Source: Research finding.

As observed in Figure 6, several key findings emerge:

- There is a positive correlation between the difference in money supply growth and economic growth and inflation, with a simple correlation coefficient of 0.53.
- The relationship between the difference in money supply growth and economic growth and inflation is not one-to-one, with deviations occurring in certain periods.
- In only two periods has the difference between money supply growth and economic growth significantly and persistently exceeded the inflation rate. Both periods (the 1970s and parts of the 2000s) coincided with sharp increases in natural resource rents driven by rising real oil prices, with the effect being more pronounced in the 1970s, leading to a larger gap between money supply growth minus economic growth and inflation.
- Even during periods of abundant natural resource rents used to control inflation, sustained high money supply growth eventually exerts inflationary pressure.
- Only in one period, starting from 2018, has the inflation rate significantly exceeded the difference between money supply growth and economic growth for a considerable duration. This period corresponds to a sharp decline in natural resource rents and the increased cost of utilizing these rents for inflation control.

Rahmani et al. (2025) demonstrate that natural resource rents explain why the deviation between the difference in money supply growth and economic growth and inflation is sometimes amplified or mitigated. Figure 6 is consistent with this finding. It can be inferred from Figure 6 that in periods without abundant natural resource rents, such as most of the 1980s and 1990s, the monetary theory adequately explains inflation. However, in the 1970s and parts of the 2000s, the use of natural resource rents to control inflation rendered the monetary theory less reliable, a phenomenon explained by Rahmani et al. (2025).

In summary, it can be argued that the monetary theory, coupled with the concept of generalized fiscal dominance, provides a robust explanation for long-term inflation in Iran. Consequently, this study does not focus on explaining long-term inflation. Given that numerous researchers, including Jalali-Naeini et al. (2024) and Rahmani et al. (2023), have concluded that exchange rate jumps are a key driver of inflationary shocks, this study considers money supply growth as a long-term factor and exchange rate fluctuations as a significant driver of short-term inflationary spikes. The primary objective is to clarify whether exchange rate jumps are an exogenous factor in driving inflationary spikes.

To further investigate whether inflationary spikes, often associated with exchange rate jumps, reflect causality from exchange rate movements to inflation or primarily represent adjustments of both to prior money supply growth, a brief analysis of the historical trends of inflation and exchange rate growth is presented in Figure 7. As clearly shown in Figure 7, Iran's economy shifted toward high inflation from the early 1970s. Notably, despite a relatively stable exchange rate, the inflation rate rose from 6% in 1971 to 25% in 1977 (highlighted in yellow in Figure 7). Thus, high money supply growth manifests its inflationary impact even in the absence of exchange rate changes, though not to its full extent. Similarly, in the 2000s, despite efforts to stabilize the exchange rate, expansionary government policies that fueled money supply growth led to inflation rising from 12% in 2005 to 25% in 2008 (highlighted in yellow in Figure 7). Subsequently, extensive foreign exchange injections and imports temporarily curbed inflation.

In the 1980s, while negative supply shocks (e.g., reduced aggregate supply) partially explained inflationary pressures, sustained money supply growth exerted its inflationary impact rapidly, without delay, due to limited import capacity for inflation control. One exchange rate jump often cited as a cause of inflationary spikes occurred in the early 1990s. However, a closer examination of post-war developments reveals that expansionary policies were the primary driver. Highly expansionary post-war policies, initially masked by improved expectations, the

recovery of firms' production, and reliance on imports, delayed their inflationary impact until the early 1990s. During this period, no significant negative supply shock occurred to justify attributing the exchange rate jump to external factors; rather, it was primarily the delayed effect of money supply growth on the balance of payments.

Another exchange rate jump, frequently cited as a cause of inflationary spikes, occurred in the early 2010s. A more plausible interpretation is that sustained high money supply growth in the 2000s, combined with reliance on oil revenues (natural resource rents) to control both exchange rate and inflation, created underlying pressure for exchange rate appreciation. This is evidenced by the increased volume of central bank interventions to stabilize the exchange rate. The exchange rate jump and the inflationary spike reflected the diminished capacity to use natural resource rents to control both, with the exchange rate reacting more quickly due to its lack of stickiness, thus being perceived as the cause of the inflationary spike.

The subsequent exchange rate jumps cited as causes of inflationary spikes occurred repeatedly after 2018. These require careful analysis. The 2018 exchange rate jump and its fluctuations into parts of 2019 represent an adjustment of the exchange rate to fundamental factors, with sanctions accelerating the timing. From mid-2013 to late 2017, first due to reduced inflation expectations and later due to the banking crisis and Ponzi-game banking practices, real interest rates rose to unprecedented levels, leading to a recession in asset and goods prices while sustaining high money supply growth. Consequently, inflation and asset price growth were delayed, accumulating significant inflationary pressure alongside high real interest rates. Additionally, reliance on improved oil revenues (natural resource rents) helped stabilize the exchange rate and inflation. Thus, the sharp 2018 exchange rate jump lacks a non-monetary and exogenous explanation as a cause of the inflationary spike. Post-2018, money supply growth intensified beyond its long-term trend, and alongside political developments acting as temporary halts or triggers for exchange rate changes, it explains much of the exchange rate jumps. Therefore, exogenous exchange rate jumps play a limited role. It should also be noted that reduced natural resource rents, their increased cost of use, rising inflation expectations, and higher money velocity partially explain these exchange rate jumps. However, reduced money supply growth since mid-2021 has limited subsequent exchange rate jumps compared to 2018, despite more severe political shocks.

The overall analysis suggests that, in addition to long-term inflation in Iran being explained by monetary factors driven by generalized fiscal dominance, inflationary spikes are also largely explained by these factors. While the role of exogenous exchange rate jumps in driving inflationary spikes is not entirely dismissed, careful examination indicates that exchange rate jumps unrelated to the fundamental factor of money supply growth play a minimal role in explaining inflationary spikes. This issue will be empirically examined in the next section.

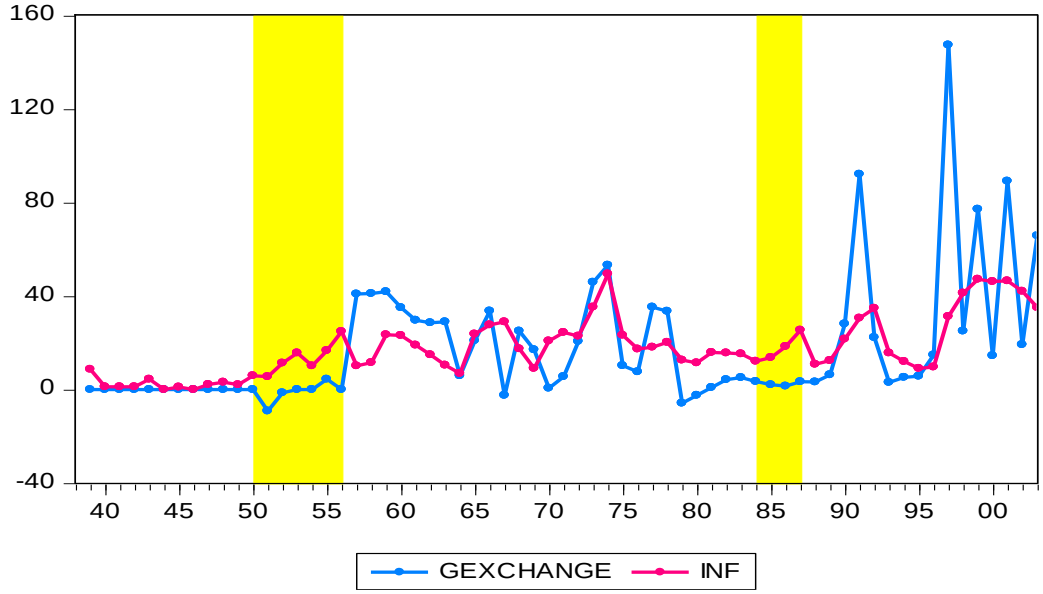

Figure 7. Percentage Change in Exchange Rate (GEXCHANGE) and Inflation Rate (INF), 1960–2025
Source: Research finding.

5. Empirical Finding

In this section, the effect of deviations in the exchange rate from its long-term trend on deviations in the inflation rate is examined to determine whether exchange rate jumps can explain inflationary fluctuations. Unlike an approach based on estimating an inflation model using fundamental factors, this study adopts an alternative method to assess the relationship between the deviations in the exchange rate and inflation.

In this method, two definitions of exchange rate deviations are considered. In the first definition, based on filtering, exchange rate deviations are calculated as the difference between the informal market exchange rate and the trend extracted using the Hodrick-Prescott (HP) filter. Under this definition, without considering

the fundamental factors affecting the exchange rate and relying solely on historical data, a smoothed trend for the exchange rate is estimated, and any deviation from this trend is regarded as an exchange rate deviation or shock.

In the second definition, based on a theoretical framework, instead of using the HP filter, the exchange rate is derived from the reformulated monetary model proposed by Darabi (2023). In this approach, the difference between the informal market exchange rate and the exchange rate calculated from the reformulated monetary model is considered the deviation from the trend. The advantage of this definition over the first is that it incorporates the determinants of the exchange rate in estimating its trend, with the residual difference between the theoretical trend and the market exchange rate interpreted as exogenous exchange rate shocks.

Similarly, the inflation rate trend is extracted using the HP filter, and the difference between the actual inflation rate and this trend is considered the deviation of the inflation rate from its long-term trend. Subsequently, deviations in the inflation rate from its long-term trend are estimated separately: once based on the first definition of exchange rate deviations using Equation (3) and once based on the second definition using Equation (4). The results are then interpreted and compared. The study covers the period from 1984 to 2023 and is based on annual data. The choice of the 1984–2023 period is due to the relative stability of the exchange rate as a result of the exchange rate regime and high oil revenues before this time period. Exchange rate and inflation data are sourced from the Central Bank of the Islamic Republic of Iran's statistics and data.

$$(\pi_t - \pi_t^{HP}) = \alpha_0 + \alpha_1 (LFX_t - LFX_t^{HP}) + u_t \quad (3)$$

$$(\pi_t - \pi_t^{HP}) = \beta_0 + \beta_1 (LFX_t - LFXM_t^{*}) + u_t \quad (4)$$

where u_t is a white noise error term. In these equations, $(\pi_t - \pi_t^{HP})$ represents the deviation of the inflation rate from its trend extracted using the HP filter, $(LFX_t - LFX_t^{HP})$ denotes the deviation of the informal market exchange rate from its smoothed trend using the HP filter, and $(LFX_t - LFXM_t^{*})$ represents the deviation of the informal market exchange rate from the exchange rate calculated based on the reformulated monetary model.

Estimating Equations (3) and (4) using the ordinary least squares (OLS) method requires that the data be stationary to avoid spurious regression and ensure the model and estimated coefficients are reliable. Table 1 presents the results of the stationarity tests for the variables.

Table 1. Results of the ADF Unit Root Test

Variable	Symbol	Specification	ADF Test
Deviation of the inflation rate from the long-term trend	$(\pi_t - \pi_t^{HP})$	With intercept	I(0)
Deviation of exchange rate from long-term trend	$(LFX_t - LFX_t^{HP})$	With intercept	I(0)
Deviation of exchange rate from monetary model rate	$(LFX_t - LFXM_t^*)$	With intercept	I(0)

Source: Research finding.

As shown in Table 1, all three variables used in the estimation are stationary, allowing the application of the OLS model. However, initial estimation results indicated that the model residuals exhibited serial correlation, following a first-order autoregressive process, AR(1).

To address this issue, the feasible generalized least squares (FGLS) method was employed. In this method, an AR(1) model for u_t is estimated first, yielding the autocorrelation coefficient $\hat{\rho}$. All variables are then adjusted based on $\hat{\rho}$, and the model coefficients are re-estimated.

Several approaches exist for implementing this method. Given the limited number of observations and to avoid reducing the sample size, the Prais-Winsten estimation method was used (see Wooldridge, 2016).

Table 2. FGLS Model Results – Equation (3)

Response Variable: Deviation of Inflation Rate from Long-Term Trend		
	Coefficient	p-value
Intercept	-0.002	0.833
Deviation of exchange rate from long-term trend	0.173	0.004
$\hat{\rho}$	0.436	
R^2	0.20	
Regression F-test	9.291	0.004
Durbin-Watson	1.641	
Jarque-Bera	1.349	0.509
Breusch-Pagan	0.081	0.777

Source: Research finding.

As shown in Table 2, deviations in the exchange rate from its filtered trend have a positive and statistically significant effect on inflationary deviations. In

other words, when focusing solely on data and calculating the long-term trend using the filter-based method, exchange rate jumps relative to their long-term trend significantly impact inflation rate jumps, consistent with findings by many researchers who attribute inflation jumps to exchange rate jumps. Approximately 20% of inflation rate deviations are explained by these exchange rate deviations. The F-statistic also indicates the regression's significance. Additionally, comparing the Durbin-Watson statistic with the values calculated by Savin and White (1977) for a regression with one explanatory variable and 40 observations confirms that positive residual autocorrelation has been addressed. The Breusch-Pagan test further confirms the homoscedasticity of residuals.

Table 3. FGLS Model Results – Equation (4)

Response Variable: Deviation of Inflation Rate from HP Trend		
	Coefficient	p-value
Intercept	-0.001	0.913
Deviation of exchange rate from monetary model rate	0.013	0.738
$\hat{\rho}$	0.410	
R^2	0.00	
Regression F-test	0.113	0.738
Durbin-Watson	1.571	
Jarque-Bera	1.661	
Breusch-Pagan	0.201	0.654

Source: Research finding.

In contrast to the previous regression, when the theoretical framework is used to calculate exchange rate deviations instead of the filter-based method, Table 3 shows that exchange rate deviations have no significant effect on inflation rate deviations from their long-term trend. In other words, these deviations are not substantial enough to explain changes in the inflation rate, with explanatory power over the 40-year period being nearly zero. Nevertheless, the Durbin-Watson statistic and the Breusch-Pagan test confirm the absence of serial correlation and homoscedasticity of residuals, respectively.

Comparing the results of Tables 2 and 3 suggests that, while exchange rate changes have a significant impact on inflation rate deviations based on data alone, the monetary model incorporating natural resource rents effectively explains exchange rate changes. In other words, after accounting for this model, residual exchange rate changes are not substantial enough to be considered the primary

driver of inflation jumps. This finding leads to the conclusion that fiscal dominance, manifested through money supply growth, plays a dominant and decisive role in shaping both exchange rate and inflation dynamics in both the short and the long term.

6. Conclusion and Policy Implications

Rather than focusing on explaining inflation in the short or long term, this study empirically investigates whether exchange rate jumps are the dominant driver of inflationary spikes in Iran. To address this question, a theoretical analysis is first provided to demonstrate that, in the long run, generalized fiscal dominance, manifested through sustained high money supply growth in Iran since the early 1970s, is the primary driver of inflation. This study does not aim to empirically test this long-term relationship. The key finding of this analysis is that, in the long run, sustained increases in the general price level and inflation are not possible without growth in monetary aggregates, particularly broad money supply growth.

Next, the study demonstrates that the Purchasing Power Parity (PPP) and monetary models provide a robust explanation for long-term exchange rate movements across a large sample of countries. For the Iranian economy, the trend of the unofficial exchange rate and the exchange rate expected from the monetary model are analyzed, revealing why, in certain periods, the unofficial exchange rate has been significantly lower than the monetary model's predicted rate. Additionally, a reformulated monetary model is employed to show that when natural resource rents (oil revenues) are incorporated, the reformulated monetary model effectively explains variations in the unofficial exchange rate.

Subsequently, an analysis of the historical trends of inflation and its fundamental long-term driver (the difference between money supply growth and economic growth) in Iran is presented. This analysis demonstrates that high money supply growth provides a convincing explanation for Iran's long-term inflation. However, it is noted that in periods when inflation is lower than what money supply growth would suggest, the abundance of natural resource rents enables the temporary control of inflation by leveraging external value-added. Nevertheless, even during periods of abundant natural resource rents or oil revenues used for inflation control, sustained high money supply growth gradually exerts its inflationary pressure.

The study further examines historical trends in exchange rate growth and inflation to establish two key points: first, inflation has persisted even during periods of exchange rate stability; second, periods of exchange rate jumps, often

cited as the cause of inflationary spikes, reflect the manifestation of the fundamental driver of both exchange rate increases and inflation. Consequently, exogenous exchange rate jumps unrelated to sustained high money supply growth have not played a significant role in Iran's inflationary spikes, though this claim is made with some caution.

In the empirical section to test our hypothesis that exogenous exchange rate shocks are not the original driver of inflation spikes, the study investigates whether exogenous exchange rate jumps have a significant effect on inflationary spikes. Based on data from 1984 to 2023, it is shown that when the effect of deviations of the unofficial exchange rate from its filtered trend is estimated on inflation rate deviations, the effect is statistically significant. This confirms that, statistically, exchange rate jumps have caused inflationary spikes. However, when the effect of deviations of the unofficial exchange rate from its fundamental value, based on the reformulated monetary model, is estimated on inflation rate deviations, the effect is not significant. This implies that exogenous exchange rate jumps, based on theoretical analysis, have not had a significant role in Iran's inflationary spikes or, at the very least, suggests that the causal effect of exchange rate jumps on inflation may have been overstated.

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