Iranian Journal of Economic Studies, 12(1) 2023, 249-270

Shiraz University

Iranian Journal of Economic Studies

Journal homepage: ijes.shirazu.ac.ir

The Impact of Removing Fictitious Assets from Bank Balance Sheet on Money Supply and Other Macroeconomic Variables

Hossein Samsami[a]*, Hesam Hassanpour[a], Mohammad Ali Nojavan[a]

a. Faculty of Economics and Political Science, Shahid Beheshti University, Tehran, Iran

Article History

Received date: 03 September 2024
Revised date: 28 September2024
Accepted date: 03 October 2024
Available online: 15 December2024

JEL Classification
E4
E5
E6
G2

Keyword
Credit Risk
Financial Frictions
Insolvency
Nonperforming Loans

Abstract

As a result of the accumulation of fictitious assets in the bank recent years, which has had grave impacts on both the money and real sectors. This study aims to comprehensively investigate the fundamental factors contributing to the expansion of liquidity arising from the creation of fictitious assets and to meticulously evaluate the subsequent repercussions of these assets on macroeconomic variables. Notably, this specific research domain remains relatively unexplored within the existing corpus of academic scholarship. Using a pattern of structural macro-econometrics and the ARDL method, this paper investigates the impact of removing fictitious assets from the bank balance sheet on the money supply and other macroeconomic variables in Iran from the first season of 2006 to the fourth season of 2022. The designed macro-econometrics pattern includes eight behavioral equations and seven identity equations. Two scenarios are explored: the first examines the impact of effective money (aggregate money minus fictitious assets) on macroeconomic variables, while the second investigates the effect of aggregate money on these variables. The findings reveal that fictitious assets on bank balance sheets increase the money supply but diminish its quality. However, fictitious assets have no discernible impact on the real sector. Moreover, effective money exerts a more substantial influence on macroeconomic variables such as production, investment, employment, and consumption than aggregate money. The results also demonstrate that ineffective money primarily contributes to rising price levels.balance sheet, the banking system has been faced with insolvency in

Highlights

- This study investigates the impact of removing fictitious assets from banks' balance sheets on macroeconomic variables.
- Removing fictitious assets from banks' balance sheets has a positive effect on investment.
- Eliminating fictitious assets from banks' balance sheets results in a decrease in liquidity.

* H-Samsami @ sbu.ac.ir

DOI: 10.22099/ijes.2024.51127.1969

1. Introduction

A major obstacle confronting the Iranian banking system is a significant amount of toxic and frozen assets within their portfolios, representing a substantial portion of their overall assets. These frozen assets fall into three distinct categories: non-collectible and non-performing assets reflecting losses due to financial mismanagement, non-financial (fixed) property generated through financial intermediation and noncurrent claims from a housing market downturn, and the accumulation of public debt. The surge in public debt has weakened the facility allocation capability of banks, resulting in financial frictions and the freezing of banks' balance sheets. Consequently, it has reduced the efficiency of the credit market, banks' ability to allocate facilities, and their capacity to confront a credit crunch. The escalation of noncurrent and overdue claims has led to severe consequences, including the emergence of fictitious assets, representing inflated loans and profits attributed to bad debts. Factors contributing to fictitious asset creation include mounting public debt, international sanctions, exchange rate volatility, economic recession, and government economic structure. Examining the bank-based financial structure in Iran is crucial for economic growth facilitation. Liquidity quality analysis is significant, given banks' liquidity generation ability. Recent data reveals a notable increase in liquidity creation and nominal product, although the actual product remains unchanged. Funding is an essential banking function, but assuming debt from bank assets contributes to a credit crunch. To address this, banks seek central bank loans or raise interest rates, fueling economic liquidity. The lack of central bank oversight prompts banks to attract deposits and provide loans, even when not directly linked to productive sectors. Over the past two decades, the monetary and actual sectors of the Iranian economy have demonstrated a marked disparity in their growth trajectories. Fictitious assets have been identified as a contributing factor to this divergence. The recent expansion of liquidity is correlated with non-current claims. Inefficient management practices and a deficiency in customer validation pose a significant threat to the financial stability of banks. Analyzing monetary and credit indicators over the past decade shows nominal growth in assets, granted facilities, money volume, and liquidity, yet the real sector does not significantly benefit .

The characteristics of non-performing loans in Iran indicate that the interaction between banks and firms in a healthy banking network has not formed. The average default rate is high compared to global experience, and although there

has been a downward trend in recent years, Iran is still in the category of countries with high default rates.

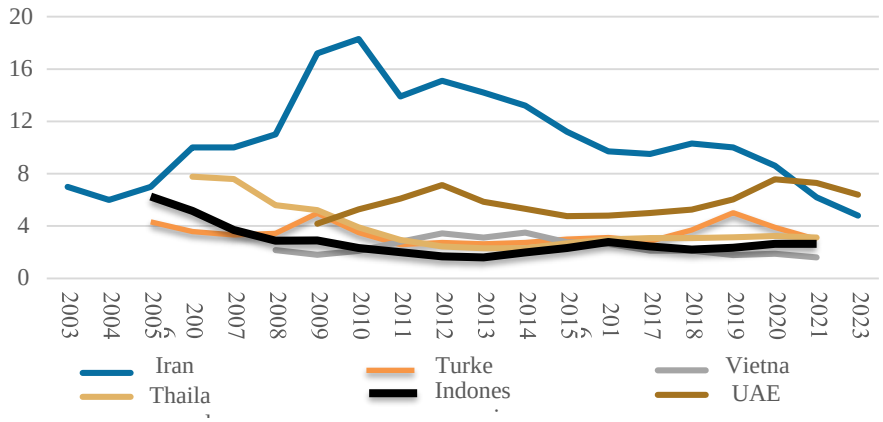

Figure 1. Non-Performing Loan Ratio in Iran and Selected Countries (Percentage).

Source: *Central Bank of the Islamic Republic of Iran and the World Bank, 2023.*

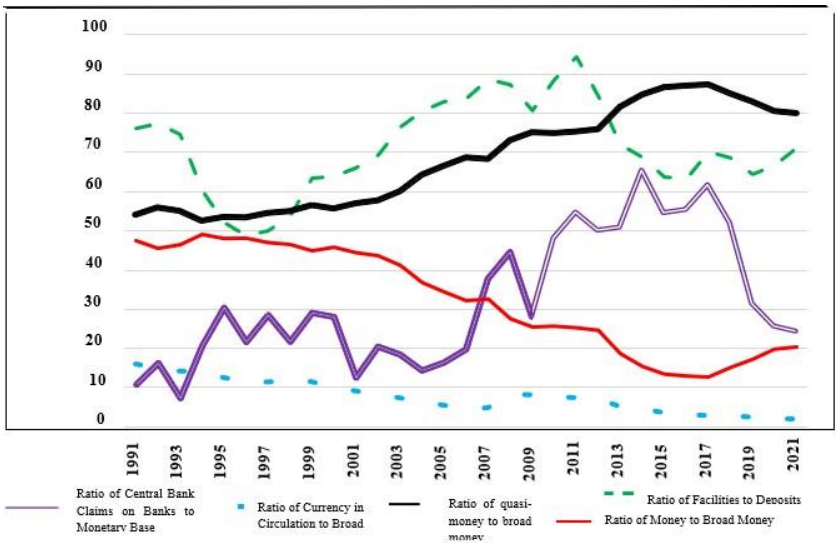

Figure 2. Monetary Variables' Trend.

Source: *Central Bank of the Islamic Republic of Iran and Statistical calculations.*

Furthermore, examining Iran's banking trends reveals a strengthening of the endogenous money creation process. Figure 1-2 demonstrates that the ratio of ' central bank claims on banks to monetary base' has escalated from approximately

10% in 1991 to over 60% in 2014, indicating that banks have been creating credit beyond the capacity commensurate with the exogenous monetary base. To mitigate their reserve deficiency, they have sought recourse in borrowing from the central bank. Additionally, the 'facilities-to-deposits' ratio has consistently remained significantly below one between 1991 and 2020, suggesting the existence of alternative channels for endogenous money creation beyond traditional lending. In addition, the ratio of 'currency in circulation to broad money' has declined from approximately 20% in 1991 to around 2% in 2020, reinforcing this trend. Concurrently, the surge in the ratio of 'quasi-money to broad money' from about 50% to over 80% during this period has stimulated endogenous money creation.

Moreover, the average 'non-performing loan (NPL) ratio' has hovered around 12% between 2004 and 2021, significantly deviating from the global average of 3%. Notably, this calculation includes restructured loans as performing, which, if adjusted, would result in an even higher NPL ratio. This elevated NPL ratio has disrupted the money creation process and incentivized banks to restructure non-performing loans to avoid recognizing incurred losses.

While most studies on banks' lending behavior in Iran focus on monetary policy tools, few explore the creation of unhealthy liquidity through fictitious assets. Consequently, this study investigates the causes and effects of increased liquidity from fictitious asset creation on macroeconomic variables.

2. A Review of the Related Literature

2.1 The Role of Financial Intermediaries in Economic Development

Financial markets, being efficient allocators of financial resources, have a significant role in facilitating production and enhancing the community's welfare. Financial markets can be categorized into the money market, which involves assets with a maturity of less than one year, and the capital market, which deals with assets with a maturity of more than one year. Each market possesses its own set of instruments. Examples of money market instruments include treasury bills, certificates of deposit, and repurchase agreements. On the other hand, securities companies and stocks are the key instruments in the capital market, known for their higher risk due to their longer maturity and price volatility. Indirect financing methods, often employed through financial intermediaries like banks, play a vital role in the financial system. To comprehend the importance of financial intermediaries and indirect financing, it is crucial to examine factors like transaction costs, risk sharing, and the costs of obtaining information in financial markets. Asymmetric information in financial markets results in adverse selections and moral hazards, which can lead to significant costs for banks. However, financial intermediaries such as banks mitigate these costs by reducing transaction costs through operational effectiveness, sharing investment risk, and addressing issues related to asymmetric information like moral hazard and

adverse selection (Mishkin, 2011).

2.2 Bank as a Financial Intermediary Institution

Financial institutions possess a cost advantage in generating information due to their expertise in identifying and interpreting signals and gathering customer data. Consequently, this advantage allows them to capitalize on economies of scale. An essential factor in banks' ability to generate profits through information production is their provision of facilities to deter free-riding, rather than acquiring assets from the open market (Mishkin, 2011).

2.3 Bank as a Money Creation Institution

Empirical evidence additionally affirms that banks do not function as financial intermediaries. In the study conducted by (Werner, 2014), despite theoretical discrepancies regarding the essence of a bank, an empirical experiment was undertaken to shed light on the true nature of a bank based on its lending operations in the real world. The research findings indicate that, during the lending process, banks do not transfer funds from domestic or foreign accounts directly to the borrower's account. Instead, they generate funds by increasing the credit balance of the borrower's account. This discovery substantiates the notion that banks operate as institutions that create money. Guided by this insight, Werner distinguishes banks from other non-banking financial institutions by highlighting their unique capacity to generate money from nothing.

Moore (1983) posits that, in practice, banks initiate the process by expanding credit, resulting in the creation of deposits, and subsequently acquiring reserves. This proposition implies that the lending and money-creation activities of banks are not solely contingent upon customer deposits. Macroeconomic determinants and legislative frameworks play a pivotal role in influencing the noncurrent claims of financial institutions. Regarding macroeconomic factors, the actual gross domestic product per capita, unemployment rate, inflation rate, and interest rates are deemed crucial.

2.4 Theoretical Foundations of Non-Current Claims

Empirical research conducted by Keeton & Morris (1987) indicates that one of the contributing factors to the emergence of noncurrent claims is the provision of credit over the scale and capacity of facilities to a particular economic sector. Consequently, it is imperative to maintain a balanced allocation of loans across diverse economic sectors.

3. Literature Review

The topic of liquidity and its impact on actual economic variables is a subject of much controversy in macroeconomics. A significant majority of studies have been dedicated to exploring this topic. However, there is a lack of research on the effects of fictitious assets on liquidity and macroeconomic variables, particularly in Iran. This research endeavors to investigate the interrelationship between non-

performing assets and liquidity, and to evaluate their combined influence on the actual sector.

Sekine et al. (2003) conducted a dynamic generalized method of moments (GMM) analysis to investigate the impact of debt forbearance on non-performing loans in Japan. Their findings suggest that while debt forbearance policies may provide temporary relief from financial distress, they can have detrimental consequences for less productive firms. By exacerbating debt-to-asset ratios, these policies can contribute to forming debt bubbles, posing systemic risks to the financial system. This phenomenon is particularly pronounced in the construction and real estate sectors.

Caballero et al. (2008) empirical study of Japan demonstrated that large Japanese banks frequently engage in formal debt restructuring for insolvent firms, commonly called "zombie firms". This practice has been demonstrated to have adverse consequences for financially sound firms, as it diverts credit toward distressed borrowers. As a result, these healthier firms experience diminished profitability, leading to reductions in production and investment. Over time, this has exacerbated the productivity gap between zombie and non-zombie firms.

Gerali et al. (2010) investigated monetary shocks and the financial market. They designed a dynamic stochastic general equilibrium model in which they discussed the role of credit supply in creating business cycles. The monetary shock in this article is a change in the money volume rate. The credit market shock can be characterized as a substantial alteration in either the loan interest rate or the level of bank capital. Monetary policy affects the performance of the banking system by influencing the loan interest rate and, consequently, the brokers' behavior. Credit shocks also affect the economy through the loan supply channel. The results indicate that credit shocks have contributed more than monetary shocks in creating economic fluctuations (such as production fluctuations).

Louis investigated the effects of macroeconomic variables and bank-specific factors on the ratio of non-current claims among different types of loans (consumer-commercial-housing) in Greek banks. The results showed that the ratio of deferred claims to the banks' total granted facilities (NPL) has a negative relationship with GDP growth, and (NPL) commercial loans have the most substantial effect. Housing loans have the most negligible effect on GDP. The unemployment rate, the real interest rate, and the amount of granted facilities positively affect the non-current claims of banks. Also, the quality of management as a bank-specific factor hurts NPL.

Berger et al. (2017) analyzed the role of banks in forming financial crises thanks to their power to create asset bubblesThe empirical results demonstrate that under non-crisis conditions, the effects of monetary policy on liquidity creation are primarily concentrated within the segment of smaller banks. Conversely, during periods of financial distress, the influence of monetary policy on liquidity creation is attenuated across all bank size categories. Furthermore, the analysis reveals that a significant deviation of liquidity creation from its historical

trend can serve as a predictive signal of impending financial crises, even when controlling for other pertinent variables.

Parvin et al. (2014) conducted a study within the framework of a New Keynesian stochastic dynamic general equilibrium model, utilizing annual macroeconomic data for Iran covering the period from 1971 to 2012. They explored the reaction of macroeconomic variables such as production and inflation to balance sheet shocks. The study indicates that the adverse effects of a shock to the reserve of deferred claims on aggregate production and inflation are more pronounced than those resulting from shocks to deposit withdrawals or bank liquidity. However, these effects dissipate more rapidly. An increase in deferred claims and, as a result, an increase in the reserve of deferred claims causes the lock of resources, prevents their use in the production sector, and weakens economic growth.

Cuncineeli(2015) examined the impacts of non-current claims on the lending behavior of banks and studied the case study of the Italian banking sector. The results indicated the positive effect of GDP on the lending behavior of banks.

Kapuuciiski (2016) researched the effects of monetary policy through the channel of influence on the bank balance sheet. This survey assessed the impact of bank balance sheet strength on bank lending using univariate panel regressions. The results show that a monetary policy shock increases non-performing loans and reduces bank profitability and capital buffer.

Zamanzadeh & Badri (2017) analyzed the causes of imbalance in the balance sheet of the banking system and its consequences on monetary and macroeconomic variables. The results show that the accumulation of fictitious assets and the emergence of imbalances in the balance sheet of the banking system have formed an unhealthy flow of liquidity creation, which is not only a risk for the banking system but also a critical factor in the stickiness of the bank interest rate despite the reduction in the inflation rate and the effects Its negative is in macroeconomics. Also, despite the lack of reduction in the liquidity growth rate, the inflation rate has faced a significant diminishing due to the reduction in the quality of liquidity affected by the decrease in the quality of the assets of the banking system, which cannot be a sustainable process.

Keshavarz and Parsa (2019) employed a dynamic stochastic general equilibrium (DSGE) model to investigate the impact of monetary policy on macroeconomic variables in Iran, focusing on the role of collateral constraints. Two monetary policy scenarios are under consideration: a conventional rule targeting GDP gaps and inflation, and a macroprudential rule that also incorporates responses to housing price deviations. The results indicate that monetary shocks lead to increases in both production and inflation. However, the effects on household consumption are heterogeneous. Patient households benefit from lower interest rates, while impatient households face increased borrowing costs due to the collateral constraint. This constraint amplifies and prolongs the effects of shocks on both groups. A comparison of the two scenarios reveals that the macro-prudential rule, incorporating a response to housing prices, is more

effective in achieving monetary policy objectives. Addressing collateral constraints and stabilizing the housing market can enhance the transmission of monetary policy to the actual economy.

Baltner et al. (2019) conducted a study examining the deleterious effects of undercapitalized banks that engaged in the practice of extending non-performing loans and concealing losses to preserve their financial stability. The research findings revealed that these actions contributed to a decline in productivity following the European sovereign debt crisis. Rather than curtailing lending activities, financially weak banks opted to reallocate credit to firms experiencing financial difficulties, diverting resources away from more productive enterprises. This reallocation of resources resulted in a notable decline in productivity within Portugal's firms in 2012.

Banerjee's (2018) research identified a correlation between declining interest rates and a significant increase in lending to zombie firms within 14 European economies. While this prolonged the survival of financially distressed companies, it ultimately had detrimental consequences for broader economic performance. The study found that the persistence of zombie firms hindered productivity growth, investment, and employment levels.

Gross et al. (2021) assessed how capital ratio shocks influence bank credit supply and aggregate demand. It distinguishes between contractionary and expansionary deleveraging scenarios. It confirms the intuitive result that only when banks choose to achieve higher capital ratios by shrinking their balance sheets would economic activity be at risk to contract.

Mahdavi et al. (2018) investigated the causes of the increasing growth and poor quality of liquidity concerning the volume of nominal production in Iran's economy. The findings suggest that the elevated liquidity ratio, coupled with government oversight of banks regarding excessive liquidity creation, has contributed to an unproductive sector of the economy. This unproductive sector has attracted and accumulated a substantial volume of bank deposits due to lucrative profit margins.

Casu et al. (2019) analyzed the relationship between liquidity creation and bank capital in the Eurozone. This study identifies a significant and inverse bi-causal relationship between capital and liquidity creation. The results indicate that banks may reduce liquidity creation as they increase capital, as stated by the "financial-fragility-crowding out" hypothesis. Moreover, their results also support the "liquidity substitution" hypothesis, which suggests that as liquidity creation increases, banks may consider certain liquid liabilities as stable funding sources, reducing banks.

Cerqueiro et al. (2023) conducted a comprehensive analysis of the impact of on-site credit portfolio inspections on Portuguese banks' lending decisions. Their findings reveal a substantial reduction in the refinancing of "zombie firms" by banks subjected to these inspections, resulting in a subsequent increase in default rates. The study suggests that the requirement to recognize losses during

inspections effectively disincentivizes banks from maintaining non-performing loans.

Blattner et al. (2023) conclude that imposing stricter capital requirements in Portugal had an unintended consequence: it may have exacerbated the problem of zombie lending. The study suggests that these regulations incentivized banks to delay recognizing losses, thereby prolonging the viability of non-performing loans.

Vithessonthi (2023) shows that banks' loan growth rate has a negative short-run effect on their non-performing loans and a positive short-run effect on their profitability. While the loan growth rate does not increase non-performing loans in the short run, there is some evidence suggesting that it increases non-performing loans in the long run. The results further indicate that banks' profitability is not affected by the level of loans but by the loan growth rate.

4. The Study Model

In recent years, Iran's banking system has faced financial frictions, unhealthy liquidity, and financial indiscipline. Given the importance of directing liquidity towards real sectors, this study aims to evaluate the existence of fictitious assets and conduct a comparative analysis of two models: one incorporating fictitious assets and one excluding them. The study will investigate the influence of these assets on the bank's balance sheet, liquidity, and other macroeconomic variables. Additionally, this research aims to identify fictitious assets, quantify the liquidity generated by these assets, and analyze their effects on macroeconomic variables. Our analysis employs banking balance sheet data and macroeconomic variables sourced from the central bank and securities and exchange organization of Iran, spanning the first quarter of 2012 to the last quarter of 2022. The hypotheses of this research are: A- Fictitious assets have a positive and significant relationship with liquidity creation. B- The impact of total liquidity is lower than effective liquidity (liquidity minus fictitious assets) on employment, investment, consumption, and production. C- Inflation is higher when there are fictitious assets than when these types of assets are not available. In this study, we have constructed a proxy for fictitious assets, which can encompass a considerable quantity of such assets. Given that fictitious assets constitute a portion of liquidity, we will subsequently concentrate on segregating liquidity into two distinct components: effective and ineffective. Employing a macro-structural econometric model, and drawing upon the insights of Gylfason and Radetzki (1991) within a supply and demand framework, we proceed to estimate the model's parameters. Upon elucidating all the interrelationships in the model based on sound economic theoretical foundations and estimating the equations through the integrated method, we validate the model to ascertain its capacity to represent the structure of the Iranian economy effectively. Subsequently, this study will evaluate the research hypotheses, determining their acceptance or rejection. Existing research has consistently demonstrated the superiority of Autoregressive Distributed Lag (ARDL) models over alternative econometric methodologies. One of the critical

advantages of ARDL is its robustness to small sample sizes, ensuring reliable parameter estimates even with limited data (Salah et al., 2022). Moreover, unlike traditional models like Vector Error Correction Models (VECM) or Vector Autoregressions (VAR), ARDL can be applied regardless of the individual integration orders of the variables, making it a versatile tool for empirical analysis (Koondhar et al., 2021). Additionally, ARDL models offer the flexibility of deriving error correction mechanisms, providing insights into the long-run relationships between variables. Furthermore, the issue of endogeneity, a common concern in econometric modeling, is less pronounced in ARDL due to its inherent structure, which minimizes correlation among error terms (Pesaran et al., 2001). However, it is essential to note that ARDL's applicability is restricted to variables integrated at most of the first order. Given these compelling advantages, we chose the ARDL framework to estimate the coefficients in this study.

4.1 Macroeconomic Model

To investigate the ramifications of eliminating fictitious assets from banks' balance sheets on liquidity and other macroeconomic variables, it is imperative to formulate an appropriate model that can accurately elucidate the dynamics of Iran's economy. The macro-econometric model employed in this study is based on the framework developed by Gylfason and Radetzki (1991). In deploying the macro model and selecting the desired economic variables to estimate the model, utmost effort has been made to design and select assumptions that align with the conditions prevailing in Iran's economy.

It assumes that actual aggregate product (Q) is produced by employing labor factor (L) with real wage (W) and imported inputs (N) with the price of (R) based on foreign currency and fixed exchange rate (EX) which refers to the value of one unit of foreign currency against domestic currency.

$$Q = Q\,(N, L) \tag{1}$$

$$\frac{\partial Q}{\partial N} = Q_N > 0 \tag{2}$$

$$\frac{\partial Q}{\partial L} = Q_L > 0 \tag{3}$$

$$Q_{NN} < 0 \tag{4}$$

$$Q_{NN} < 0 \tag{5}$$

This function has some features:

1 (The marginal product of factors is positive .

2 (factors of production face diminishing marginal returns .

3 (factors of a product are compensated with each other.

Restricted exchange reserves are one of the crucial characteristics of Iran's economy. We derive the aggregate supply curve under the assumption of constrained exchange earnings.

4.2 Derivation of Aggregate Supply with Restricted Exchange Reserve

We derive the factor demand function by maximizing the profit function, following the approach of Samsami et al. (2007) and Toutunchi (2006).

$$Max\ \pi = PQ - WL - RN \quad (6)$$

$$S.t\ :\ \beta_0 . \bar{q} = R.N \quad (7)$$

restricted exchange reserve $\bar{q} . \beta_0$ refers to foreign income and the portion of foreign income allocated to import of inputs.

Lagrange function

$$\in = PQ - WL - R.e.N + \boldsymbol{\lambda}(\beta_0 . \bar{\bar{q}} - R.N) \quad (8)$$

$$\frac{\partial \in}{\partial N} = P\frac{\partial Q}{\partial N} - R.EXR - \lambda.R = 0 \quad (9)$$

$$\frac{\partial \in}{\partial L} = P\frac{\partial Q}{\partial L} - W = 0 \quad (10)$$

$$\frac{\partial \in}{\partial \boldsymbol{\lambda}} = \beta_0 . \bar{q} - R.N = 0 \quad (11)$$

According to first-order condition, yield L and K

$$\lambda = \lambda(\frac{W}{P} . \frac{\beta_0 \bar{q}}{R}) \quad (12)$$

$$L = L(\frac{W}{P} . \frac{\beta_0 . \bar{q}}{R}) \quad (13)$$

$$N = \frac{\beta_0 . \bar{q}}{R} \quad (14)$$

With substitution of L and K in equation (1):

$$Q = Q(\frac{\beta_0 . \bar{q}}{R} . \frac{W}{P}) \quad (15)$$

$$\frac{\partial Q}{\partial \bar{q}} > 0 \quad (16)$$

$$\frac{\partial Q}{\partial (\frac{\bar{\bar{W}}}{P})} < 0 \quad (17)$$

And then:

$$GDP = Y = Q - \frac{EXR.RN}{P} \quad (18)$$

Substitute equation(14) in (13):

$$GDP = Y = Q - \frac{\boldsymbol{e\,\beta_0 . \bar{q}}}{\boldsymbol{P}} \quad (19)$$

To reformulate the equation for P, we propose the following functional form:

$$P = P(EXR, \frac{\beta_0 \bar{q}}{R} . W . Y) \quad (20)$$

We have: $\frac{\partial P}{\partial Y} > 0$, $\frac{\partial P}{\partial W} > 0$, $\frac{\partial P}{\partial EXR} > 0$

4.3 Aggregate Demand

On the demand side of the economy, the main equation of aggregate demand is:

$$Y = CO + IP + G + X - [Z + (\frac{EXR.R}{P})N] \quad (21)$$

$$Y = E + X - [Z + (\frac{EXR.R}{P})N] \quad (22)$$

where E is the expenditure of the domestic sector (including private consumption (CO), private sector investment (IP), and government expenditure

(G), Z is the import of final consumption goods in domestic currency, N is the import of production inputs with price R in foreign currency, and X is the export in domestic currency.

It is assumed that domestic expenditure is a function of gross domestic product, exchange rate, money volume, consumption expenditure, and government investment. Total expenditure function is:

$$E = E\,(Y, EXR, M, G) \quad (23)$$

In Iran's economy, foreign exchange earnings affect money volume and government expenditures. An increase in foreign exchange earnings can augment the central bank's foreign exchange reserves and consequently expand the monetary base. This leads to an increase in money supply and total spending in the economy. To investigate this influence, we consider the general relationship of the money supply as follows:

$$M = mt\,.B \quad (24)$$

In the above relationship, M is the money supply, mt is the monetary multiplier, and B is the monetary base. This relationship can also be written in terms of monetary base components:

$$M = mt\,(NFA + NGD + DBS + NO) \quad (25)$$

In this regard, NFA is the net foreign assets of the central bank, NGD is the net debt of the public sector to the central bank, DBS is the claims of the central bank from the banking system, and net NO is the other assets of the central bank. Each of the components of the monetary base can also be written as follows:

$$NFA = NFAt\text{-}1 + a.EXR.\bar{q} \quad (26)$$

$$NGD = NGDt\text{-}1 + NGDO + \lambda(e\bar{q}\,\theta) \quad (27)$$

In this relation, λ itself is defined as follows:

$$\lambda = \frac{dNGD}{dEXR\bar{q}\,\theta} \quad (28)$$

It is hypothesized that, despite the increase in government income resulting from the accumulation of foreign exchange earnings, the public sector's net debt to the central bank will decline. In the above expression, NFAt-1 is the net foreign assets of the central bank in the previous period, α is a ratio of foreign exchange earnings that is added to foreign exchange reserves, NGDt-1 is the net debt of the public sector to the central bank in the previous period, NGDO is the net of other government debts to the central bank and θ is the share of the government's foreign exchange revenues from the total revenues of the country. Substitute the above equation in equation (17) and make some alterations to it, we will have:

$$M = M0 + mt[\,a - \lambda\,\theta\,]\,EXR\bar{q} \quad (29)$$

$$M = [\,NFAt\text{-}1 + NGDt\text{-}1 + NGDO + DBS + NO] \quad (30)$$

It is also assumed that government expenditure is financed mainly through taxation, foreign exchange earnings from oil, and the budget deficit (BD). Therefore, the government expenditure relationship is considered as follows:

$$G = T + EXR\bar{q}\,\theta + BD \quad (31)$$

Exports are divided into two parts: oil export and non-oil export. The dollar value of oil exports is independent of the exchange rate and its amount depends

on the quota set by OPEC. It is assumed that non-oil exports are a function of the exchange rate and income of foreign countries.

$$X1 = a3\frac{e}{P}\bar{q} + X(\frac{e}{P}, GDPOECD) \quad (32)$$

In equation (32), α3 is the portion of foreign exchange earnings related to the sale of oil from the total foreign exchange earnings, X is non-oil exports, and GDPOECD is the national income of the trading partner country. According to the explanations of the first part, imported inputs account for more than 80% of the country's imports, including raw materials, intermediate goods, and capital (Toutunchi, 2006). In addition, in the aggregate supply side, the demand function of imported input in the conditions of currency restrictions is captured as follows:

$$N = \frac{\beta_0 \bar{q}}{R} \quad (33)$$

Therefore, according to the above, the total import function can be written as follows:

$$IM=Z+\frac{R.EXR}{P}.N \quad (34)$$

It is assumed that importing final goods is a direct function of domestic expenditure and a negative function of the real exchange rate.

$$Z = Z(\frac{E}{P}, \frac{EXR}{P}) \quad (35)$$

With the substitution of the above function and the input demand for the currency limit in Equation (20), the following function is yielded:

$$IM = Z(\frac{E}{P}, \frac{EXR}{P}) + \frac{\beta_0 e \bar{q}}{P} \quad (36)$$

Finally, the function of the aggregate demand will be as follows (Samsami et al., 2014):

$$YD = C + I + G + X - IM \quad (37)$$

Considering the equilibrium conditions, we will have:

$$YD=YS \quad (38)$$

In addition to the behavioral equations created in this econometric model, the behavioral functions of non-performing assets and liquidity have also been added to this model.

4.4 Estimation of the Model

Table 1. The General Form of Behavioral Equations of the Model

Aggregate supply function
$LOG(PGDP)=\alpha_0+\alpha_1 LOG(EXR)+\alpha_2\ LOG(W)+\alpha_3\ LOG(RGDP)$
Employment function
$LOG(EMP)=\beta_0+\beta_1\ LOG(RGDP)+\beta_2 LOG(RW)$
Consumption function
$LOG(CO)=\gamma_0+\gamma_1\ LOG(YD),+\gamma_2\ LOG(RNONFIC)+\gamma_3\ LOG(RFIC)$
Investment function
$LOG(IP)=\delta_0+\delta_1\ LOG(RGDP)+\delta_2\ IR+\delta_3\ LOG(RNONFIC)+\delta_4\ LOG(RG)+\delta_5\ LOG(REXR)$

Non-oil export function
$LOGXNO\$= \varepsilon_0 + \varepsilon_1 LOG\left(\frac{EXR}{P}\right) + \varepsilon_2\ LOG(GDPOECD)$
Import function
$LOG(IM) =\epsilon_0+\epsilon_1 LOG(E) +\epsilon_2\ LOG(\frac{EXR}{P})$
Liquidity function
$LOG(M2) = \theta_0+\theta_1 LOG(FIC) +\theta_2 LOG(RGDP) +\theta_3 RIR+\theta_4 INF)$
Non-current claims function
$LOG(NPL) =\mu_0+\mu_1 IR + \mu_2 LOG(FIC) +\mu_3\ LOG(EXR)+ \mu_4 LOG(DEPECO))$

$LOG(PGDP)= \beta_0+ \beta_1 LOG(EXR) +\beta_2 LOG(W) + \beta_3 LOG(RGDP)$	Aggregate supply function
$LOG(EMP) = \mu_0+ \mu_1 LOG(RGDP) +\mu_2 LOG(RW)$	Employment function
$LOG(CO)= \theta_0 + \theta_1 LOG(YD) +\theta_2 LOG(RM2)$)	Consumption function
$LOG(IP)= \alpha_0+\alpha_1 LOG(RGDP)+ \alpha_2 RIR +\alpha_3 LOG(RM2)+ \alpha_4 LOG(RG)+ \alpha_5 LOG(REXR)$	Investment function
$LOGXNO\$=\varepsilon_0 +\varepsilon_1 LOG\left(\frac{EXR}{P}\right) + \varepsilon_2\ LOG(GDPOECD)$	Non-oil export function
$LOG(IM) =\delta_0 +\delta_1\ LOG(E) +\delta_2\ \ LOG(\frac{EXR}{P})$	Import function
$LOG(M2) =\beta_0\ +\beta_1\ LOG(FIC) +\beta_2\ LOG(RGDP) +\beta_3\ RIR+\beta_4\ INF)$	Liquidity function
$LOG(NPL) =\beta_0 +\beta_1\ IR +\beta_2\ LOG(FIC) +\beta_3\ LOG(EXR)+ \beta_4\ LOG(DEPECO))$	Non-current claims function

$E = CO +IP + G$	Total expenditure
$GDP = E + RX1 – IMR$	Goods and services demand
$X1 = XO\$ + XNO\$(\frac{EXR}{P}, GDPOECD)$	Export
$RX1 =X1 * (EXR / P)$	The Rial value of the export
$IMR = IM\$ * (EXR / P)$	The Rial value of the import
$FIC = (NPL + LTOT * 50\%) * RB$	Fictitious assets
$NONFIC = M2 – FIC$	Effective liquidity

***Source:* Samsami et al. (2007) and Toutunchi (2006).**

In the above equations, the variable FIC is a proxy of fictitious assets. Based on the investigations, fictitious assets are considered as an estimate of non-performing assets and are calculated according to the following relationship:

$$FIC = (NPL + ltot * 50\%) * ir \quad (39)$$

Where NPL is non-performing assets, lto is the total number of facilities and ir is the bank interest rate. According to the empirical studies and the assertion of the former governor of the Central Bank of Iran, banks expand the loan contracts that are overdue and belong to the non-current claims and change their entity to

current claims, these kinds of facilities account for 50% percent of banking system's annual working facilities. Also, in these equations, M2 is the volume of nominal liquidity, RM2 is the volume of real liquidity, FIC is fictitious assets, NPL is non-performing assets, NONFIC is effective liquidity, private sector consumption CO, PGDP is an implicit adjustment index of GDP, EMP is the total employment of the country, IP is private sector investment. RGDP Real Gross Domestic Product, DEPECO Economic Recession Index, RIR Real Interest Rate, RW Real Monthly Minimum Wage, EXR Nominal Exchange Rate in the Free Market, TOTL Seasonal Net Facility, YD Disposable Income, GDPOECD Gross Domestic Product of OECD Member States, E Expenditure Total, IM$ is the total expenditure at constant prices of 1390, RX1 is riyal value of the total export at constant prices of 1376, XO$ is oil export in dollars. In this part, two different models will be presented to investigate the effect of removing fictitious assets on liquidity and variables of the real sector. After estimating the equations in two different models and solving them, we create a scenario for the models. Next, in each scenario, we examine the effect of changing liquidity with and without considering fictitious assets on macroeconomic variables. That is to say, at this stage, we take into consideration the ineffective or total liquidity (with fictitious assets) and check its effect on all macroeconomic variables, and once again, we take into account the effective liquidity (without fictitious assets) and its effect on all macroeconomic variables. The behavioral equations of the macro-econometric model of the study were specified based on the research objectives and theoretical and empirical literature related to each of the equations. The actual variables are all based on the fixed prices of 2013. If the integration of a set of desired variables is proven based on the stationary test of model variables, it can be said that there is a long-term equilibrium relationship between these variables. These variables may have had a random trend (unstable) individually, but they follow each other well over time so that the difference between them is stable (Martin, 2013). The ARDL model estimation results are summarized in Tables 3 to 12. It should also be noted that these equations show long-term equilibrium relationships.

Table 2. Unit Root Analysis of Time Series

Result	Prob	Constant ,Constant&Trend, None	First difference	Prob	Constant ,Constant&Trend, None	Variables
I(1)	0.009	N	D(LOG (co))	0.093	C&T	LOG(Co)
I(1)	0.001	N	D(LOG((IP))	0.394	C&T	LOG (Ip)
I(1)	0.000	C&T	D(IR)	0.46	C&T	IR

I(1)	0.000	C&T	D(LOG(Yd))	0.520	C&T	LOG(Yd)
I(1)	0.01	C&T	D(LOG(FIC))	0.07	C&T	LOG(Fic)
I(1)	0.005	C&T	D(LOG(GDP))	0.071	C	LOG(GDP)
I(1)	0.008	C&T	D(LOG((M2)	0.23	C&T	LOG(M2)
I(1)	0.0014	C&T	D(LOG(EXR))	0.391	C&T	LOG(Exr)
I(1)	0.029	C	D(LOG(EMP)	0.27	C&T	LOG(Emp)
I(1)	0.018	C&T	D(LOG(NPL)	0.41	C&T	LOG(Npl)
I(1)	0.00	C&T	D(LOG(XO$)	0.172	C&T	LOG(XO$)
I(1)	0.013	C&T	D(LOG(W))	0.14	C&T	LOG(W)
I(1)	0.00	C&T	D(LOG(IM$))	0.373	C&T	LOG(IM$)
I(1)	0.00	C&T	D(LOG(X1))	0.531	N	LOG(X1)
I(1)	0.00	C&T	D(LOG(IMR)	0.210	C&T	LOG(IMR)
I(1)	0.00	N	D(LOG(E))	0.075	N	LOG(E)
I(1)	0.0284	C&T	D(LOG(PGDP)	0.838	C&T	LOG(Pgdp)
I(1)	0.0086	C&T	D(LOG(Nonfic)	0.42	C&T	LOG(Nonfic)

***Source**: Research finding.*

Table 3. Aggregate Product Equation

Variables	Coefficient	T value
LOG(EXR)	0.29	4.9
LOG(RGDP)	0.06	2.24
LOG(W)	0.73	11.25
R2	LM	RESET
0.99	1.38	1.10
	(0.26)	(0.38)

***Source:** Research finding.*

Table 4. Private Sector Consumption

Variables	Coefficient	T value
LOG(YD)	0.81	11.67
LOG(RNONFIC)	0.075	2.12
LOG(RFIC)	-0.03	-1.8
R2	LM	RESET
0.94	0.74	0.53
	(0.488)	(0.93)

***Source**: Research finding*

Table 5. Private Sector Investment

Variables	Coefficient	T value
LOG(REXR)	-0.2	-3.03
LOG(RGDP)	0.6	4.54
LOG(RNONFIC)	0.99	2.17
LOG(RG)	0.03	2.2
LOG(RIR)	-1.4	-2.7
R2	LM	RESET
0.99	2.41	1.44
	(0.10)	(0.19)

***Source**: Research finding*

Table 6. Employment Equation

Variables	Coefficient	T value
LOG(RGDP)	0.29	2.34
LOG(RW)	0.04	2.2
R2	LM	RESET
0.97	0.11	0.23
	(0.89)	(0.98)

***Source**: Research finding*

Table 7. Non-performing Claims Equation

Variables	Coefficient	T value
LOG(FIC)	0.7	2.48
IR	6.25	1.3
LOG(DEPECO)	0.4	3.1
R2	LM	RESET
0.94	0.16	0.28
	(0.95)	(0.84)

***Source**: Research finding*

Table 8. Liquidity Equation

Variables	Coefficient	T value
LOG(FIC)	0.94	2.9
LOG(RGDP)	7.5	2.08
RIR	4.2	2.4
INF	3.15	2.3
R2	LM	RESET
0.96	0.66	0.7
	(0.51)	(0.71)

***Source**: Research finding*

Table 9. Non-oil Export Equation

Variables	Coefficient	T value
LOG(EXROECD)	0.8	2.2
LOG(GDPOECD)	0.05	0.44
R2	LM	RESET

0.94	0.74	0.76
	(0.48)	(0.63)

***Source**: Research finding*

Table 10. Import Equation

Variables	Coefficient	T value
LOG(E)	1.28	3.26
LOG(REXR)	-0.21	-2.22
R2	LM	RESET
0.98	1.51	1.09
	(0.23)	(0.38)

***Source**: Research finding*

According to the t-statistics, all the coefficients in the model equations, except the real fictitious liquidity coefficients RFIC in the private sector consumption equation, the IR interest rate variable in the non-current claims equation, and the GDPOECD GDP variable have the necessary statistical validity. Having estimated and solved the equations in two different models with the help of Eviews 13 software, we are now investigating their effects on macroeconomic variables by applying changes in the components of effective liquidity and total liquidityTo assess the impact of a one-standard-deviation increase in effective and total liquidity, these variables were artificially elevated by that amount from the first season of 2021 to the winter season of 2022. The two models were then re-estimated separately using this adjusted dataset. Ultimately, the values of liquidity change in the two models are compared.

Tables 13 and 14 demonstrate the results of an alteration in endogenous variables of the model after changing effective and ineffective liquidity parameters.

Table 11. The Percentage Change of the Endogenous Variables after the Applying of the Effective Liquidity Change

Variables	RGDP	LOG(IP)	EMP	LOG(CO)	LOG(PGDP)
Percentage change	5.2	3.6	2.3	2	-1.5

***Source**: Research finding*

Table 12. The Percentage Change of the Endogenous Variables after the Application of Ineffective Liquidity Change

Variables	RGDP	LOG(IP)	EMP	LOG(CO)	LOG(PGDP)
Percentage change	-1.5	-2.6	-2	1	1.3

***Source**: Research finding*

According to the simulation of the model, effective liquidity has a positive impact on GDP, while total liquidity has a negative impact. However, the effects of changes in total liquidity on this variable are adverse. Moreover, although

effective liquidity has a positive effect on private-sector investment, the result of total liquidity is negative. That is to say, with the imposition of a one percent change in total and effective liquidities, the influence of effective liquidity is more significant on investment. Concerning changes in private sector consumption, the impact of effective liquidity is twice as much as total liquidity.

Regarding the employment and general price level, they are affected by effective liquidity much more than total liquidity. An increase in effective liquidity by one standard deviation led to a 2.3% increase in employment, while a similar increase in total liquidity resulted in a 2% decrease in employment. The general price level is decreased by 1.5, thanks to one standard deviation increase in effective liquidity. However, one standard deviation increase in total liquidity leads to a 1.5 increase in the general price level.

To conclude, based on the results, the first hypothesis of this research is confirmed. According to the estimated results of Table 8, it can be seen that with an increase of one percent in fictitious assets, liquidity increases by about 0.94 percent. As mentioned in the estimation of fictitious assets, non-performing assets are considered part of fictitious assets. Aligning with the results of previous studies, there is a direct relationship between liquidity and non-performing assets; therefore, according to the estimation of the liquidity function, the second research hypothesis is also confirmed.

The results show that for one standard deviation increase in effective liquidity, the GDP has increased by about 5.2% compared to the base state. Also, this figure for private sector investment, employment, and consumption is about 3.6%, 2.3%, and 2% respectively. In addition, the results show that for one standard deviation increase in total liquidity, the GDP decreases by about 1.5% compared to the base form. However, regarding private sector investment and employment, it is about 2.6 percent and 2 percent, respectively. Moreover, the consumption of the private sector has increased by only one percent.

In this research, the third hypothesis is also confirmed. Inflation has changed due to the increase in effective liquidity and total liquidity; So that with an increase of one standard deviation in effective liquidity; inflation will decrease by 1.5% compared to the base state, but with an increase of one standard deviation in total liquidity, inflation will increase by 1.3% compared to the base state.

5. Conclusion

In conclusion, the findings indicate that the existence of fictitious assets in the bank balance sheet causes an increase in the money supply, and reduces the quality of money. However, fictitious assets have no impact on the real sector and the effective money's influence on macroeconomic variables such as production, investment, employment, and consumption is more than the aggregate money's impact on these variables. The findings further indicate that ineffective monetary policy primarily results in inflation, adversely affecting employment, investment, and production. These outcomes align with the research of Banerjee (2018) and Sekine et al. (2003). Since banks are the most crucial sector of the country

regarding leading liquidity in Iran's economy, the financial discipline of the government sector and the monetary discipline of the banking sector require that these two institutions cooperate perfectly with each other.

To effectively implement provisioning policies for non-performing loans, it is crucial to adopt a macroprudential perspective. This involves encouraging banks to accumulate reserves in times of economic growth and using these reserves during economic downturns. Such a countercyclical approach can greatly enhance the stability of the banking system. The central bank, as the most prominent monetary institution, needs to strengthen its role as a supervisor of the banking system and not allow banks to balance their assets and liabilities through borrowing to provide more facilities.

Author Contributions

Conceptualization, all authors; methodology, all authors; validation, all authors; formal analysis, all authors; resources, all authors; writing—original draft preparation, all authors; writing—review and editing, H.H; supervision, H.S. All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Conflicts of Interest

The authors declare no conflict of interest.

Data Availability Statement

The data used in the study were taken from https://www.cbi.ir.

Acknowledgements

Not applicable

References

Banerjee, R., & Hofmann, B. (2018). The rise of zombie firms: causes and consequences. BIS Quarterly Review September.

Berger, A. N., & Bouwman, C. H. (2017). Bank Liquidity Creation, Monetary Policy and Financial Crises. Journal of Financial Stability, 30(2),139-155.

Blattner, L., Farinha, L., & Rebelo, F. (2023). When Losses Turn into Loans: The Cost of Weak Banks. American Economic Review, 113(6), 1600-1641. https://doi.org/10.1257/aer.20190149

Blattner, L., Farinha, L., & Rebelo, F. (2019). When losses turn into loans: The cost of undercapitalized banks, ECB Working Paper Series, No 2228.

Caballero, R. J., Hoshi, T., & Kashyap, A. K. (2008). Zombie lending and depressed restructuring in Japan. American Economic Review, 98(5), 1943-77.

Casu, B., di Pietro, F., & Trujillo-Ponce, A. (2019). Liquidity Creation and Bank Capital. Journal of Financial Services Research, 56(3), 307-340 . https://doi.org/10.1007/s10693-018-0304-y

Cerqueiro, G., Degryse, H., & Ongena, S. (2023). Swiss Finance Institute Research Paper Series N20-16 On-Site Inspecting Zombie Lending. Retrievedfromhttps://papers.ssrn.com/sol3/papers.cfm?abstract_id=3530574.

Cuncineeli, D. (2015). The Impact of Non-performing Loans on Bank Lending Behavior: Evidence from the Italian Banking Sector. Eurasian Journal of Business and Economics, 8(16), 59-71. https://doi.org/10.17015/ejbe.2015.016.04.

Gerali, A., Neri, S., Sessa, L., & Signoretti, F. M. (2010). Credit and Banking in a DSGE Model of the Euro Area. Journal of Money, Credit, and Banking, 42, 107-141.

Gross, M., Kok, C., & Żochowski, D. (2021). The Impact of Bank Capital on Economic Activity - Evidence from a Mixed-Cross-Section GVAR Model. ECB Working Paper, Retrieved from https://doi.org/10.2139/ssrn.2769909

Gylfason, T., & Radetzki, M. (1991). Does Devaluation Make Sense in the Least Developed Countries? Economic Development and Cultural Change, 40(1), -25.

Kapuuciiski, M. (2016). The Role of Bank Balance Sheets in Monetary Policy Transmission. Evidence from Poland. NBP Working Paper, 245, Retrieved from https://doi.org/10.2139/ssrn.2841629

Keeton, W. R., & Morris, C. S. (1987). Why do Banks' Loan Losses Differ? Economic Review, 72(5), 3-21.

Keshavarz, Hadi.,& Parsa, Hojat. (2019). The Impacts of Monetary Policy on Macroeconomic VariablesAssuming the Collateral Constraint. Iranian Journal of Economic Studies, 8(1), 69-90.

Koondhar, M.A., Aziz, N., Tan, Zh., Yang, Sh., Abbasi, K.R., & Kong, R. (2021). Green growth of cereal food production under the constraints of agricultural carbon emissions: A new insights from ARDL and VECM models. Sustainable Energy Technologies and Assessments, 47, 1-19.

Moore, B. J. (1983). Unpacking the Post Keynesian Black Box: Bank Lending and the Money Supply. Journal of Post Keynesian Economics, 5(4), 537-556. https://doi.org/10.1080/01603477.1983.11489391

Mahdavi, A., Elahi, N., Komijani, A., & Tavakoli, A. D. (2018). The Effects of Real and Monetary Variables on the Interest Rate of Bank Deposits in Iran. Journal of Financial Economics, 13(46), 1-24.

Martin, V., Hurn, S., & Harris, D. (2013). Econometric Modelling with Time Series Specification, Estimation, and Testing. London: Cambridge University Press.

Mishkin, F. (2011). The Economics of Money, Banking and Financial Market (11th). Pearson: Columbia University Press.

Parvin, S., Ebrahimi, I., & Ahmadian, A. (2014). Analysis of the Impact of Banking System's Balance Sheet Shocks on Output and Inflation in Iranian Economy. Journal of Economic Research, 14(52), 149-186.

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

Salah, A., Nusair, S.A., & Olson, D. (2022). The dynamic relationship between exchange rates and stock prices for the G7 countries: A nonlinear approach. Journal of International Financial Markets, Institutions, and Money, 78, 1-24.

Samsami, H., Ahmadlou, F., & Azimi, A. (2014). Comparing the Impact of Government Financing on Production and Inflation through Increasing Exchange Rate and Borrowing from the Central Bank. Quarterly Journal of Theories of Financial Economics, 2(3), 1-26.

Samsami, H., Sadeghi,M.,& Sherafat,m.(2007). Inflation- targeting exchange rate policy for an oil-producing country the case of Iran. International Research Journal of Finance and Economics, (12),80-97.

Sekine, T., K. Kobayashi, and Y. Saita (2003). Forbearance Lending: The Case of Japanese Firms. Monetary and Economic Studies,21(2) 69-92

Toutunchi, S. M. (2006). The Impact of Volatility of Exchange Rate on Macroeconomic Variables (Unpublished Master's Thesis). Shahid Beheshti University, Iran.

Vithessonthi, C. (2023). The Consequences of Bank Loan Growth: Evidence from Asia. International Review of Financial Analysis, 83(2023), 252-270.

Werner, R. A. (2016). A Lost Century in Economics: Three Theories of Banking and the Conclusive Evidence. International Review of Financial Analysis, 46(2016), 361-379\.

Werner, R. A. (2014) Can Banks Individually Create Money out of Nothing?- The Theories and the Empirical Evidence. International Review of Financial Analysis, 36(2014), 1-19.

Zamanzadeh, H.,& Badri, A. (2017). The Role of Unbalanced Balance Sheet of Banking System in Creating the Puzzle of Interest Rate, Inflation and Liquidity Growth: Evidence from Iran. Journal of Money and Economy, 11(2), 173-191.