Journal of Money and Economy
Vol. 15, No. 4, Fall 2020
pp. 403-422
DOI: 10.29252/jme.15.4.422

Original Research Article

Macroeconomic Effects of Government Debt on Banks in Iran

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Received: 11 Apr 2020 Approved: 20 Feb 2021

In the Iranian economy, part of the government's fiscal policies and liabilities is always financed by banks. As government debt to banks increases, the private sector's access to loans and facilities is limited. It can cause undesirable macroeconomic outcomes. This study investigates the macroeconomic effects of government debt on banks in Iran over 1972–2016 by using an SVAR model. Results show that government debt to banks does not significantly affect the aggregate demand ratio to aggregate supply and GDP per labor. Still, it significantly increases the real exchange rate and decreases the non-tradable goods' ratio to tradable goods prices. In the long-run, the real exchange rate, the ratio of non-tradable goods to tradable goods price, and the general price level changed by 34.46, 20.95, and 46.4 percent, respectively, which can be explained by the government debt to banks. Results indicate that the government policy manages the Iranian economy.

Keywords: Banks, Government Debt, Real Exchange Rate, Tradable Goods, Non-Tradable Goods, SVAR.
JEL Classification: E62, E69, H63, H69.

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[DOI: 10.52547/jme.15.4.403]

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1 Introduction

Using fiscal policies, governments pursue sustained long-run economic growth. Accordingly, in recession periods, they prevent recession deepening by reducing taxes and increasing spending and financing through debt issuance. On the contrary, they repay their debts by increasing taxes and reducing their expenses in boom conditions. The effect of government debt on the real sector of the economy is still unclear. In this regard, there are two sets of theoretical foundations, including the principle of Ricardian equivalence and the Keynesian theory. The Ricardian equivalence principle suggests that for a given path (level) of government spending, the intertemporal transfer of tax (accumulation or reduction of the government debt) does not affect the private sector consumption (Barro, 1974; Blanchard & Fischer, 1989). Therefore, in a closed economy, interest, investments, and production rate will remain the same. For the Keynesians, tax decreases, while maintaining government spending levels, have led to government debt accumulation, which, in time, increases private consumption, and as a result, affects economic variables, e.g., production and employment (Apere, 2014). The conventional view of government debt suggests that demand-driven production and the financial deficit (or high government debt) have a positive effect on disposable income, aggregate demand, and total production in the short-run. These positive effects are likely to be larger when the actual product level is below potential capacity (Elmendorf & Mankiw, 1999). In general, government borrowing is acceptable as long as it is in line with sound public finance. A sound public finance policy is a policy whereby the present value of the budget deficit created during the recession period is equal to the present value[1] of the total surplus of budgets created during the boom period. For the government to pay its obligations, the government debt should comply with the "No-Ponzi game" requirements. The principles of sound public finance are based on the idea that a structural and permanent deficit should be prevented. Keynes (1923) was the first economist to support this idea. According to Keynes, the government should create a deficit in the recession period, and a surplus during the boom period should offset this deficit. A permanent deficit leads to emerging expectations based on which the government will never repay its debts (Curtaşu, 2011).

In developed countries, debt issuance is done through the capital market channel, but in developing countries, governments generally borrow from the

[1] Provided that the present value calculation is made on the basis of the interest paid to the financier institutes.

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[DOI: 10.52547/jme.15.4.403]

banking system due to the less developed capital markets. The banking system includes the central bank and the banks. Various studies have been carried out on government borrowing from the central bank and its effects (e.g., Aisen & Veiga, 2008; Kwon et al., 2009; Bassetto & Butters, 2010; Aktas et al., 2010; Badarudin et al., 2011; Bywaters & Thomas, 2011; Aisen & Hauner, 2013; Bajo-Rubio et al., 2014; Kliem et al., 2016; Berentsen & Waller, 2017; Williamson, 2018; Bassetto & Cui, 2018). Yet, government borrowing from banks and its implications are less considered by empirical studies. However, in developing countries, government debt to banks has a considerable share in the banks' balance sheet. In Iran, more than 25% of government debt belongs to banks (Salmani, 2019). That is, the Iranian government has resorted to banks to finance its budget deficit. Accordingly, this paper analyzes the macroeconomic effects of government debt on banks in Iran using the SVAR approach over the period 1973–2016.

This study, as compared to international and national studies, is distinguished for the subject and effects transition mechanism. The macroeconomic effects of government debts on banks in Iran, and other countries, based on the effects transition mechanism, are not studied. In this paper, the effects transition mechanism of government debts to banks and the economy through supply gap channel and total demand, real currency rate, the price gap between tradable and non-tradable sectors, the general level of prices, and production level, are studied.

The remainder of this paper is organized as follows. Section 2 reviews the theoretical framework and empirical literature. In Section 3, modeling and methodology are described. Section 4 estimates and analyzes the results, and finally, Section 5 concludes the paper.

2 Theoretical Framework and Empirical Literature

The government's debts to banks are studied in different studies, especially after the debt crisis in Europe.

In the wake of the 2008-2009 financial crisis, European countries' public finances have been severely distressed, placing their debt's sustainability into question. Sovereign risk ratings were repeatedly devalued, raising important concerns about European authorities' ability to preserve the Eurozone’s financial stability as a whole. All countries have been affected to greater or lesser degrees, but their funding costs, i.e., bond and credit default swap (CDS) spreads, have risen sharply without exception. At the regional level, several studies have shown that contagion may have occurred across the sovereign debt of different European countries during the global financial

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[DOI: 10.52547/jme.15.4.403]

crisis and the Euro debt crisis (Antonakakis & Vergos, 2013; Fernández-Rodríguez et al., 2015; Ho, 2016). More importantly, deteriorating bond markets have severely impacted the private sector, and produced adverse effects on bank funding conditions, significantly disrupting economic recovery in early 2010. During the sovereign crisis, banks in Europe were confronted with stress in their capital and liquidity positions caused by their exposure to government debt securities. In this way, Bolton and Jeanne (2011) showed that i) individual incentives of member countries are to supply an excessively low amount of secured debt and an excessively high amount of risky debt, and ii) banks' incentives are to diversify their portfolios of sovereign debt, which reduces the cost of a default of any individual financial institution while increasing the risk of contagion.

Also, A bias toward domestic government debt provides banks with a hedge against a Eurozone break-up, reducing redenomination risk for both distressed countries such as Greece or Italy and sounder countries such as France or Germany (Battistini et al., 2014). The government could also use "moral suasion" to induce domestic banks to purchase large amounts of sovereign debt. De Marco and Macchiavelli (2016) provide evidence of the government pressure channel: government-owned banks increased the home bias during the sovereign crisis. It was Italy's case: even if state-owned banks were sold to foundations (nonprofit organizations) in 1990, banking foundations are still under political groups' influence. The implications of government debt management always have been a challenging topic in the economy, and there is some contradictory empirical evidence on the performance and effects of government debt on the economy (Jiménez, 2011). For example, according to Galí (1994), government purchases, in themselves, may act as a stabilizer. By contrast, Bratsiotis and Robinson (2004) showed that the Mexico government debt in 1994, caused by a deficit, could lead to a financial crisis. In general, the negative and positive effects of government debt on the economy are most dependent on government debt management. Besides, a key issue in government debt management policy is the choice of government debt financers. To finance the deficit, governments can borrow from the central bank, banking network, and non-depository financial institutions (households, non-depository institutions, and foreign organizations) (Branson, 1989). For the macroeconomic effects of government borrowing from the central bank, Sargent and Wallace (1981) suggested the theory of "financial dominance." In this theory, the government adopts a deficit policy regardless of the central bank's decisions, and this deficit is financed by borrowing from the central bank. If so, monetary policies

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follow financial policies. Based on the theory of "fiscal dominance," two other theories were raised. The first is the "fiscal theory of inflation." According to this theory, in a predominantly financial condition, the financer independently and by regarding the brokerage income determines the budget's initial balance, and the monetary position regulates the money growth rate. As a result, the monetary authority loses control of inflation (Drazen, 1985; Chugh, 2015). The second is the "fiscal theory of price level." According to this theory, the government's intertemporal budget allocation shows that the real accumulation of government debt is equal to the sum of the current account surplus and future account surplus. Consequently, monetary policy determines the government's prices level through brokerage and intertemporal budget (Ho, 2005). It indicates that the central bank loses control over price levels, even in countries where brokerage accounts for a small portion of total government revenue (Canzoneri et al., 2001). Moreover, if the government borrowing from the banking system causes the banking system to borrow from the central bank, it will indirectly raise fiscal dominance, inflation, and the price level. But if the government borrowing from the banking system limits the non-state sector's access to the bank facilities, the interest rate (financing cost) will increase. In other words, government borrowing from the non-state sector's financial resources will lead to resource accumulation, and the private sector's share in the economy reduces. It is known as the "crowding-out of private investment" (Majumder, 2017). Yet, if the government debt to the banking system is formed because of the government support of the private sector, gross fixed capital, and social goals are formed, the government will be complementary to the private sector (crowding-in of private investment). The outcome of these effects will determine the effect of government debt on the banking system on the economy's real and nominal sector. According to monetarists, the expansion of state sector spending will inevitably hurt private-sector spending unless the money supply increases equivalently (Thomas, 2000). According to Keynesians, assuming the presence of unemployment in the economy and low investment sensitivity to interest rate, expansionary fiscal policy does not increase interest rates or lead to a slight increase in interest rates, and thus, production and income increase. Besides, Keynes assumed that government expenditures increased private investment due to the positive effect on investors' expectations. Keynesians agree with monetarists only if there is an economy with full employment. The "neoclassical loanable fund theory" suggests that the interest rate mechanism solves the balance of savings and investment, and the slow or weak performance of this mechanism is attributed to short-run deviations in

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employment and production. In the case of increased government expenditures (and financing by government debt), the interest rate should maintain equilibrium in the capital market and inevitably replace private investment (Khan and Gill, 2009). Friedman (1968) argued that if there was an economy with full employment, the price level would rise as aggregate demand grew. As a result, debt accumulation for increasing the demand for government consumption expenditures would be inflationary. Miller (1983) argued that government deficits would inevitably cause inflation, whether or not the budget deficit was monetary. Because there were different channels where the budget deficit caused inflation without being monetized. He stated that even if the central bank did not monetize the budget deficit by printing banknotes, the government deficit would still be inflationary through the crowding-out effects (Aworinde, 2013).

Eldan (1997) studied Turkey's real section's interaction, a financial section of economics in different Financial Liberalization stages during 1980-1990. CGE simulation showed that financing the budget deficit through debt (government bonds) and monetization has a significant negative effect on macroeconomic. The pursuing of this policy pressures the interest rate and minifies financial markets and the private sector. As a result, the real economy would shrink.

Checherita-Westphal and Rother (2012) have studied the effects of government debt on the economic GDP growth per capita in the 12 Eurozone countries over 40 years (from 1970); their reviews showed the non-linear effects of government debt on economic growth. The Debt to GDP ratio was more than 90-100% will have devastating effects on long-run growth. Furthermore, they stated that the high negative effect of government debt on economic growth might start at an approximate GDP rate of about 70–80% of domestic production. Therefore, they recommended a more discreet policy at this level. In this manner, they indicated the universal debt ratio changing and budget deficit to interior GDP have a negative linear relationship with GDP growth per capita growth. The channels we used in our study are presented as follows: 1-private section saving 2-governmental investing 3-Total factor productivity (TFP) and 4- long term nominal and real lending rate. Spilioti and Vamvoukas (2015) did this studying during the time of about 40 years in Greece that showed meaningful positive effects of debts on the GDP growth.

Mayer et al. (2013) analyzed the effects of government fiscal position on the transmission of government expense shocks in a New Keynesian model. The results indicate if real lending rates have limited flexibility, the government's higher debts will result in less uniform behavior of

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macroeconomic variables, and higher debts will support this mechanism. Therefore, their simulations showed that for higher debt-to-GDP ratios, pro-cyclical real wage fluctuations are strengthened, indicating a stronger countercyclical behavior of marginal profits compared to a lower indebted economy. So, the government's financial position channels may decrease profit and occupational opportunities and increase jobless numbers.

Umaru et al. (2013) studied the relationship between Nigeria's economic growth and the foreign and domestic debts over 1970–2010 using the OLS method. Results showed that the external debt had a negative effect, and the domestic debt positively impacted Nigeria's economic growth.

Spilioti and Vamvoukas (2015) have studied the government debts effects on Greece's economic growth from 1970-2010. They used financial policy variables, trading, and population policy variables of government besides debt policy variables. The results indicated a positive effect of increasing government debts on the economic growth of Greece.

Afonso and Alves (2015) studied the effect of public debt on economic growth for annual and 5-year average growth rates and the existence of non-linearity effects of debt on growth for 14 European countries from 1970 until 2012. They also considered debt-to-GDP ratio interactions with various subsets of monetary, public finance, institutional, and macroeconomic variables. The results showed a maximum negative impact of around –0.04% and –0.03% for each 1% increment of public debt, for annual and 5-year average growth rates, respectively. Besides, we find an average debt ratio threshold of around 75%. Belonging to the eurozone has a detrimental effect of at least –0.5% for real per capita GDP, and the banking crisis is the most harmful crisis for growth.

Chen et al. (2017) studied the optimum level of investing and government debt to GDP ratio based on 65 developed countries panel data, compiling a theoretical non-linear model. They indicated that each country has its optimum level of investing and government debt based on economic positions by using Smooth Transition Regression.

Berentsen and Waller (2017) developed a dynamic general equilibrium model, in which the fiscal price level was considered a condition of equilibrium. The study of the model's dynamic features showed that government debts' market value could fluctuate even if there were no changes in the current or future time taxes or costs. This dynamics of government debt prices is simply due to the liquidity of government debt.

De Luigi and Huber (2018), by compiling a Threshold Vector Autoregression with Stochastic Volatility model and using seasonal data over

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1967:1-2012:4 period time of USA economy, showed that in high debt regimes, monetary policies have less efficiency.

Grobéty (2018), by studying 28 industries in 39 developed and developing countries in period time 1990-2007 by using the non-linear pattern, found that industries in countries with the government debt to GDP ratio are growing faster than other countries. They stated that if government debt has good liquidity, industries can use these debts as a collateral bond in obtaining facilities.

Keddad and Schalck (2020) examined Sovereign Risk Spillovers' effect on 30 Domestic Banks from 14 countries during the European Debt Crisis by using the Markov Switching Model. The results show that the increase in sovereign credit risk seems to have generated second-round effects for some banks that have experienced a deterioration in their funding conditions due to a rise in the domestic sovereign default risk. Overall, the results suggest that sovereign CDS spreads can be considered good forewarning indicators for predicting the evolution of bank CDS spreads. The result also shows that the effects differ depending on the country and the financial institution.

3 Methodology and Research Model

This paper employs the SVAR approach to study government debt effects on the banks in Iran's macroeconomy. Unlike the unconstrained VAR model, where the structural shocks are identified tacitly and arbitrarily, SVAR models have a theory-based economic logic based on the economic theories to apply short- or long-run constraints. Structural patterns are obtained after applying constraints (Elbourn, 2008). The basic SVAR approach is as follows:

$$\Gamma Y_t = BX_t + e_t \quad (1)$$

Where Y_t is a vector of $(n \times 1)$ consisting of endogenous variables, X_t is the lagged exogenous and endogenous variables, and $\sum e = E(ee')$ is the variance-covariance matrix of structural components. In Equation 1, Γ and B are unidentified. To identify them, the decreasing form of the model is calculated, where the simple information in the dataset is summarized. The decreasing form shows each endogenous variable as a function of the predetermined variables:

$$Y_t = B * X_t + u_t \quad (2)$$

Where $B = \Gamma^{-1}\Gamma$, $u_t = \Gamma^{-1} e_t$, and the variance-covariance matrix of the decreasing form is $\sum u = E(uu')$. In this paper, the Y_t vector includes

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variables introduced in Table (1). u_t is the error terms of the modified form as the following matrix:

$$u_t = [u^{Lddepp_t}, u^{Ladtas_t}, u^{Lrexch_t}, u^{Lpntpt_t}, u^{Lcpi_t}, u^{Lgdpl_t}] \quad (3)$$

Table 1
Definition of Variables

Variable	Definition	Reference of Raw Data
LDDEPP	natural logarithms of government debt per capita to the banking system	Central Bank of Iran
LADTAS	natural logarithms of the total domestic demand ratio to the total domestic supply1	Central Bank of Iran
REXCH	natural logarithms of the real exchange rate2	Central Bank of Iran, World Bank
LPNTPT	natural logarithms of the ratio of non-tradable goods to tradable goods prices3	Central Bank of Iran
LGDPL	natural logarithms of GDP for labor force at the fixed price of 2004	Central Bank of Iran, Statistical Center of Iran
LCPI	natural logarithms of the index of goods and consumer services prices due to the base year 2004	Central Bank of Iran

In the present study, the following SVAR model has been used to model the macroeconomic effect of government debt to banks in Iran:

$$\begin{bmatrix} e^{Lddepp_t} \\ e^{Ladtas_t} \\ e^{Lrexch_t} \\ e^{Lpntpt_t} \\ e^{Lcpi_t} \\ e^{Lgdpl_t} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 & 0 & 0 \\ b_{31} & b_{32} & b_{33} & 0 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & b_{44} & 0 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & b_{55} & 0 \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & b_{66} \end{bmatrix} \times \begin{bmatrix} u^{Lddepp_t} \\ u^{Ladtas_t} \\ u^{Lrexch_t} \\ u^{Lpntpt_t} \\ u^{Lcpi_t} \\ u^{Lgdpl_t} \end{bmatrix} \quad (4)$$

Where the vector e_t contains the structural error terms, defined as follows:

[1] In order to calculate the aggregate demand, the amount of export was subtracted from GDP, and the amount of import was added to the GDP. In addition, the aggregate supply was considered as equal to GDP.

[2] The real exchange rate was calculated by multiplying the dollar rate (in Rial) in the informal market by the ratio of the US CPI index to the Iran CPI index.

[3] In order to calculate the price index of non-tradable goods, there was used the implicit indicator of the building sector, and in order to calculate the price index of tradable goods, the implicit indicator of the manufacturer was used regardless of the building sector.

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$$e_t = [e^{Lddepp_t}, e^{Ladtas_t}, e^{Lrexch_t}, e^{Lpntpt_t}, e^{Lcpi_t}, e^{Lgdpl_t}] \quad (5)$$

In the following, reasons for applying constraints are described according to equations system 4. According to Equation 1, it is assumed that government borrowing from banks follows a simple random process. In other words, government debt to banks can change for various budget and non-budget reasons. According to Equation 2, the government borrowing from banks, credits, and payable facilities to the non-state sector may be limited. In other words, the private sector has limited access to banking resources. In turn, it leads to changes in the private sector's aggregate demand for goods and inputs. Yet, supply is affected by the limitations, too. But the aggregate supply is inelastic in the short-run due to technological and manufacturing limitations. Therefore, the ratio of aggregate demand to aggregate supply in the economy will change. According to Equation 3, if the total economic demand changes, the general price level will change, and to adjust some changes in the price level, the government may regulate imports based on the demand changes (Farzanegan & Markwardt, 2009). These measures will affect the demand for currency and, consequently, the market's nominal exchange rate. At last, the real exchange rate will be determined by the exchange rate changes and the price level. However, at this stage, the aggregate supply in the economy changes, and therefore, demand and prices for the production factors will change. Some of the changes in inputs and factors price will be neutralized on the supply side through regulating imports. However, supply-side developments are also reflected by the real exchange rate change. According to Equation 4, in the process of establishing the real exchange rate, if because of the shock of current (budget) variables and government debt to banks, a surplus of aggregate demand emerges, assuming both types of tradable and non-tradable goods to be normal, the demand for both types of goods will increase. But the price growth of these two goods depends on the supply response. Yet, it is almost impossible to control the prices of non-tradable goods through imports. In contrast, excess demand for tradable goods is made up by increasing imports, and as a result, the price of non-tradable goods is more likely to increase than the tradable goods. Also, an increase in the exchange rate will raise the non-tradable goods' ratio to tradable goods prices. Because non-tradable goods such as housing have a capital function, and with the increased exchange rate as an alternative investment asset, the expected return on housing investment is also expected to increase. According to Equation 5, the change in the price of non-tradable and tradable goods leads to new equilibrium values of the general price level. According to Equation 6,

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government debts to banks, by changing the supply and demand gap, the real exchange rate, the relative prices, and the general price level will lead to changes in the aggregate supply, and consequently, to changes in the economic growth.

4 Model Estimation and Results Analysis

Before analyzing the stationarity of research variables, related descriptive statistics of all research variables are presented in Table (2).

Table 2
Descriptive Statistics

variable	LREXCH	LPNTPT	LGDPL	LCPI	LDDEPP	LADTAS
Mean	9.0864	-0.1037	-9.3682	2.6397	-9.3544	-0.0199
Median	9.2548	-0.1035	-9.4211	2.6765	-10.4561	-0.0055
Maximum	10.3507	0.2766	-8.8686	5.8909	-4.3494	0.2737
Minimum	7.8363	-0.5041	-9.6542	-0.6931	-13.4396	-0.5406
Std. Dev.	0.5668	0.1619	0.1920	2.0785	2.3224	0.1346
Skewness	-0.3811	-0.0393	1.1718	-0.1068	0.7037	-1.1224
Kurtosis	2.9956	2.8392	3.6565	1.6082	2.4856	7.2805
Jarque-Bera	1.0167	0.0561	10.3654	3.4699	3.9296	40.8820
Probability	0.6015	0.9723	0.0056	0.1764	0.1402	0.0000

Source: Research findings

Time series is modeled based on the assumption of variables stationary. Based on the KPSS unit root test (Kwiatkowski et al. 1992) results, the null hypothesis of this test, which is the absence of unit root for all variables during the studied period, is confirmed (1972–2016) (Table 3).

Table 3
KPSS Unit Root Test Results

Variable		LDDEPP	LADTAS	LCPI	LGDPL	LPNTPT	LREXCH
KPSS statistic		0.1408	0.1058	0.1400	0.2495	0.1366	0.1332
Critical value	1%	0.2160	0.7390	0.2160	0.7390	0.2160	0.2160
at the	5%	0.1460	0.4630	0.1460	0.4630	0.1460	0.1460
significance	10%	0.1190	0.3470	0.1190	0.3470	0.1190	0.1190
level							

Source: Research findings

After ensuring the variables' stationarity, the first step in dynamic models is to identify the optimal lag length. Due to the small size of the sample, the Schwartz criterion (S.C.) was used. This criterion determines 1 as the optimal

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lag length. Hence, the SVAR model is estimated with a lag length of 1. It should be noted that a structural break due to the economic developments in Iran during the studied period is a probable one. Accordingly, to promote the research model, a trend variable, a dummy variable for the years of the Iran-Iraq war, and two other dummy variables were defined for the developments associated with the exchange rate systems from 1993 to 2001 and 2002–2016 and exogenously logged into the model. It should be mentioned that all four variables were statistically significant in the estimated model. Results of the matrix B of the SVAR are as follows:

$$B = \begin{bmatrix} 0.29 & 0.00 & 0.00 & 0.00 & 0.00 & 0.00 \\ -0.01 & 0.06 & 0.00 & 0.00 & 0.00 & 0.00 \\ -0.19 & 0.35 & 0.22 & 0.00 & 0.00 & 0.00 \\ 0.02 & 0.13 & -0.04 & 0.14 & 0.00 & 0.00 \\ 0.03 & -0.10 & 0.61 & 0.06 & 0.12 & 0.00 \\ -0.08 & 0.53 & 0.25 & 0.05 & 0.14 & 0.05 \end{bmatrix} \quad (6)$$

It should be noted that for the system of hypothesized equations and applying constraints, we emphasize immediate, simultaneous effects, and thus, applying zero constraints to equations does not mean ineffective. Still, it means that the variable effect on the others does not appear in the same period. By using the matrix B values and the residual terms of the solved VAR, we can extract the structural shock and examine its effect on the response variables using instantaneous reaction functions and variance analysis. Table 4 presents the results of the instantaneous reaction functions, and Table 5 shows the results of the variance analysis.

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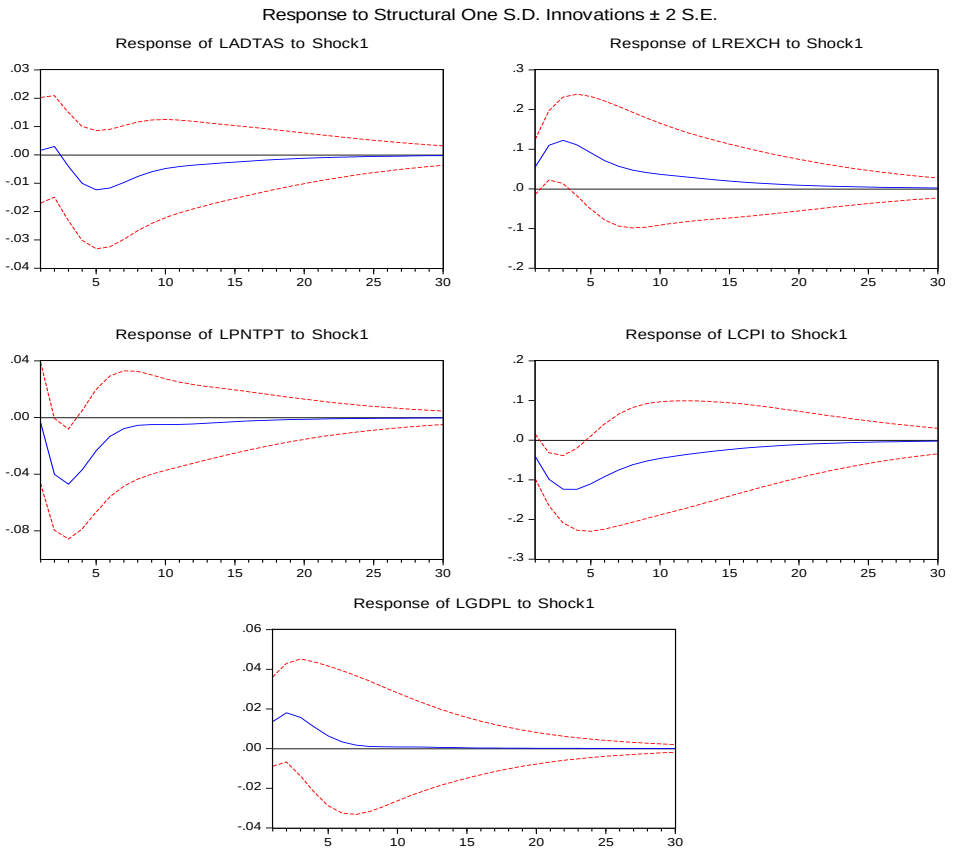

Figure 1. Macroeconomic Instantaneous Response to a Standard Deviation from Increase in Government Debt Per Capita to Banks.
Source: Research findings

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Table 4
The Macroeconomic Instantaneous Response to a Standard Deviation of Increase in Government Debt Per Capita to Banks

Period	LADTAS	LREXCH	LPNTPT	LCPI	LGDPL
1	0.0016	0.0552	–0.0038	–0.0413	0.0136
	(0.0093)	(0.0346)	(0.0214)	(0.0282)	(0.0113)
2	0.0030	0.1097 *	–0.0401 *	–0.0986 *	0.0180
	(0.0090)	(0.0437)	(0.0197)	(0.0334)	(0.0124)
3	–0.0041	0.1221 *	–0.0471 *	–0.1238 *	0.0157
	(0.0096)	(0.0544)	(0.0194)	(0.0424)	(0.0147)
4	–0.0101	0.1109 **	–0.0369 **	–0.1241 *	0.0108
	(0.0101)	(0.0638)	(0.0209)	(0.0516)	(0.0164)
5	–0.0124	0.0908	–0.0235	–0.1102 **	0.0064
	(0.0104)	(0.0710)	(0.0217)	(0.0599)	(0.0176)
6	–0.0117	0.0714	-0.0134	–0.0920	0.0033
	(0.0104)	(0.0750)	(0.0213)	(0.0663)	(0.0180)
10	–0.0049	0.0367	–0.0050	–0.0461	0.0008
	(0.0087)	(0.0641)	(0.0162)	(0.0713)	(0.0136)
15	–0.0026	0.0195	–0.0029	–0.0236	0.0004
	(0.0064)	(0.0465)	(0.0111)	(0.0588)	(0.0077)
20	–0.0012	0.0093	–0.0013	–0.0112	0.0001
	(0.0045)	(0.0325)	(0.0071)	(0.0419)	(0.0040)
30	–0.0003	0.0021	–0.0003	–0.0025	0.0000
	(0.0017)	(0.0126)	(0.0024)	(0.0161)	(0.0010)

* and ** indicate the significance at the probability level of 5% and 10%, respectively.
Source: Research findings

According to Table 4, creating a positive shock, to the extent of a standard deviation, in the government debts to the banks does not significantly affect the aggregate demand-to-the aggregate supply ratio. But this increase is not statistically significant. The shock would cause the real exchange rate to increase, which is statistically significant during the second, third, and fourth years after the shock. The second, third, and fourth year's increased measure is 0.1097, 0.1221, and 0.1109 percent, respectively. The ratio of non-tradable goods to tradable goods prices starts to decrease under the influence of government debt's positive shock to banks during the second, third, and fourth years after the shock, which is statistically significant. The decreases in the second, third, and fourth year are –0.0401, –0.0471, and –0.0369 percent. Under the influence of the government debt shock to the deposit-accepting organizations, the general price level starts to drop significantly during the second to fifth years. These drops in the second, third, fourth, and fifth years are as much as –0.0986, –0.1238, –0.1241, and –0.1102 percent, respectively.

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The level of GDP does not show a significant response to shocks of government debt to banks. To understand the effect of government debt on banks in Iran, two points should be identified: 1) What components does government debt consist of? 2) Does government borrowing from the banks takes place from the deposits of the non-state sector? Based on the balance sheet items of banks in Iran, government debt to banks does not only include the government's direct debts but that part of the bank's claims of state and non-state sectors guaranteed by the government, although not repaid at the maturity date. Therefore, the government's debt to the banks does not necessarily mean that the government has been directly provided with facilities. Moreover, the government is not provided with loans and facilities not from non-state deposits but from a credit line created by the central bank (which, in turn, increases the banks' debt to the central bank). Besides, most of the Iranian economy's subsidized banking facilities are provided to the non-state sector, and the government guarantees repayment of a major part of the facilities. Accordingly, the structure of government debt to the banking system does not significantly limit the private sector's access to the banking system resources. It should be noted that providing subsidy facilities is a supportive policy focused on developing the non-state sector, principally with a low-profit rate. It can keep the costs of goods and services low and cause the private sector to move toward production. According to the central bank's time-series data, most of the subsidy facilities are provided to the non-state sector. So that in 2016, the share of the non-state subsidy facilities reached over 99%. As a result, if the government debt to the banking system increases for the guarantee and the obligation to repay the matured subsidy facilities, in some ways, the government will accept the non-state sector debt burden to the banking system because most of the subsidy facility resources are allocated to the non-state sector. Accordingly, instantaneous response functions show that as the government debt rises, a gap emerges between the whole economy's supply and demand. Although this gap is not statistically significant, prices are significantly reduced as the price level drops, the real exchange rate rises. On the one hand, government debt to the banks is largely due to government plans to develop infrastructure and invest in manufacturing equipment and machinery. As a result, the supply of non-exchangeable goods increases, which means controlling their price. On the other hand, implementing these projects is associated with the demand for exchangeable goods and services. Meanwhile, the price will also be adjusted if the facilities are managed to produce exchangeable goods and services. Based on instantaneous response functions, the effect has been a decrease in the ratio of non-tradable goods to

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tradable goods prices. With the price ratio condition, the general price level will eventually be at the lower equilibrium level.

Suppose part of government debts to the banking system obtain through the credit line (L.C.) from the central bank. In that case, monetary base changes, the demand level of the whole economy, total supply, and general price level can change. Also, suppose this credit line settles from foreign currency sources of oil revenues of the Iran government. In that case, the exchange rate may change, and the results of nominal exchange rate changes and general prices level will react to the real exchange rate. These cases are other channels of transferring government debt to the banking system effects through macroeconomic variables. In the SVAR mechanism, this is regarded indirectly because the sample is generally specified.

Table 5
Analysis of the Variance Decomposition of Macroeconomic Variables to Structural Shock of Government Per Capita Debt to Banks

Period	LADTAS	LREXCH	LPNTPT	LCPI	LGDPL
1	0.0718	6.0387	0.0778	5.1111	3.4870
2	0.2608	15.2075	7.2880	18.8691	6.3414
3	0.6004	22.4551	15.2753	31.0977	8.0144
4	2.6102	27.4962	19.3852	39.2995	8.6354
5	5.4045	30.5804	20.7517	43.9281	8.7477
6	7.7564	32.2637	20.9841	46.1248	8.7142
7	9.3021	33.1145	20.9173	46.9349	8.6716
8	10.2048	33.5469	20.8340	47.0904	8.6464
9	10.7226	33.7962	20.7958	47.0071	8.6357
10	11.0409	33.9691	20.7991	46.8760	8.6333
15	11.7471	34.3817	20.9184	46.5315	8.6410
20	11.9306	34.4507	20.9448	46.4290	8.6424
30	11.9794	34.4663	20.9521	46.3960	8.6427

Source: Research findings

Given that the effect of government debt-to-banks on LREXCH, LPNTPT, and LCPI is statistically significant and statistically non-significant on LADTAS and LGDPL, the analysis results of variance is also valid for LREXCH, LPNTPT, and LCPI. According to the results of variance analysis functions, the shock of government debt to banks in the first year of real exchange rate changes, the ratio of tradable goods to non-tradable goods prices, and the general price levels are 6.0387, 0.0778, and 5.1111 percent, respectively. In the short-run (5 years), they are 30.5804, 20.7517, and

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43.9281 percent, respectively, and in the long-run (15 years) are 34.3817, 20.9184, and 46.5315 percent, respectively.

5 Conclusion

In developing countries, e.g., Iran, it is common for the government to borrow from banks. Yet, empirical research rarely deals with the outcome of government debt to banks. The present study analyzed the macroeconomic effects of government debt on banks in Iran using the SVAR method over the period 1973–2016.

Instantaneous response functions showed that the positive shock of government debt per capita to banks did not significantly affect the ratio of aggregate demand to aggregate supply. But the real exchange rate increases under the influence of this shock, which is statistically significant over the first three years. By contrast, the ratio of non-tradable goods to tradable goods prices decreases, which over the second, third, and fourth years after the shock is statistically significant. Consequently, the general price level's effects over the second to fifth years after the shock reduce significantly. Also, the shock of government debt to banks has no significant effect on the production level. The favorable effects of government debt on banks on the Iranian economy's nominal sector come from the government debt to banks. The debt is mainly due to the banks' subsidy facilities to the private sector, whose repayments have been guaranteed by the government.

Moreover, a part of this debt is due to government involvement in building economic infrastructure. Therefore, here the government has a subsidiary role to the private sector. Based on these results, if the government's goal is controlling inflation, improving the real exchange rate, increasing the Iranian economy's competitiveness, and mitigating the Dutch disease effects, it is better to managed borrow from the banks to offset its fiscal deficit. It should be noted that this borrowing alone can be the source of many problems in the Iranian economy if the government overborrow banks or does not timely settle the debts.

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