

Fiscal versus Monetary Dominance: Evidence from Iran

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In this paper, we dealt with fiscal dominance, which is a situation in which the fiscal authority sets its expenditure and taxes without regard to any requirement of intertemporal budget balance. Therefore, the monetary authority must adjust its policies to ensure that the government budget is in balance. The existence of oil revenues for the government on the one hand and its lack of access to the financial market, on the other hand, are reasons that we can see financial repression and fiscal dominance in the economy of Iran. This paper presents forward-looking estimates of the relationship between the change in the consolidated primary deficit and the change in the monetary base. This study covers the period 1978-2017, and an autoregressive approach is applied. We conclude that using the budget data only, the existence of fiscal dominance cannot be rejected.

Keywords: Fiscal Dominance, Monetary Dominance, Macroeconomics, Financial Market

JEL Classification: C40, E31, I32

1 Introduction

This paper deals with fiscal dominance in the economy of Iran, that is with the influence of government deficits on the growth of the money base and money supply.

If we want to understand the implication of fiscal dominance, we need to place the Central Bank and the Treasury within a set of strategic conflict (Alesina & Tabellini 1988). The Central Bank is asked to seek price stability or low inflation rates. The fiscal authorities, instead, must interpret the desire

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for public expenditures. This difference in motives makes the Treasury seek as much seigniorage as possible from the monetary authorities. The greater the power of the fiscal authorities over the monetary authorities that is, the greater the degree of fiscal dominance, the lower the cost to Treasury of financing a given budget deficit. According to this view, the Central Bank independence and monetary accommodation are inversely related.

Like any other agents, governments are financing their expenditures with their sources of income. In other words, all governments face an intertemporal budget constraint, which must be held. That is by definition, the current real value of its net liabilities must be equal to the present value of its primary surpluses (tax revenues minus non-interest expenditures).

In a “Ricardian Regime”, the government is expected to adjust its primary surpluses to limit the accumulation of its debt. That is what happens when the monetary authority is dominant and independent. However, there is also the possibility of a non-Ricardian regime where the governments set their policies (primary deficit) independently of their liabilities. In that case, the monetary authority is dominated and has to set its policy according to government debt. The latter is the case of fiscal dominance and our interest to study in this paper.¹

With monetary dominance, monetary policies are set independently and the fiscal authority has to adjust its policies when a fiscal shock occur. Therefore, the Central Bank is free to control its target variables, whether it is nominal interest or money base level. However, when there is fiscal dominance, the government can generate revenue from seigniorage. As monetary policy must adjust to deliver the level of seigniorage required to balance the government’s budget, prices and inflation are affected by changes in fiscal policy.

While Fridman (1968) had warned us not to expect too much from monetary policy as it cannot permanently influence the level of real output, unemployment or real rates of return to securities, he still did assert that a monetary authority could exert substantial control over the inflation rate, especially in the long run. However Sargent & Wallace (1981) in a paper named “some unpleasant monetary arithmetic”, explain that “even in an economy that satisfies monetarist assumptions, if monetary policy is interpreted as open market operations, then Friedman's list of the things that

¹ The definition of fiscal dominance and monetary dominance is borrowed from Sargent & Wallace (1985)

monetary policy cannot permanently control may have to be expanded to include inflation.”

Fiscal dominance can be more plausible in developing countries where due to less efficient tax collection, political instability, and more limited access to external borrowing tend to lower the relative cost of seigniorage and increase dependence on the inflation tax [Catao and Terrones (2005)]. Inflation targeting in developing countries and emerging countries have been less successful than developed countries (see Blanchard (2004), Ersel (2008)). Because not only their inflation is rather higher, but also the output and inflation are more volatile. The more fragile institutions and imperfect credibility, and the nature and magnitude of the shocks that hit these economies are the inherited characteristic in these economies (Fraga, Goldfajn, & Minella, A. (2003)). In these countries, serious fiscal vulnerabilities, higher sovereign risk, and considerable uncertainty about future interest create specters of fiscal dominance (Turner (2011)).

It is also of crucial importance in countries with the resource-based economy, since whether policymaker looks for a managed exchange rate regime or desires a more independent monetary policy (and inflation targeting programs), then monetary dominance would be presumably necessary (see Savastano (1992), Tornell and Velasco (1998), Elbadawi, Goaid and Ben Tahar (2017)).

A deep literature has been developed that studies the relationship between government's deficits and money growth. For instance, Gadea, Sabaté, and Sanz (2012) study the role of seigniorage in Argentina during 1875 and 1990 period and find a dynamic relationship from deficits to monetary base when considering the whole period. Thus, they conclude that fiscal dominance holds in the long run for this country. Although for the two episodes of gold standard and tablita when the monetary policy was active, this causality weakens. Tanner and Ramos (2003), apply both a backward-looking approach and forward-looking approach to study evidence of monetary or fiscal dominance in Brazil. They find some evidence in favor of a monetary dominant regime for 1995-1997 but not the 1990s as a whole. They also argue that while there were some fiscal adjustments in 1999, which yielded a primary surplus of 3%, a credible monetary dominant regime requires further adjustments of the primary surplus. Also Tanner and Samake (2008) estimate a model, using Brazilian data and conclude that, in 2002, the level and the composition of public debt in Brazil, and the general level of risk aversion in world financial markets were indeed so as to imply a perverse effect of interest rate on exchange rate and inflation. Therefore, when there was fiscal dominance, a

central bank engineered an increase in interest caused depreciation and inflation¹. Fratianni & Spinelli (2001) investigate fiscal dominance in Italian monetary history and conclude that fiscal dominance is the prevailing regime in Italy, at least until 1981. Fiscal dominance is not the only operative in the sixties and the seventies, but also in the thirties, the twenties, much of the so-called gold standard period, and even more during wars. Da Costa and Olivo (2008) study the economy of Venezuela as an example of a country with oil dominance. They argue that changes in the monetary base may occur as a result of fiscal policy without being reflected in net credit to the government in the central bank accounts which were an instrument for investigating fiscal dominance in some previous studies. Besides, they argue fiscal dominance may not be identified in oil economies (or resource-based economies for that matter) based on the overall primary fiscal balance and the stock of debt. Revising the instrument variables, they reveal that there is a fiscal dominant regime in Venezuela.

Controlling for a more comprehensive set of economic structure variables and using system generalized method of moment (GMM) dynamic panel estimation, Elbahnasawy, and Ellis (2016) investigate what determines seigniorage. They find out an inverse relationship between financial development and exchange rate management to seigniorage. However, in their study, evidence on greater reliance on seigniorage when there is political instability and polarization is weak. They also show that the size of the shadow economy and natural resource rents are directly related to seigniorage, the latter result likely a result of exchange rate management.

Studies in developed countries were rather inconclusive. Joines (1985) compared the relationship between money growth and government war spending and non-war deficits and found that money growth was related to war spending. King and Plosser (1985), who did a study to find out whether fiscal deficit does help to predict future seigniorage for the United States², reported mixed evidence.

All studies in which the data used was on post-war period but before the 1980s in the United States, find the same inconclusive result, as in this period there was a small variation in deficit and the small variation there was, was

¹ In-order the government be able to sell debts, the interest rate must have been higher which leded the saving toward the domestic debt and caused appreciation. However higher interest rate would make default more possible and therefore turns government debt less attractive and thus caused depreciation and therefore inflation.

² They also extended their studies to cover more countries and found results similar to United States.

due to the endogenous response of fiscal deficits to the business cycles. To resolve this problem, researchers try to distinguish between the two regimes by focusing on the relationship between structural deficits (high employment deficit) and money growth. Grier and Neiman (1987) summarized some earlier studies of the relationship between deficits and money growth (and some other measures of monetary policy) in the United States and realized that there exists a relationship from structural deficit to money creation.

Bohn (1998) asks whether the government cut the deficits when liabilities rise in US? Canzoneri et al. (2001) asks whether current reductions in the primary deficit help pay down the debt in US (reduce future liabilities and interest payments). Although their questions are different and rely on different approaches, they conclude that there is not enough evidence to confirm fiscal dominance.

Catao and Terrones (2005)'s study covers 107 countries over 1960–2001 and reveals a strong positive association between deficits and inflation among high-inflation and developing country groups, but not among low-inflation advanced economies.

Nevertheless, fiscal dominance is also not a trivial subject in developed countries. Even though there is ample evidence that the arrangements for public debt management and monetary policy in place before the 2007–08 global crisis were very successful in achieving their stated objectives, the recent crisis has brought to the surface the fact that the “*macroeconomic*” dimension of government debt management has not had the attention it deserves. [Blommestein and Turner (2011)] While pre-eminence of price stability has remained, financial stability objectives (notably those with a systemic dimension) have gained ground.

One can also find studies regarding fiscal dominance in Iran. Tavakolian (2014) studies the degree of fiscal dominance and its costs for the economy of Iran in a DSGE model using Resende and Rebei (2008) approach to the degree of fiscal dominance. This study indicates that a higher degree of fiscal dominance significantly affects the dynamics of all the main variables so that in high fiscal dominance regime, there are lower output and higher inflation. Also using the method of sensitivity analysis, this study indicates that over 70% of government expenditures are financed with money creation. Moshiri et al. (2011) resolve a very similar outcome when they studied fiscal dominance in a DSGE model and using the Bayesian method. Tavakolian and Komijani (2012) argue that it is more likely that the monetary policy in Iran is discretionary and not based on a rule or a target. Therefore, although there have been explicit targets for inflation and economic growth in all five-year

development plans (except the fifth plan), using an adjusted New Keynesian DSGE model for Iran, they show that in most plans monetary authorities do not observe the explicit targets of five-year plans. The estimated monetary reaction function is only capable of explaining the period 2001-2011.

Asgharpur, Salmani, and Oskoui (2015) replicate the study of Da Costa and Olivo for Iran during 1979-2012 using government debt to the Central Bank as an instrument for monetary policy and government deficit (without oil income) as an instrument for fiscal policy. They conclude that government debt was monetized, and monetary policies were used to solve fiscal unsustainability.

There are also studies investigating the annual budget laws, which motivate a strong fiscal dominance assumption through multiple tasks, assigned to the monetary and banking system (See Shahbazi, Rohani, Azizinejad (2016)). The channels revealed in these studies are also of much importance as they cannot be investigated when you look at the budget itself, and they shed light upon off-budget mechanisms. Although Government Budget is supposed to be an annual statement presenting the revenues and spending for a financial year, in practice the governments in Iran might affect the monetary policy in the form of notes to annual budget laws. In other words, instead of fiscal policies, the annual budget laws might directly determine the monetary policy. For instance, they might order some banks to supply loans to some targeted population. Some times the repayment planning are even vague in the law, so they end up turning to debts of the government to the banking system which itself turns to the debts of the banking system to the central bank. The reason is that first of all such policies are limiting the accessible resources to the banks, and secondly under these policies, the resources are not allocated efficiently.

Governments do not stop there. Regarding currency policies, the annual budget laws deteriorate monetary policies. Some times the notes on annual budget laws allow the sovereign wealth funds to make “Rial” deposits in banks, even though that is against the sovereign wealth funds statute. It makes the sovereign wealth funds to be inactive and banking system active in allocating the funds resources. Making the resources accessible in local money and exchanged in banking system levels changes the more expanded definition of money, M2. There are so many other examples which can be identified by studies that are done each year by reviewers of annual budget laws, but we stop here.

Economies that exhibit *oil dominance*—a situation in which oil exports largely affect the main macroeconomic indicators may also exhibit fiscal

dominance. Concerning fiscal policy, government expenditure in oil economics tends to be closely correlated with the degree of oil dominance (measured in terms of government expenditures to GDP). It implies a reduction in the government's net worth and thus, less resource for future generations. In general, a close relationship between the fluctuations in oil exports and government expenditures not only may have implications for the dynamics of the government's net worth but also for monetary management. [Da Costa and Olivo (2008)]. Iran is no exception. Iran is a resource-dependent economy meaning that a substantial portion of the government sources of income is from selling its resources (oil in particular). It means the government is financing a considerable amount of its expenditures with selling its asset and diminution of its worth.

On the other hand, although in means of limiting seigniorage, since 2000 it has been forbidden for the government to borrow from the Central Bank directly, this policy was not sufficient enough to restrain the pattern. In fact, according to the data, ever since the government has been borrowing from the banks. Since government debts to the banking system may not be repaid in time and usually are not according to risk management of the banks, they can be examples of financial repression. (Reinhart & Sbrancia 2011) The data reveals that as debts to the Central Bank has been declined, debts to banks has been raised, which itself lead to an increase in debts of the banks to the Central Bank.

These thought-provoking facts make studying fiscal dominance in Iran of our interest. Using the data from 1357 to 1396, we want to empirically distinguish between the two possible regimes: monetary dominant regime and fiscal dominant regime. Asgharpur, Salmani, and Oskoui (2015) use government debt to the Central Bank as an indicator of monetary policy, which also has been used in some other studied in the literature. However, central bank intervention in the foreign exchange market, together with the government's financing of expenditures with oil-related receipts, as explained above, makes this method less interesting. In this paper, the monetary base has been used as an indicator. De Costa and Olivo (2008) argued that the government might sell the foreign exchange generated from oil export activity and increases the international reserve but does not spend the revenue simultaneously and therefore by decreasing the government debt to the Central Bank, no change in the monetary base might be seen. However, as our data is annual, we believe such circumstances are not a concern to us, and all changes in the monetary base would be seen as originating from changes in the central bank's net international reserves.

It would be a valid point that using only data generated by looking at revenues and spending in the budget; we are ignoring off-budget mechanisms which we noted earlier and did not seem to be insignificant. For a more comprehensive study, one needs to, first of all, identify all the channels in the off-budget mechanism and then generate the related data. However, currently, we do not have access to such information, and we use the official data for the budget.

We are using a VAR method, and as it appears in the result, the hypothesis of fiscal dominance cannot be rejected. It means that relation from government deficits to the growth of the money base can be detected. More precisely, the hypothesis that the government domestic primary deficits influence the changes in the monetary base cannot be rejected.

The paper is organized as follows. Section 2 introduces budget identities, the intertemporal solvency condition and then reviews the empirical studies about fiscal dominance in different countries so that we are familiar with the technics and theories. Section 3 presents our model and the result. Section 4 presents a summary and some conclusions

2 Budget Identities and the Intertemporal Solvency

This section introduces the government sector's budget constraint and examines the revenue implications of inflation. A public finance approach toward inflation yields several insights. Among the most important is the recognition that fiscal and monetary policies are linked through the government sector's budget constraint (Walsh, 2017). Variations in the inflation rate can have implications for the fiscal authority's decisions about expenditures and taxes, and, conversely, decisions by the fiscal authority can have implications for money growth and inflation. But first things first let's have a look at the budget constraint.

Assume that to finance expenditures (G_t), the government levies taxes (T_t) (a more conventional way). It also has income sources from seigniorage ($MB_t - MB_{t-1}$). If government expenditures exceeded the tax revenue and the revenue from seigniorage, it must issue debt to finance the uncovered expenditures. So each period the government issues new debt (B_t) and repays the debt from last period and its interest ($(1 + i_{t-1})B_{t-1}$), which was issued before. Then the government-sector budget identity¹ takes the following form:

¹ The reason we call it government-sector budget identity and not the government's budget constraint is that first, this equation is derived from combining the government's budget and central bank's budget. Thus, it represents the government sector.

$$G_t + (1 + i_{t-1})B_{t-1} = T_t + B_t + MB_t - MB_{t-1} \quad (1)$$

The equation (2.1) says that the nominal value of government purchases, plus its payment of interest on the outstanding privately held debt, must be funded by revenue from one of three alternative sources; Taxes, borrowing from the private sector or borrowing from the Central Bank. Government debts to the Central Bank are part of the monetary base.

In a resource-based economy where the government owns the resources like oil, it can also use the income from selling these resources and use this income to finance its budget. When the resource is sold in foreign money, then the government has to sell the foreign money to the central bank to exchange it for local money and be able to use the income in domestic markets. This process also increases the monetary base.

Dividing the two sides by the price level P_t . (2.1) we obtain the budget identity in the real form:

$$g_t + r_{t-1}b_{t-1} = t_t + (b_t - b_{t-1}) + s_t \quad (2)$$

Where g_t is real government expenditures, t_t is real taxes, b_t is real debt issued at t and r_{t-1} is the real interest on debts issued at $t-1$ and $s_t \equiv \frac{MB_t - MB_{t-1}}{P_t}$ which represents seigniorage.

3 Fiscal Dominance and Monetary Dominance

Iterating forward the equation (2.2) obtains the intertemporal budget identity:

$$r_{t-1}b_{t-1} = \frac{1}{1+r} \sum_{i=0}^{\infty} \left(\frac{1}{1+r}\right)^i [t_{t+i} + s_{t+i} - g_{t+i}] \quad (3)$$

Which means that the debt outstanding must be paid either today or someday in the future. $(t+s-g)$ is known as a primary surplus. And $(t-g)$ is known as a primary fiscal surplus. So the primary surplus is constituted of primary fiscal surplus (s^f) and seigniorage. Then:

$$r_{t-1}b_{t-1} = \frac{1}{1+r} \sum_{i=0}^{\infty} \left(\frac{1}{1+r}\right)^i [s^f_{t+i} + s_{t+i}] \quad (4)$$

From (2.4) it can be realized how the monetary policy and fiscal policies are linked through the government sector intertemporal budget. The literature has studied different assumptions regarding the link between these two kinds of policies.

First is the assumption that the fiscal policy adjusts itself to ensure that the government's intertemporal budget is always in balance while monetary

policy (setting nominal money or nominal interest at a target) is free to set its policies and is not subordinated to fiscal policy. Such a regime is called monetary dominant. In this case, the traditional view would conclude, the price level is independent of fiscal policy.¹

The second assumption is that the fiscal authority sets its expenditure and taxes independently and if the present discounted value of these taxes is not sufficient to finance expenditures (in present value terms), monetary policy, money creation must adjust to ensure that the government's intertemporal budget is in balance. This regime is called a fiscal dominant regime.

Leeper (1991) also explains the policies in the different regimes in this manner: "a policy is active or passive depending on its responsiveness to government debt shocks" an active monetary authority set its policy (nominal money supply or nominal interest) independent of the government debt. A passive monetary policy, however, responds to government debt shocks. So, when there is monetary dominance, the monetary policy is active, and the fiscal policy is passive. And when there is fiscal dominance the fiscal policy is active meaning that it sets the primary fiscal policy independently and the monetary policy follows.

Two approaches are used in the literature to distinguish between monetary dominant and fiscal dominant regime: the backward-looking approach and the forward-looking approach. The backward-looking approach follows Bohn (1998) whose question to answer was: Does the government cut the deficits when liabilities rise? Such a framework cannot distinguish between *ex-post* adjustments of primary deficits to liabilities (consistent with an MD regime) and *ex-ante* adjustments of liabilities to primary deficits (consistent with an FD regime and the FTPL). The forward-looking approach following Canzoneri et al. (2001) is an attempt to answer the question that whether current reductions in the primary deficit help pay down the debt (reduce future liabilities and interest payments), If so, shocks to the current primary deficit and future liabilities should be positively correlated.

There are also studies in Iran in which the optimum level of seigniorage was investigated. There are also studies, which are more related to fiscal

¹ Although Leeper (1991) argued that even in case of monetary dominance as long as the fiscal policy affects the real interest rate, price level would not be independent of fiscal policy. A balanced budget increase in government expenditures raises the real interest rate, making bonds more demandable and lowers the real demand for money. While in monetary dominant regime the supply in nominal money is set independent of the fiscal policy, the price must jump so as to the money market clears. Therefore, even-though the money supply is set independently, the fiscal policy affects the prices.

dominance. Asgharpur, Salmani, and Oskoui (2015) replicate the study of Da Costa and Olivo for Iran during 1979-2012 using government debt to the Central Bank as an instrument for monetary policy and government deficit (without oil income) as an instrument for fiscal policy. They conclude that government debt was monetized, and monetary policies were used to solve fiscal unsustainability.

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4 Empirical Results

Studies reveal that the size of the shadow economy and natural resource rents are directly related to seigniorage, which is probably due to exchange rate management (Elbahnasawy and Ellis (2016), Elbadawi, Goaied and Ben Tahar (2017)). When there is oil dominance in an economy, one can also suspect the fiscal dominance in that economy. Oil dominance is a situation in which oil exports largely affect the main macroeconomic indicators.

Figure 1 indicates that historically, most of the export in the economy of Iran has been oil exports. Its share from the total export of the economy has never been less than 0.4. Thus, oil export determines a considerable amount of access to foreign currencies and can affect so much of macroeconomic indicators.

When the government owns the oil resources, it can finance its expenditure by the revenue generated from oil-exporting activities. However, this may have similar effects as monetizing the deficit, depending on the central bank's *de-facto* exchange rate policy. In this case, the problem is twofold. First is that then the central bank's intervention in the foreign exchange market is a common practice to follow as the central banks want to avoid large fluctuations.

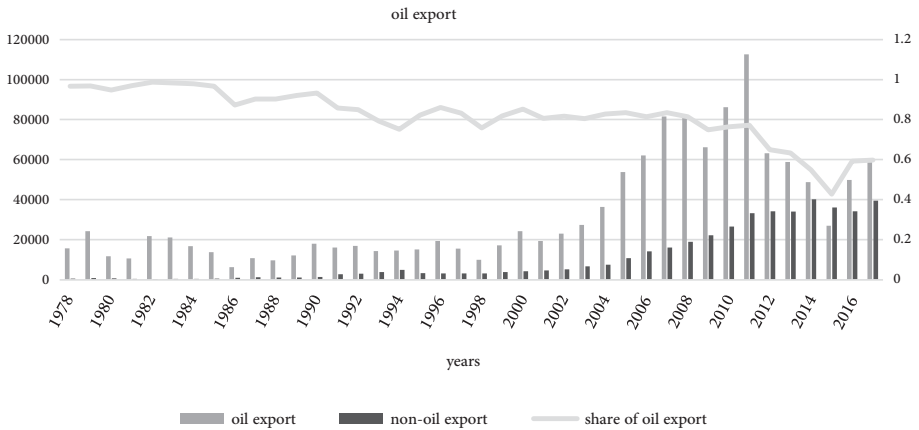


Figure 1. The Left Axis Presents Oil Export and Non-Oil Export Measures, and the Right Axis Presents the Share of Oil Export from Total Export

Second is the problem of inconsistency in the fiscal policy. In days of high revenue from oil exports, which is mostly due to rising in oil prices, governments might make new commitments which may not be met in days of lower-income. In resource-based economies, expenditures are often procyclical. The inconsistency of fiscal policies of this kind requires seigniorage to ensure that still government budget is balanced.

Figure 2 presents the share of oil revenue from the total revenue of government in Iran. As can be seen, oil revenue follows tax revenue very closely, and on average, it constitutes half of the government revenue. This fact reveals that the government budget is so dependent on its oil export activities.

The intervention of the central bank in the foreign exchange market, together with the government's financing of expenditures with oil-related receipts are reasons that Da Costa and Olivo (2008) introduce a measurement named gamma with which they try to indicate the link between changes in the monetary base and fiscal policy. Gamma is defined as:

$$\gamma_t = \frac{g_t - R_t^{no}}{R_t^o}$$

where g_t is government expenditure, R_t^{no} is non-oil revenue of government and R_t^o is the oil revenue of the government. Then the more is a non-oil primary fiscal deficit, and the less is oil revenue of the government,

the more is gamma, indicating the possibility of fiscal dominance. Figure 3 presents the indicator Gamma for the economy of Iran.

As can be seen, the Gamma was always positive. Since R_o is always positive, a positive γ would indicate that a monetary expansion of oil origin initially took place. Such monetary expansion could have been offset either by a fall in net international reserves or through central bank open market operations (if there was an operative bond market).

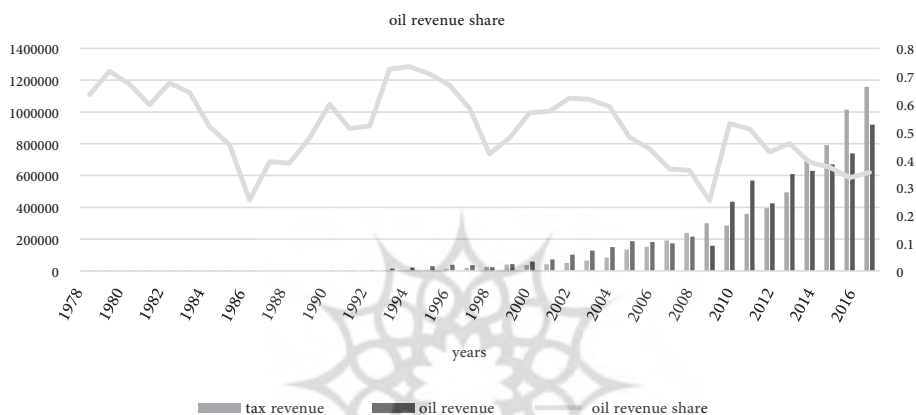


Figure 2. The left axis measures the government's oil revenue and tax revenue. The right axis measures the share of oil revenue from the total revenue of the government.

Turner (2010) argues that fiscal dominance is more plausible in developing countries because, in contrast to developed economies which can issue bonds with different maturities, because of their lack of credibility, they could not borrow long term. Their only option to borrow from the banking system or from abroad. These borrowing constraints made the monetary accommodation of significant fiscal deficits almost inevitable.

Figure 4 presents the components of the monetary base. For a long time, net government debt to the Central Bank was a major component of the monetary base, which also relates to seigniorage and fiscal dominance more directly. However, since 2000, it is illegal for the government to borrow from the Central Bank directly in order to limit seigniorage. Nevertheless, this policy was not sufficient enough to restrain the pattern of fiscal dominance. In fact, according to the data since 2001, while the government debt to the Central Bank has declined, the banking system's debt to the Central Bank has grown.

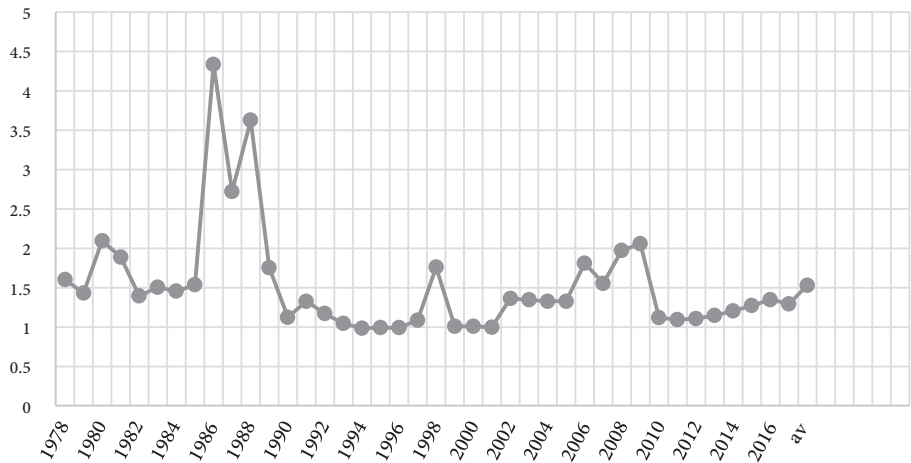


Figure 3. Gamma. A simple indicator of investigating the possibility of fiscal/oil dominance.

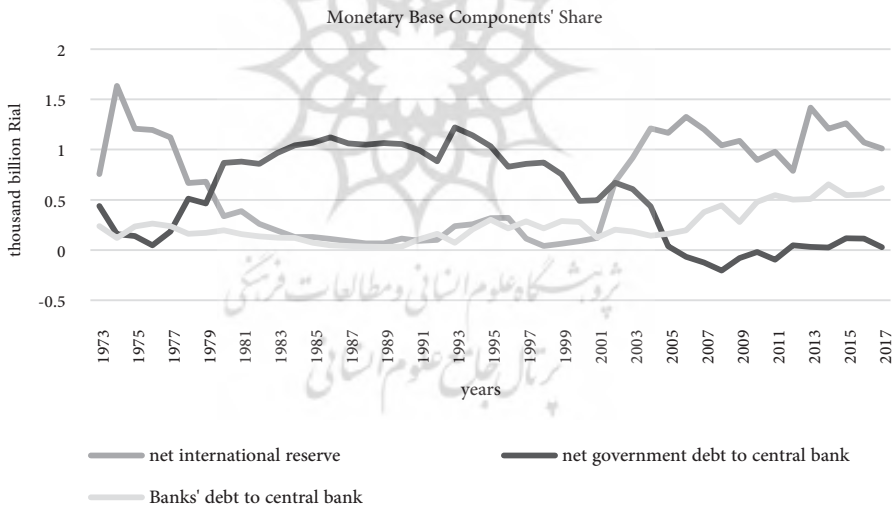


Figure 4. Components of the Monetary Base.

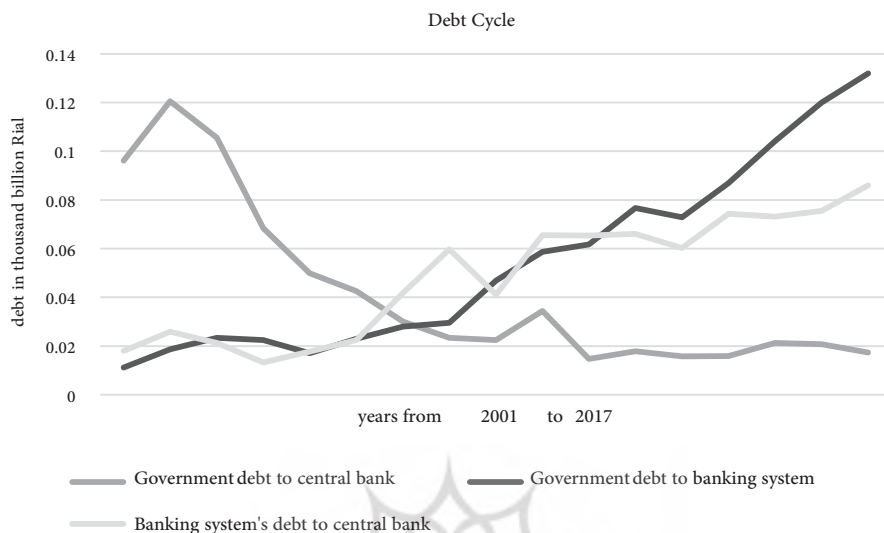


Figure 5. The Debt Cycle. This figure shows that as borrowing directly from the central bank became illegal, government debt to the banking system has increased and this is associated with an increase in the banking system's debt to the Central Bank.

Figure 5 explains more. When the government could not borrow from the central bank directly, it has chosen another alternative. Since 2001 the government debt to the banking system has increased instead. Since government debts to the banking system may not be repaid in time and usually are not according to risk management of the banks, they can be examples of financial repression (see Reinhart & Sbrancia (2011)). When these debts are not repaid, they cause deficits in banks 'balance-sheet, which in turn generate banking system debt to the central bank. We might have stopped the government from borrowing directly, but now government is borrowing indirectly: from the banks.

As mentioned in the previous section, there are studies in which the fiscal dominance in Iran was investigated and could not be rejected. This paper contributes to that literature by studying the relationship between movements in fiscal policy and monetary policy. The method used is somehow similar to Asgharpur, Salmani, and Oskoui (2015), which was replicated from Da Costa and Olivo (2008). However, our instruments for policies are rather different.

Using equation (2.8), we can show that:

$$liabilities_1 - liabilities_0 = rliabilities_0 + primary\ deficit_1 \quad (5)$$

As discussed in the previous section, there are two approaches for distinguishing fiscal dominant regime from the monetary dominant regime; Backward-looking approach and forward-looking approach.

The backward-looking approach following Bohn (1998) asks whether the government cut the deficits when liabilities rise? However, as it is discussed in the fiscal theory of price level, this approach cannot distinguish between *ex-post* adjustments of primary deficits to liabilities and *ex-ante* adjustments of liabilities to primary deficits. If the prices have changed so that the equilibrium condition (budget identity) is satisfied, we observe a decline in primary deficit, which is not due to fiscal policy adjustment.

The forward-looking approach following Canzoneri et al. (2001) is an attempt to answer the question that whether current reductions in the primary deficit help pay down the debt (reduce future liabilities and interest payments), If so, shocks to the current primary deficit and future liabilities should be positively correlated.

That is the method we are going to apply. We attempt to see whether changes in primary deficit can explain changes in government liabilities. As an indicator of fiscal policy, we use the primary operating balance of the government, that is a fiscal balance excluding oil-related net receipts and as an indicator for monetary policy we use monetary base.

The prerequisite of using fiscal sustainability framework as an instrument to determine fiscal dominance in an oil economy or any other resource-based economy is to focus on government net worth and its corresponding flow. If the government owns the oil resource, the value of this asset is equivalent to the present value of all future sales and extraction of oil means consuming a nonrenewable source. Financing government expenditures with oil-related fiscal receipts reduce the government's worth. Oil-related fiscal receipts are equivalent to exchanging a less liquid asset for a more liquid asset. So we use primary operating balance.

Asgharpur et al. (2015) use government debt to the Central Bank as an indicator of monetary policy. They follow De Costa and Olivo (2008) who argued that the government might sell the foreign exchange generated from oil export activity and increases the international reserve but does not spend the revenue simultaneously and therefore by decreasing the government debt to the Central Bank, no change in the monetary base might be seen. However, as our data is annual, we believe such circumstances are not a concern to us,

and all changes in the monetary base would be seen as originating from changes in the central bank's net international reserves.

The general VAR model representation is as follows.

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p y_{t-p} + B x_t + v_t \quad (6)$$

Where y_t represents the vector of endogenous variables $y_{t-1}, y_{t-2}, \dots, y_{t-p}$ represents the lag of endogenous variables and x_t is the vector of exogenous variables. v_t is the vector of error terms.

Here, the endogenous variables are operating primary fiscal deficit and the monetary base. Our control variable is the oil price for which we want to control. Then $v_t = (v_{mb}, v_{opfd})$.

And we need that

$$v_t = B w_t \quad (7)$$

meaning that the error vector itself is composed of 'own' error terms and contemporaneous correlations with 'other' errors.

First of all, using augmented dickey-fuller we realize the hypothesis that the logarithm of nominal operating primary fiscal deficit (LDNO) and the logarithm of nominal money base (LMB) have unit roots could not be rejected. Then the test was applied to the first difference of these variables, and this time, it was rejected. It means that although these variables are not stationary, their first differences are. As both variables have unit roots, we check whether they are cointegrated. Since both variables are $I(1)$, we need to consider the possibility that they will be related to each other using a third variable. If there is cointegration between the two, that might be needed to be considered of a sign to that.

Before that, using the Akaike and Schwarz criteria, and taking into account the stability of the VAR system, one lag is chosen as an optimum number of lags. Then we applied the Johansen and realize that, the hypothesis that there is no cointegration could not be rejected for this data, and therefore, we use the simple VAR model to answer the question in hand. It means that these variables do not have a long-run association. And by that, we mean that there is no third variable which is determinant to both and is the reason for the relationship between the two if there is any. By checking for cointegration we want to make sure when we find a significant relationship between our variables, it is not the case that they are independent of each other, but both are under the affection of a third variable. Table 1 indicates that they are not

cointegrated. Therefore if there is a relationship between them, a simple VAR model will be able to discover that.¹

Table 1

Johansen Tests for Cointegration: Cointegration of Rank Zero Cannot Be Rejected

Rank	Trace statistic	Critical value
0	9.5066*	15.41
1	0.0091	3.76

Source: Research Findings

Overall, if the oil dominance/fiscal dominance hypothesis holds, the empirical tests should be able to detect a connection between oil prices, the primary domestic fiscal deficit, and the monetary base. If the fiscal dominance hypothesis holds, then the following results should be observed in our reduced-form model:

- 1) I-R functions and VD consistent with a positive response of the monetary base to shocks to the primary domestic deficit and no response of the primary domestic deficit to shocks to the monetary base;
- 2) One-way Granger-causality running from the primary domestic deficit to the monetary base.

We need to emphasize here that our model is a reduced form model, and the causality we are referring to is a Granger-causality. For further studies, one needs to test the hypothesis in a structural model.

In any regressions, the coefficients must come from a theoretical theory. Of course ours is not ad hoc either. The fact that fiscal and monetary policies end up to be related to each other one way or another utilizing the government budget was earlier explained in this paper and because of the conflict of interests of the two authorities they must play a game which results in one becoming dominant. Given this theory when VD is consistent with our hypothesis and the Granger test confirms the causality, in a reduced form

¹ A potential third variable related to both might be GDP which indicates the overall situation of the economy and might affect both the fiscal policy and monetary policy. Although there was no cointegration in the third model we have controlled for this variable and in the third model we have altered our target variables so as to be in relation to GDP. So if there is a relationship between the monetary policy and fiscal policy, statistically it is not due to cycles of GDP and economy.

model, we are claiming Granger causality from changes in deficits to money base changes.¹

Our first model to be estimated is such that:

Endogenous variables:

DLMB = First difference of log (nominal money base)

DLDNO = First difference of log(nominal operating primary fiscal deficit)²

Exogenous variable:

DLOIL = First difference of log (oil prices)

When the VAR model is estimated, it indicates that both regression (implicit in the vector regression) are significant, the operating primary deficit's coefficient is significant, which means that fiscal policy is actually a good explanatory variable for changes in money base or monetary policy and therefore, monetary dominance can be rejected. Also, we can realize that while coefficients of oil prices as an explanatory variable for monetary policy is not significant, it is significant in explaining the fiscal policy. The coefficient of oil price in the latter equation is positive which indicates that when the oil prices rise, and government generates resources from selling oil resources, either the expenditures have also increased, or government have cut other sources of its revenue and therefore the deficit of government when excluding the oil revenue, is increasing.³

On the other hand, the results indicate that the coefficient on the money base explaining the fiscal policy is not significant. Which means the fiscal dominance cannot be rejected. Moreover, the sign of the coefficient confirms the government expenditures and deficits are pro-cyclical.

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¹ Using a structural VAR model one can get use of economic theory more than what the Cholesky decomposition has to offer. With SVAR, it is possible to apply a theoretical constraint on simultaneous shocks, and if the variables have long term associations, it is possible to apply a theoretical constraint on longterm effects of shocks. But here we have a reduced form model and we look for Granger-causality only.

² We defined nominal operating primary fiscal deficit as = - (primary fiscal surplus – oil revenue)

³ It is important to note here in case of increase in oil revenue government can easily increase its current expenditures and create new duties. However when the oil price falls it in practice cutting the expenditure will not be relatively easy as there are political concerns. So in turn this also will result in the need for the monetary authorities' help later on.

Table 2

Vector Autoregression Results: Short-Run Effects: 1st Model

Equation	D.LMB		D.LDNO	
Prob. > Chi2	0.0048		0.000	
Explanatory variable	Coefficient	Prob> z	Coefficient	Prob> z
D.LDNO (-1)	-0.0422	0.39	-0.0469	0.71
D.LDNO (-2)	0.1483	0.004	0.0877	0.50
D.LMB (-1)	0.469	0.002	0.2085	0.58
D.LMB (-2)	-0.0298	0.046	-0.666	0.07
D.LOIL	-0.030	0.32	0.3634	0.00
cons	0.1446	0.00	0.1885	0.034

Source: Research Findings

Table 1

Granger Causality

equation	Excluded	Chi2	Prob> chi2
D.LDNO	D.LMB	3.0946	0.213
D.LDNO	All	3.0946	0.213
D.LMB	D.LDNO	9.1032	0.011
D.LMB	All	9.1032	0.011

Table 4 and indicates the result for the variance decomposition of the money base. As it is presented A one standard deviation shock to D.LDNO has a positive effect on DLMB that explains around 13 percent of its forecast error variance in a ten-period horizon.

Table 4

Variance decomposition of monetary policy: First difference of logarithm of money

Period	Fiscal shock	Monetary shock
1	0.016894	0.983106
2	0.017309	0.982691
3	0.114826	0.885174
4	0.125357	0.874643
5	0.125654	0.874346
6	0.125417	0.874583
7	0.125884	0.874116
8	0.126111	0.873889
9	0.126143	0.873857
10	0.126138	0.878362

Source: Research Findings

The Granger causality test is applied, to check for Granger causality, which confirms the relationship from fiscal policy toward the monetary policy. But it does not confirm it the other way around. Although most variations in D.LMB is explained by itself, still fiscal shock seems to matter for monetary policy.

Table 5 and indicates the result for variance decomposition of operational primary fiscal deficit. As it is presented a one standard deviation shock to D.LMB has a mere positive effect on DLDNO that explains around 5 percent of its forecast error variance from the 3rd period onward. This conclusion is also in favor of the existence of fiscal dominance.

Table 5

Variance Decomposition of Fiscal Policy: The First Difference of Logarithm of Operational Primary Fiscal Policy

Period	Fiscal shock	Monetary shock
1	1	0
2	0.995019	0.004981
3	0.949366	0.050634
4	0.942616	0.057384
5	0.941465	0.058535
6	0.941501	0.058499
7	0.941305	0.058695
8	0.941176	0.058824
9	0.941145	0.058855
10	0.941145	0.058855

Source: Research Findings

To check for the validity of our results, we needed to test diagnostic statistics. First of all, we checked for residual autocorrelation. In Lagrange multiplier test, the probability for two lags is 0.44, which means that the no autocorrelation hypothesis cannot be rejected. Second, we needed the disturbances to be normally distributed. All Kurtosis test, Skewness test, Jarque-Bera test indicate that the normal distribution of disturbances in D.LMB regression and D.LDNO regression, and the overall equations cannot be rejected. Third, we wanted to make sure that our model satisfies stability condition. Eigenvalue stability condition was performed, and the result is that all coefficients lie inside the unit circle, and the model is stable.

Our variables had no cointegration and therefore had no long-run association. Still we have run a 2nd model which controls for GDP. Again, both regressions are significant. Also the coefficient of the first lag of the

variable D.LDNO is statistically different from zero. Growth in oil prices also is an explanatory variable for growth in operating primary fiscal deficits in this model. So is growth in GDP. As the coefficient of D.LMB is not significant for D.LDNO, meaning fiscal dominance cannot be rejected. Granger causality test also implies that there is a one-sided relationship from D.LDNO toward D.LMB.

Table 6
Vector Autoregression Results: 2nd Model

Equation	D.LMB		D.LDNO	
Prob. > Chi2	0.0023		0.000	
Explanatory variable	coefficient	Prob> z	Coefficient	Prob> z
D.LDNO(-1)	-0.0648	0.198	-0.1258	0.311
D.LDNO(-2)	0.1359	0.007	0.0445	0.719
D.LMB(-1)	0.4559	0.002	0.1627	0.649
D.LMB(-2)	-0.265	0.069	-0.5507	0.126
D.LOIL	-0.0707	0.070	0.2227	0.021
D.LGDP	0.2426	0.114	0.8471	0.025
cons	0.1047	0.013	0.0495	0.635

Source: Research Findings

The same is true when instead of controlling for GDP, we convert our variables to those that are about GDP. That is when as for monetary policy, we use the logarithm of MB/GDP, and as for fiscal policy, we use the logarithm of DNO/GDP. Again, the variables have a unit root, but they are not cointegrated. Therefore, we can use the VAR model approach. One can find the results in the appendix.

So in this study, the hypothesis of fiscal dominance could not be rejected. Nevertheless, the variance decomposition did not represent a very high impact of fiscal policy toward monetary policy. A researcher familiar with government budget data, however, knows that this data cannot reveal different kinds of policies that the government can make, so that dominate the monetary policy. Off-budget data are of crucial importance and if they are accounted for, perhaps the result could indicate a higher fiscal dominance. But until a clean data of that kind would be published, our result could only rely on formal budget data only.

5 Conclusion

In this paper, we dealt with fiscal dominance, which is a situation in which the fiscal authority sets its expenditure and taxes without regard to any requirement of intertemporal budget balance.

We explained two facts in the economy of Iran. First, the existence of oil export revenue for the government, which both has a large share of total export in this country and a considerable share of government revenue. We argued that when there is oil dominance, the probability of fiscal dominance is also higher. Second, we pointed on the fact that while borrowing from the Central Bank has been illegal since 2000; the government is still borrowing from the Central Bank with the banking system as an intermediate. The government is borrowing from the banking system, and as these debts are not being repaid or perhaps are forced on banks with low-interest rates, they can distort banks' balance sheet. Then banks would need to borrow from the central bank. That is why, as government debt to the Central Bank has been declined, the banking system's debt has been raised.

These facts and some important results in previous studies in the literature makes us suspect fiscal dominance in Iran. Therefore, after a careful review of the literature, we arrived at a more relevant method to examine the hypothesis of fiscal dominance in Iran.

Using a VAR model, our results indicate that the existence of fiscal dominance cannot be rejected even though we did not find evidence of a high fiscal dominance. We argued that using the off-budget data could alter our result in this regard significantly.

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Appendix 1. Autoregressive estimation for the 3rd model.

Table 7

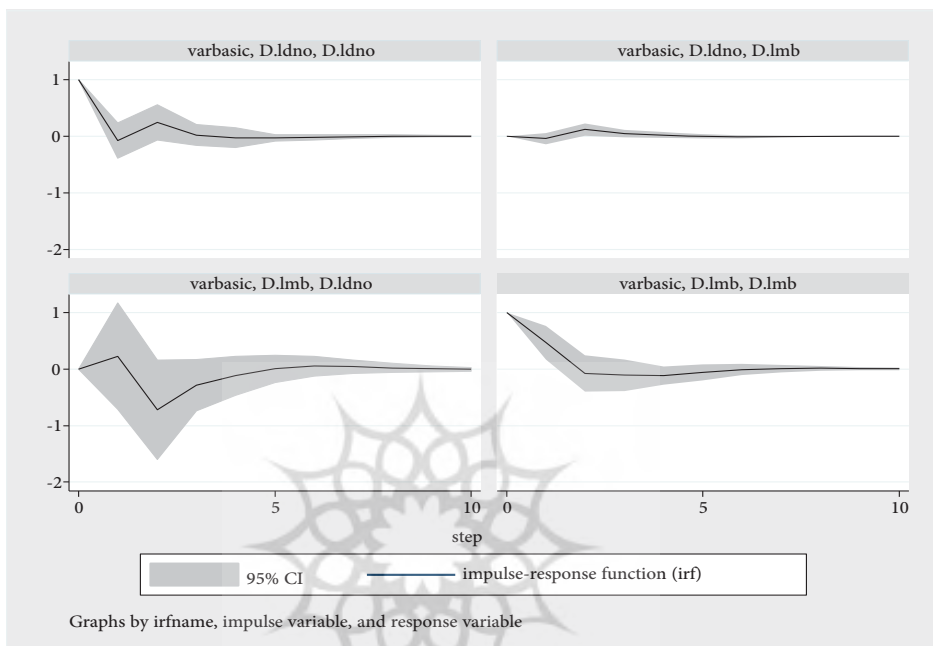
Vector Autoregression Results: 3rd Model

Equation	D.LMBG		D.LDNOG	
Prob. > Chi2	0.00		0.05	
Explanatory variable	coefficient	Prob> z	Coefficient	Prob> z
D.LDNOG(-1)	-0.0148	0.835	-0.1897	0.207
D.LDNOG(-2)	0.1981	0.000	-0.0444	0.783
D.LMBG(-1)	0.3739	0.001	0.0260	0.915
D.LMBG(-2)	-0.0122	0.916	-0.2119	0.385
D.LOIL	-0.2063	0.000	0.2089	0.006
cons	0.0349	0.028	0.0783	0.020

Source: Research Findings

Appendix 2. IRFs

Appendix 2. IRFs



Source: Research Findings

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