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Fiscal Sustainability in Iran: Assessing the Period of 1342-1380

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Abstract

Budget deficit constitutes a major fiscal indicator. It has major important ramification on macro-economic position of all nations. In developing countries generally, and in Iran specifically, governments are likely to spend more on miscellaneous as well as differentiated obligations causing high expenditure costs with respect to their limited revenues. This causes a budget deficit to incur. The Iranian officials traditionally have regarded the oil revenue as an income item in budget statement and, generally, use a fraction of this revenue as current expenditure. Looking into this issue, the article analyzes the government's inter-temporal budget with some adjustment and interpretation. The empirical findings suggest that the country has not been in a sustainable path during the sample period. This article arrives at the conclusion that the Iranian fiscal stance with respect to the future generations is non-stationary and that the fiscal authorities would not be able to repay the incurred debts to the future generations and that the central government is in fact vulnerable, viz., involved with insolvency conditions.

Key words: Fiscal sustainability, Budget deficit, Oil revenue, Generations, "Core" debts, Vulnerable, Insolvency.

I- Introduction

Budget deficit constitutes a major fiscal indicator. It has major important ramification on macro-economic position of all nations. In developing countries generally, and in Iran specifically, governments are likely to spend more on miscellaneous as well as differentiated obligations causing high expenditure costs with respect to their limited revenues. This causes a budget deficit to incur.

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The question is that how long a government budget deficit can continue to be unchecked? The response initially proceeds to raise two separate issues. The first one concerns the desirability of perpetual deficits. That is, can we live with such effects exerted on inflation, investment, and the balance of payments? The second issue pertains to feasibility of perpetual deficits (Hamilton & Flavin, 986). That is, given the government desired to run a budget deficit perpetually, especially through exporting exhaustible resources, can it hold on to such a desire?

This article assesses fiscal sustainability in an economy where a fraction of government income, and hence government debt, is derived predominantly from a non-renewable resource (i.e., oil). In other words, the article aims at analyzing the fiscal sustainability in Iran for a period of about four decades.

Iran's budget deficit is usually less than that of other developing countries. This is due to the oil revenue and other income resources gained from selling foreign exchange at different rates. Despite this, the Iranian government borrows from internal sources –such as banking system- and occasionally from foreign sources. Here, however, the author attempts to analyze budget deficit, using the inter-temporal budget constraint approach, employing a new interpretation of income items, hence a new concept of debt coined as actual or "core" debt. In addition, as pointed earlier, the article focuses on fiscal sustainability, which is derived from government's financial character.

Traditionally, the Iranian officials decide on a budget each year considering both the circumstances as well as the planning framework of the development policy. The evidence shows that, most often, the budget is implemented with some deficit thus creating a fiscal debt, internally and externally. Economic conditions are such that the government is dependent on oil revenues and that the ever-existing gap of exchange rates, caused by fluctuating oil prices, is determined exogenously. There is evidence indicating that the government has tried to compensate its deficit through frequent borrowing from abroad, often utilizing oil revenues and the gap of exchange rates for reimbursement.

The Iranian officials traditionally have regarded the oil revenue as an income item in budget statement and, generally, use a fraction of this revenue as current expenditure. Looking into this issue, the article analyzes the government's inter-temporal budget with some adjustment and interpretation as follows. First, a fraction of the oil revenue considered as a borrowing from future generations and is regarded as a debt in the Iranian annual budget statement. Second, the general debt item consists of debt to the banking system and debt to the future generations, totally regarded as domestic resources, in addition of foreign debt. Thus the relation of total debt is as:

$B_t^{ac} = B_t^b + B_t^o + B_t^f$. Where B_t^{ac} is actual or core total debt at time t,. B_t^b Is debt to banking system at time t; B_t^o s debt to the future generations at time t - (these two make the domestic debt); B_t^f is borrowing from foreign sources, which is same as foreign debt. Thus, the actual or core debt consists of apparent debt, as it is inserted in the budget statement, and debt to the future generations, borrowing from the future generations that should be discounted.

$$D_t^{ac} = D_t^{ap} + D_t^o$$

where

D_t^{ac} = actual or core debt at time t

D_t^{ap} = apparent debt at time t

D_t^o = debt to the next generations at time t

Thus, analysis of fiscal sustainability will be done by these interpretations of revenue and debt, i.e., adjusted revenue and actual or core debt. An entity's liability position is sustainable if it satisfies the present value budget constraint without a major correction in the balance of income and expenditure given the costs of financing, which the entity faces in the market. Vulnerability is simply the risk when the liquidity or solvency conditions are violated and it is where the borrower enters a crisis. The main hypothesis of this article is to test the solvency condition of fiscal stance of Iran.[1]

The organization of the article is as the following. Section II is a summary of a general overview of different approaches to assessment of fiscal sustainability, beginning with the present value budget constraint, which constitutes the core of this article and a brief explanation of other approaches to

1- As the main debt of Iranian government is from internal sources, and as the officials' frequent borrowing from abroad, this article focuses on fiscal sustainability while overlooking the external sustainability which is a minor fact in fiscal stance of the Iranian officials.

fiscal sustainability. Section III explains the main model of the present value budget constraint (PVBC) by using variable with their new interpretation ("core deficit"). Section IV concerns the empirical value and testing of the assessing fiscal sustainability. Final section summarizes findings of the article and ends with results and conclusions.

II- An Overview

A PVBC approach: On the basis of the theoretical framework, most analytical discussions of fiscal sustainability take, as their starting point, a representative agent model in which the government must satisfy both an inter-temporal budget constraint and, in every period, a static budget constraint. In a simple, closed–economy version of such model (where there is no need to be concerned with complications created by external debt), and abstracting from monetary considerations, the static budget constraint is

$$B_{t+1} = R_t B_t + D_t \qquad (1)$$

where B_t is the beginning period stock of government debt (i.e. bonds outstanding), $R_t = 1 + r_t$ is discount factor applying between periods t and t+1, and D_t is the primary fiscal deficit(i.e., it excludes interest payments).Solving equation (1) forward gives the inter-temporal budget constraint.

$$B = -\sum_{j=0}^{\infty} R(t,t+j)^{-1} D_{t+j} + \lim_{T\to\infty} R(t,t+T)^{-1} B_{t+T+1} \qquad (2)$$

Where $R(t,t+j) = \prod_{k=0}^{j} R_{t+k}$ is the discount factor applying between period *t* and $t+j$. From equation (2), sustainability (or solvency) requires that the present value of future primary surpluses exceed the present value of future primary deficits by a sufficient amount to cover the difference between the initial debt stock and the present value of the terminal debt stock. Transverse condition implies that $\lim_{T\to\infty} R(t,t+T)^{-1} B_{t+T+1} \leq 0$, has to hold. In fact, this condition will hold as an equality since private agents cannot end up being indebted to the government, and as a consequence sustainable fiscal policy has to respect the present value budget constraint (PVBC)

$$B_t = -\sum_{j=0}^{\infty} R(t,t+j)^{-1} D_{t+j} \qquad (3)$$

Sustainability thus requires that today's government debt is matched by an excess of future primary surpluses over primary deficits in present value terms. (Chalk, N., and Hemming, R., 2000).

Assessing sustainability in the first instance means forming a view of how outstanding stocks of liabilities are likely to evolve over time. This requires projecting the flows of revenues and expenditures, as well as exchange rate changes. In other words, an entity's liability position is sustainable if it satisfies the present value budget constraint without a major correction in the balance of income and expenditure given the costs of financing the entity faces in the markets.

Fiscal indicators: is another approach of assessing of fiscal sustainability. A ratio such as public debt-to- GDP ratio is considered in this approach. It is often used to assess current fiscal policy by judging whether the existing fiscal surplus is consistent with a stable debt-to- GDP ratio, or to indicate how much effort is required to achieve a stable debt ratio.

The usefulness of any fiscal indicator depends on the appropriate coverage of the public sector. Ideally, for sustainability analysis, the fiscal framework should include all parts of the public sector that can accumulate debt including public enterprises, especially to the extent that their income and debt reflect mostly noncommercial obligations.

More generally, contingent liabilities that have an important impact on fiscal sustainability are often difficult to measure. While data are frequently available on debt formally guaranteed by the central government, experience suggests that non-guaranteed debt has often turned out to be important contributor to public build-up and should ideally be monitored and controlled.

It should be noted that such indicators are not backed by a formal definition of sustainability. Instead, they rely on a more intuitive notion of what distinguishes sustainable from unsustainable fiscal policy. Thus Buiter (1985) argues that sustainable fiscal policy should maintain the ratio of public sector net worth to output at its current level. He then calculates the permanent primary deficit necessary to achieve this objective, which is given by

$$\bar{d} = (r_t - n_t)w_t \tag{4}$$

where $d_t = \frac{D_t}{Y_t}$ is the ratio of the primary deficit to output, $w_t = \frac{W_t}{Y_t}$ is the ratio of net worth to output, and n_t is the growth rate. The sustainability indicator suggested by Buiter is

$$\bar{d} - d_t = (r_t - n_t)w_t - d_t \tag{5}$$

which is the difference between the constant wealth primary deficit and the current primary deficit. A negative value suggests that the current primary deficit is too large to stabilize the net worth ratio and that fiscal policy should thus be regarded as unsustainable.

While easy to interpret, one problem with the Buiter indicator is that it is difficult in general to obtain accurate information on the true size of government net worth. Blanchard (1990) gets around this problem by looking at the change in policies required to maintain the current debt ratio. He then develops two indicators of sustainability. The primary gap indicator is based on the permanent primary deficit necessary to stabilize the debt ratio. The latter is given by

$$\bar{d} = (n_t - r_t)\,b_t \tag{6}$$

where $b_t = \frac{B_t}{Y_t}$ is the ratio of debt to output. The primary gap indicator is then

$$\bar{d} - d_t = (n_t - r_t)\,b_t - d_t \tag{7}$$

A negative value for this indicator suggests that the current primary deficit is too large to stabilize the debt ratio and that fiscal policy is thus unsustainable (Chalk, N., and Hemming, R., 2000).

Fiscal sustainability under uncertainty: Barnhill, and Kopits(2003) argue that in the past decade, an increasing number of capital–account crisis have brought into focus the potential damage inflicted by a vulnerable public sector. While the nature and extent of the fiscal contribution to these crises has been the subject of investigation and debate, it is widely recognized that in an open economy, a vulnerable fiscal position is often reflected in a vulnerable external position.

They continue that their paper intends to move beyond the conventional approach, base on scenario calculations or other summary indicators, for assessing fiscal sustainability, and in particular, toward a more explicit and realistic way of accounting for the risks faced by the public sector. With this objective, it is proposed that a formal methodology, drawing on quantitative techniques be adopted to determine fiscal risk. Specifically, a *Value-at-Risk* (VaR) approach is developed.

Although periodic asset bubbles and bank failures have been around for a very long time, vulnerability to the ensuing in this interdependent world has increased significantly in recent years. Increased risk manifests, above all, in highly volatile exchange rates, interest rates, inflation rate, output, commodity prices, and asset prices. Identification of these environmental risks and measurement of their volatility and correlation is relatively novel. In this regard, the *VaR* concept represents a major innovation for improving risk measurement and management.

In the most general form, the basis for calculating the *VaR* is the variance of the return on the portfolio

$$\sigma_p^2 = w'\sum w \qquad (8)$$

where:

w = vector of weights for the various securities in the portfolio,

w' = transposed vector of weights in the portfolio, and

Σ = variance –covariance matrix of R returns on securities in the portfolio.

Equation (8) is the essence of the *VaR* analysis; it constitutes the envelope for the volatility of, and correlation among, various risk variables. To implement *VaR* it is necessary to specify the determination of each risk variable, including the relationship among these variables over time. Depending on the specification of the risk variables, which impose varying data and calculation requirements, the *VaR* can be calculated according to either local-valuation or full- valuation methods.

The delta-normal approach is the most commonly used local-valuation method. This consists of calculating the maximum potential loss in the portfolio over a relatively short predetermined time period, under the rather convenient assumption that all risk variables are normally distributed. Hence, from (8) we can readily calculate the entire portfolio value at risk:

$$VaR_p = \alpha\sigma_p W \tag{9}$$

where α = standard normal deviate ,
W = initial portfolio value.

For the public sector, the public sector net worth can be summarized in a general functional form as:

$$W = PV(q , r_H , r_F , f, P_N , P) \tag{10}$$

indicating that the public sector net worth will depend on the present and future level of output(q), interest rates at home and abroad (r_H, r_F) , the exchange rate (f) , world commodity prices (P_N) ,and the domestic price level(P). If $W \geq 0$, the public sector is deemed to be solvent and the intertemporal budget constraint is fully satisfied.

Now for the public sector, the net worth equation (10), subject to *VaR*, over a given time horizon and subject to a confidence level, to estimate the risk adjusted net worth:

$$W^* = PV(q , r_H, r_F, f, P_N, P) - VaR(W) \tag{11}$$

Fiscal sustainability and Non-Renewable Resources: Chalk (1998) attempts to assess sustainable fiscal behavior in an economy where wealth is derived predominantly from a non-renewable resource endowment. He explores the issue within a simple dynamic framework that highlights the structural weaknesses in the underlying budgetary position, takes into account the rate of depletion of a country's natural resource base, and examines the impact of changes in a country's terms of trade.

Chalk constructs a model consisting of consumers that are assumed to live two periods and to receive an income solely from government transfer. In each period there are two generations alive, the young and the old. Moreover, He uses a resource use and technology relation, in dynamic form, with a per capita resource stock and the stock is depleted by per capita production.

The other part of his model is government which owns the natural resource and derives revenue from its sale. The government runs a deficit which is defined as total government spending less transfer to individuals and revenue from sources other than oil and investment income.

In summary, the equilibrium condition of the economy is summarized by three equations; namely, capital market, government sector, and resource constraint. He assesses fiscal sustainability of budget deficits in two cases: case I: a deteriorating terms of trade, and case II: an improving terms of trade.

III- Model

It is worth reviewing some points before explaining the model of the inter-temporal budget constraint approach, since they help to clarify the theoretical and empirical aspect of the model.

The government's one period budget constraint, which describes the dynamics of accumulation of debt at time t can be given as

$$\Delta B_t^{ac} = G_t - R_t + i_{t-1} B_{t-1}^{ac} \tag{12}$$

where:

B_t^{ac} = Actual total debt

G_t =Expenditure net of interest payments

R_t = Adjusted revenue (which is equal to total revenue in the budget minus φ percent of the oil revenue)

i_t = Rate of interest paid on debt

By defining $G_t - R_t = -S_t$ (or primary surplus or deficits- primary deficit refers to the fiscal deficit excluding interest payments, and I call it as "core deficit") in (12), the government budget constraint can be changed as follows:

$$B_t^{ac} = (1 + i_{t-1})B_{t-1}^{ac} - S_t \tag{13}$$

Equation (13) says that actual total debt at time t is a function of previous actual debt, amount of interest for the previous actual debt and the core deficit at time t. The existence of foreign currency denominated debt necessitates the budget constraint to be altered in order to incorporate such debt. The government budget identity for Iran is assumed to be in the following form:

$$D_t^{ac} + e_t D_t^f = (1 + i_{t-1})\, D_{t-1}^{ac} + \left(1 + i_{t-1}^f\right) e_t D_{t-1}^f - S_t - \omega_t \tag{14}$$

were:

D_t^{ac} = domestic currency denominated actual net total debt

D_t^f = foreign currency denominated net total debt in foreign currency

e_t = exchange rate

i_{t-1} = interest rate on domestic currency denominated debt

i_{t-1}^f = interest rate on foreign currency denominated debt

S_t = primary surplus or deficit of the government (core deficit)

ω_t = increase in (the nominal stock of reserve money) base money

The domestic and foreign currency denominated debt in this equation can be expressed in domestic currency by:

$$B_t^{ac} = D_t^{ac} + e_t D_t^f \tag{15}$$

where B_t^{ac} is the net actual total debt measured in domestic currency. Applying this definition and defining η_t as the proportional change of the exchange rate, $\frac{\Delta e_t}{e_t}$, in period t, equation 14 can be written as:

$$B_t^{ac} = (1+i_{t-1})B_{t-1}^{ac} - S_t + e_t D_{t-1}^f[(1+i_{t-1}^f) - (1+i_{t-1})(1-\eta_t)] - \omega_t \quad (16)$$

Defining the augmented primary surplus as

$$S_t^* = S_t - e_t D_{t-1}^f[(1+i_{t-1}^f) - (1+i_{t-1})(1-\eta_t)] + \omega_t$$

which shows changes in debt due to variations from uncovered interest parity and the increase in the stock of high-powered money .

On the basis of this definition we can obtain the following equation

$$B_t^{ac} = (1+i_{t-1})B_{t-1}^{ac} - S_t^* \quad (17)$$

The following discount factor is applied to discount the variations from time t to time 0.

$$q_t \equiv \prod_{j=0}^{t-1} \frac{1}{1+i_j} \; ; q_0 = 1$$

This allows for stochastic interest rates in the process. The equalization of q_t will be known as of time t. Applying this discount factor in equation 17, the discounted variables can be obtained in the following form

$$q_t B_t^{ac} = q_{t-1} B_{t-1}^{ac} - q_t S_t^* \quad (18)$$

Letting b_t^{ac} and s_t as the discounted value of the actual debt and augmented primary deficit (core deficit) respectively, equation can be as follows:

$$b_t^{ac} = b_{t-1}^{ac} - s_t \quad (19)$$

With manipulating the equation 19, we can write this equation as:

$$\Delta b_t^{ac} = b_t^{ac} - b_{t-1}^{ac} = - s_t \quad (20)$$

This relation implies that the change in the discounted value of the actual debt at time t is equal to the discounted primary surplus (or core deficit) at time t.

By recursive substitution forwards, equation 19 is seen to imply

$$b_t^{ac} = b_{t+N}^{ac} + \sum_{j=1}^{N} s_{t+j} \tag{21}$$

In fact equations (19) and (21) summarize the definition of monetary and fiscal policy. If the first term on right hand side of equation (21) goes to zero or is non-positive in the final period, the stock of debt will be zero or non-positive in a finite horizon economy. In an infinite horizon economy, if the transverse condition holds, then the outstanding debt of time t equals the present discounted value of future augmented primary surpluses. The term E_t in this equation acts as the expectation operator based on the information at time t.

$$\lim_{N\to\infty} E_t b_{t+N}^{ac} = 0 \tag{22}$$

This states that the expectation at time t of the present value of future government debt goes to zero in the limit. When we apply this condition to equation (21), the government inter-temporal budget constraint can be obtained as follows:

$$b_t^{ac} = \sum_{j=1}^{\infty} s_{t+j} \tag{23}$$

Where b_t^{ac} is the current stock of actual debt and s_t is the expected future augmented non interest (i.e., primary) surplus (core deficit). If the debt stock is positive, government will have to make negative primary surpluses in the future to compensate current positive primary surpluses.

The sustainability of fiscal policy can be determined by obtaining the forecast trajectory of the stochastic process of b_t^{ac} and testing whether $\lim_{X\to\infty} b_{t+N}^{ac} = 0$ .If the forecasted trajectory of the discounted actual debt converges to zero, fiscal policy can be considered as sustainable. In order to conduct the econometric analysis, it is assumed that b_t^{ac} (or discounted actual debt) follows a multivariate Auto Regressive Integrated Moving Average (ARIMA) process as suggested by Wilcox (1989). In this analysis, b_t^{ac} should display two properties. First, it has to be stationary and second, b_t^{ac} must have its unconditional mean equal to zero. If non-stationary is found, then it would imply that the policies pursued during the sample period would interpret ultimate insolvency of the government.

In order to determine the stationary of discounted net actual total debt, the following model is used:

$$b_t^{ac} = \alpha_0 + \alpha_t t + \beta b_{t-1}^{ac} + u_t \qquad (24)$$

Where:

b_t^{ac} =discounted net actual debt at time t

α_0 = Drift term

α_1 = Coefficient of the trend

t = Time trend

β = Autoregressive parameter

u_t = Random error term

The error term assumed to be independently and identically distributed. The equation is used to test the unit root tests (Dickey - Fuller Test), β is the parameter concerned in this equation. The discounted actual debt (b_t^{ac}) will be stationary if β is less than one (in absolute terms).If it is equal to one the variance of b_t^{ac} goes to infinity as time (t) goes to infinity and there is a unit root situation.

In order for the results to be more robust, the econometric analysis also includes the Augmented Dickey-Fuller (ADF) and Phillips and Perron tests. Hence, this article is based on all these tests for unit roots (see the Appendix, tables 5-10).

IV-Empirical Results

The assessing fiscal sustainability in Iran for period 1342 -1380 is done with testing this null hypothesis; $H_0 : \alpha_t = 0 , \beta = 1$ .It is used to identify the trajectory. There are three possibilities in this procedure. If the null hypothesis is not rejected or H_0 is accepted, it means that b_t^{ac} is non stationary. This implies b_t^{ac} process will be unsustainable if it is continued indefinitely and means fiscal insolvency. If null hypothesis is rejected but $\alpha_t \neq 0$, then there is a deterministic trend. As a result of this finding, unsustainability will be still possible. If the null hypothesis is rejected, $\alpha_t = 0$ and $\beta \prec 1$, will result in the same effect because the expectation of $b_{t+N}^{ac} = 0$ will not be zero.

Time series data for the period 1342 to 1380 are used in this article. The definitions of variables are as follows. The actual or core deficit consists of total apparent compensatory sources in the budget statement and total debt to the future generations which is considered 70 percent of oil and gas income in the budget statement. This percent (φ) is calculated by $\varphi = (1 - n)$, where *n* stands for the period that each generation retired and it is considered, on average, 30 years by the government.

The actual or core deficit (debt), b_t^{ac}, is discounted in the limits of interest rate that is practiced in borrowing ,i.e., 15% - 20% . Besides these two limits, we consider an interest rate between these two limits – 18%.

By running the equation (24) for discounted actual or core debt, with these three interest rates, the coefficients of α_0 , α_t ,and β are obtained and are summarized in the table 1. Their standard errors are shown in parentheses.

Confidence interval with ± 3 st. error (99 percent) confirms that null hypothesis is not rejected or $H_0 : \alpha_t = 0 , \beta = 1$ is accepted, it means that b_t^{ac}, core debt, is non stationary. This implies b_t^{ac} process will be unsustainable if it is continued indefinitely. In other words the Iranian fiscal stance is vulnerable or the government is encountered with insolvency conditions considering the oil income share of future generations.

Table 1 : Coefficients with Different Discount Factor

Actual or core debt → (Discounted) ↓ Coefficients	(b_t^{ac})LB1 15 percent	(b_t^{ac})LB2 18 percent	(b_t^{ac})LB3 20 percent
β	0.875 (0.083)	0.860 (0.084)	0.858 (0.085)
α_t	0.010 (0.005)	0.007 (0.006)	0.007 (0.006)
α_0	0.206 (0.223)	0.446 (0.200)	0.444 (0.197)

Note: Standard errors are in parentheses

Source: Computer printouts in Appendix 1, table 2, 3, 4.

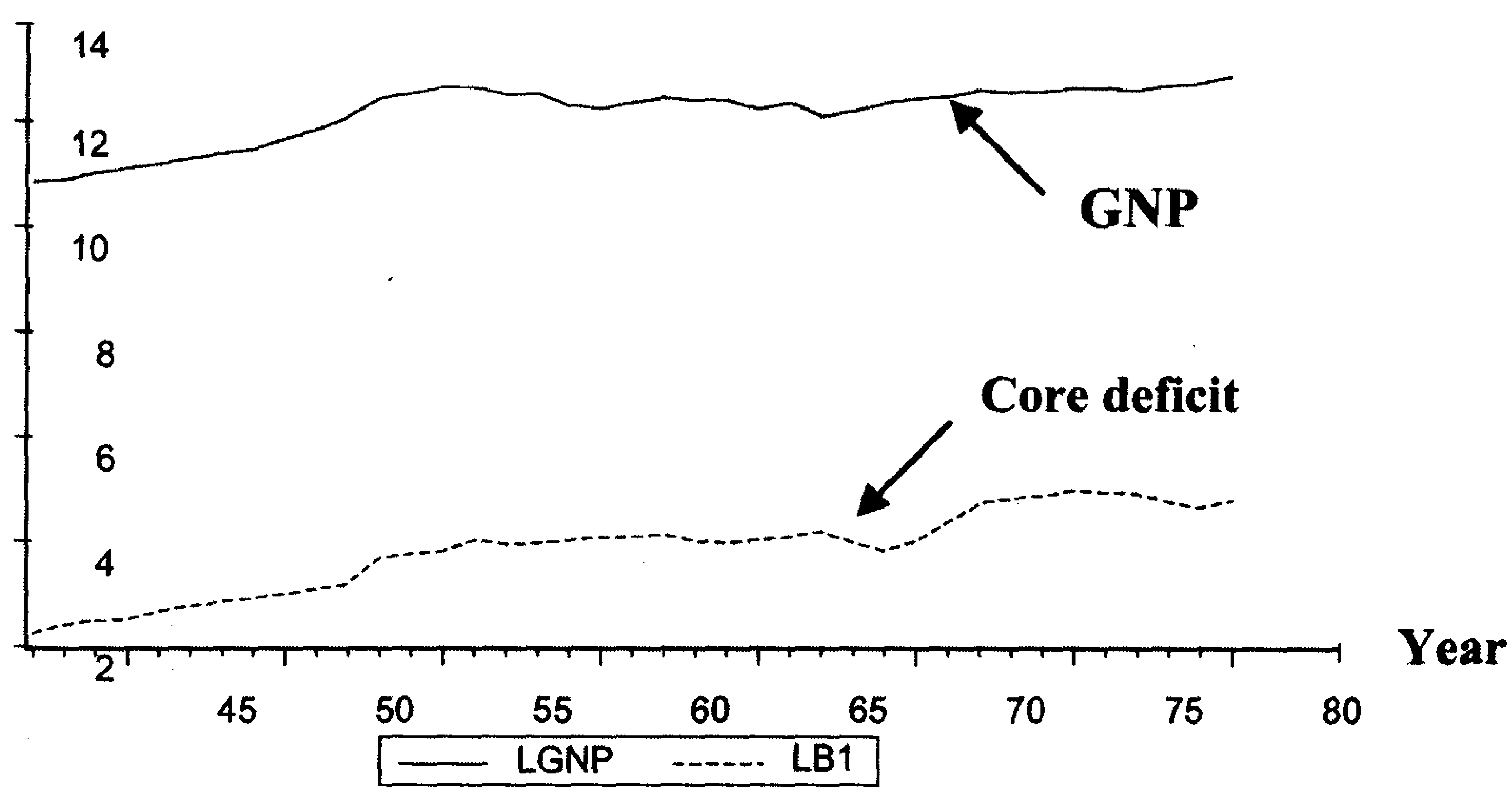

Fig 1: GNP and Core Deficit (in logarithm)

V-Concluding Remarks

The empirical findings suggest that the country has not been in a sustainable path during the sample period. Sustainability of a country's fiscal stance has become an important issue in recent policy discussions. This article assesses fiscal sustainability in an economy where a fraction of government income, and hence government debt, is derived predominantly from a non-renewable resource (i.e., oil). In other words, the main purpose of the article is to analyze the fiscal sustainability in Iran for a period of about four decades.

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The Iranian officials traditionally have regarded the oil revenue as an income item in budget statement and, generally, use a fraction of this revenue as current expenditure. Looking into this issue, the article analyzes the government's inter-temporal budget with some adjustment and interpretation as follows. First, a fraction of the oil revenue considered as a borrowing from future generations and is regarded as a debt in the Iranian annual budget statement. Second, the general debt item consists of debt to the banking system and debt to the future generations, totally regarded as domestic resources, in addition of foreign debt.

Thus, analysis of fiscal sustainability will be done by these interpretations of revenue and debt, i.e., adjusted revenue and actual or core debt. An entity's liability position is sustainable if it satisfies the present value budget constraint without a major correction in the balance of income and expenditure given the costs of financing, which the entity faces in the market. Vulnerability is simply the risk when the liquidity or solvency conditions are violated and it is where the borrower enters a crisis. The main hypothesis of this article is to test the solvency condition of fiscal stance of Iran, especially, with regard to oil income share of future generations, considering it as a debt (or borrowing) of existing generations from future generations.

This article arrives at the conclusion that the Iranian fiscal stance with respect to the future generations is non-stationary and that the fiscal authorities would not be able to repay the incurred debts to the future generations and that the central government is in fact vulnerable, viz., involved with insolvency conditions.

The foregoing analysis suggests the need for fiscal consolidation measures to address the problem of sustainability. In this regard, the reduction of the core deficit would constitute an important fiscal adjustment measures towards a sustainable deficit. It will be done by transferring and changing the combination of government incomes in the budget statement by adjusting the tax systems and reducing the government dependency on oil revenue.

Appendix

Table 1: Time Series of Core Deficit (debt), Discounted

Year	(Debt)B1	(Debt)B2	(Debt)B3
	15%	18%	20%
1342	169.7577	141.9029	127.8246
1343	242.4820	202.7773	182.6850
1344	288.7688	241.5964	217.6924
1345	304.2316	254.6656	229.5108
1346	448.0969	375.3116	338.3113
1347	559.4553	468.8899	422.7668
1348	681.9224	571.9538	515.8365
1349	796.2042	668.3592	602.9757
1350	963.9515	809.9223	730.9577
1351	1190.556	1001.357	904.1063
1352	1509.959	1271.475	1148.540
1353	4583.183	3864.312	3492.589
1354	5582.275	4713.498	4262.735
1355	6256.602	5291.418	4788.769
1356	10108.85	8564.586	7757.228
1357	8434.514	7160.294	6491.214
1358	8788.295	7476.970	6785.274
1359	10066.29	8585.145	7799.987
1360	11235.32	9608.073	8740.798
1361	11455.20	9825.211	8951.507
1362	13139.54	11306.61	10318.21
1363	9675.762	8355.943	7639.605
1364	8806.797	7635.586	6995.446
1365	10181.84	8865.760	8141.213
1366	11480.14	10043.37	9246.216
1367	14475.47	12729.04	11752.02
1368	9115.606	8060.574	7465.253
1369	6287.820	5593.772	5198.573
1370	9457.376	8468.611	7900.252
1371	21334.82	19239.71	18023.30
1372	48976.68	44504.63	41880.72
1373	61173.23	56043.52	53000.80
1374	69717.45	64432.27	61262.02
1375	88391.82	82458.18	78857.36
1376	81574.74	76862.03	73966.85
1377	75752.53	72138.53	69889.33
1378	52134.08	50207.82	48993.57
1379	40330.65	39305.30	38650.21
1380	55850.07	55850.07	55850.07

Source: Bank Markazi (Central) Iran, Balance sheet, and economic reports, different issues.

Table 2 : Estimation of Equation no (24)

Dependent Variable: LB1 (b_t^{ac} - 15 percent)				
Method: Least Squares				
Date: 04/09/04 Time: 19:51				
Sample(adjusted): 1343 1380				
Included observations: 38 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.448864	0.205899	2.180019	0.0361
TT	0.006201	0.005848	1.060392	0.2962
LB1(-1)	0.865337	0.082792	10.45191	0.0000
R-squared	0.970118	Mean dependent var		3.851585
Adjusted R-squared	0.968411	S.D. dependent var		0.755808
S.E. of regression	0.134332	Akaike info criterion		-1.101344
Sum squared resid	0.631581	Schwarz criterion		-0.972061
Log likelihood	23.92554	F-statistic		568.1446
Durbin-Watson stat	1.300344	Prob(F-statistic)		0.000000

Source: table 1

Table 3 : Estimation of Equation no (24)

Dependent Variable: LB2 (b_t^{ac} - 18 percent)				
Method: Least Squares				
Date: 04/09/04 Time: 19:45				
Sample(adjusted): 1343 1380				
Included observations: 38 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.446205	0.200543	2.224986	0.0326
TT	0.006906	0.006034	1.144468	0.2602
LB2(-1)	0.860576	0.083726	10.27847	0.0000
R-squared	0.971476	Mean dependent var		3.794168
Adjusted R-squared	0.969846	S.D. dependent var		0.773204
S.E. of regression	0.134267	Akaike info criterion		-1.102322
Sum squared resid	0.630963	Schwarz criterion		-0.973039
Log likelihood	23.94411	F-statistic		596.0136
Durbin-Watson stat	1.300401	Prob(F-statistic)		0.000000

Source: table 1

Table 4: Estimation of Equation no (24)

Dependent Variable: LB3 (b_t^{ac} - 20 percent)				
Method: Least Squares				
Date: 04/09/04 Time: 19:34				
Sample(adjusted): 1343 1380				
Included observations: 38 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.444461	0.197352	2.252124	0.0307
TT	0.007339	0.006140	1.195295	0.2400
LB3(-1)	0.857607	0.084277	10.17600	0.0000
R-squared	0.972195	Mean dependent var		3.759468
Adjusted R-squared	0.970606	S.D. dependent var		0.782944
S.E. of regression	0.134234	Akaike info criterion		-1.102813
Sum squared resid	0.630654	Schwarz criterion		-0.973530
Log likelihood	23.95344	F-statistic		611.8763
Durbin-Watson stat	1.300519	Prob(F-statistic)		0.000000

Source: table 1

Table 5: Augmented Dicky –Fuller Test (b_t^{ac} - 15 percent)

ADF Test Statistic	-5.917759	1% Critical Value*		-4.2412
		5% Critical Value		-3.5426
		10% Critical Value		-3.2032
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(LB1,3)				
Method: Least Squares				
Date: 04/09/04 Time: 19:55				
Sample(adjusted): 1346 1380				
Included observations: 35 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LB1(-1),2)	-1.644817	0.277946	-5.917759	0.0000
D(LB1(-1),3)	0.341850	0.176580	1.935948	0.0620
C	0.005125	0.062204	0.082388	0.9349
@TREND(1342)	-0.000307	0.002676	-0.114818	0.9093
R-squared	0.637370	Mean dependent var		0.008745
Adjusted R-squared	0.602276	S.D. dependent var		0.252695
S.E. of regression	0.159363	Akaike info criterion		-0.728051
Sum squared resid	0.787296	Schwarz criterion		-0.550297
Log likelihood	16.74089	F-statistic		18.16217
Durbin-Watson stat	1.965015	Prob(F-statistic)		0.000001

Source: table 1

Table 6: Augmented Dicky –Fuller Test (b_t^{ac} - 18 percent)

ADF Test Statistic	-6.013241	1% Critical Value*		-3.6289
		5% Critical Value		-2.9472
		10% Critical Value		-2.6118
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(LB2,3)				
Method: Least Squares				
Date: 04/09/04 Time: 19:57				
Sample(adjusted): 1346 1380				
Included observations: 35 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LB2(-1),2)	-1.642947	0.273222	-6.013241	0.0000
D(LB2(-1),3)	0.341429	0.173805	1.964438	0.0582
C	-0.000913	0.026635	-0.034296	0.9729
R-squared	0.636394	Mean dependent var		0.008917
Adjusted R-squared	0.613668	S.D. dependent var		0.252825
S.E. of regression	0.157145	Akaike info criterion		-0.781481
Sum squared resid	0.790224	Schwarz criterion		-0.648166
Log likelihood	16.67592	F-statistic		28.00363
Durbin-Watson stat	1.963332	Prob(F-statistic)		0.000000

Source: table 1

Table 7: Augmented Dicky –Fuller Test (b_t^{ac} - 20 percent)

ADF Test Statistic	-6.008007	1% Critical Value*		-3.6289
		5% Critical Value		-2.9472
		10% Critical Value		-2.6118
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(LB3,3)				
Method: Least Squares				
Date: 04/09/04 Time: 19:59				
Sample(adjusted): 1346 1380				
Included observations: 35 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LB3(-1),2)	-1.643411	0.273537	-6.008007	0.0000
D(LB3(-1),3)	0.341973	0.174002	1.965339	0.0581
C	-0.000654	0.026663	-0.024514	0.9806
R-squared	0.635847	Mean dependent var		0.009030
Adjusted R-squared	0.613087	S.D. dependent var		0.252912
S.E. of regression	0.157317	Akaike info criterion		-0.779287
Sum squared resid	0.791960	Schwarz criterion		-0.645971
Log likelihood	16.63752	F-statistic		27.93757
Durbin-Watson stat	1.961425	Prob(F-statistic)		0.000000

Source: table 1

Table 8: Phillips - Perron Test (b_t^{ac} - 15 percent)

PP Test Statistic	-7.415201	1% Critical Value*		-4.2324
		5% Critical Value		-3.5386
		10% Critical Value		-3.2009
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Lag truncation for Bartlett kernel: 3		(Newey-West suggests: 3)		
Residual variance with no correction				0.024644
Residual variance with correction				0.014067
Phillips-Perron Test Equation				
Dependent Variable: D(LB1,3)				
Method: Least Squares				
Date: 04/09/04 Time: 20:00				
Sample(adjusted): 1345 1380				
Included observations: 36 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LB1(-1),2)	-1.215159	0.176004	-6.904155	0.0000
C	-0.006729	0.060456	-0.111297	0.9121
@TREND(1342)	0.000339	0.002632	0.128955	0.8982
R-squared	0.591419	Mean dependent var		0.009218
Adjusted R-squared	0.566656	S.D. dependent var		0.249076
S.E. of regression	0.163964	Akaike info criterion		-0.698690
Sum squared resid	0.887174	Schwarz criterion		-0.566730
Log likelihood	15.57642	F-statistic		23.88364
Durbin-Watson stat	2.065367	Prob(F-statistic)		0.000000

Source: table 1

Table 9: Phillips-Perron Test (b_t^{ac} - 18 percent)

PP Test Statistic	-7.544000	1% Critical Value*		-3.6228
		5% Critical Value		-2.9446
		10% Critical Value		-2.6105
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Lag truncation for Bartlett kernel: 3		(Newey-West suggests: 3)		
Residual variance with no correction				0.024742
Residual variance with correction				0.014050
Phillips-Perron Test Equation				
Dependent Variable: D(LB2,3)				
Method: Least Squares				
Date: 04/09/04 Time: 20:02				
Sample(adjusted): 1345 1380				
Included observations: 36 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LB2(-1),2)	-1.215388	0.173680	-6.997847	0.0000
C	0.000561	0.027005	0.020788	0.9835
R-squared	0.590213	Mean dependent var		0.009385
Adjusted R-squared	0.578160	S.D. dependent var		0.249203
S.E. of regression	0.161855	Akaike info criterion		-0.750276
Sum squared resid	0.890702	Schwarz criterion		-0.662303
Log likelihood	15.50497	F-statistic		48.96987
Durbin-Watson stat	2.060273	Prob(F-statistic)		0.000000

Source: table 1

Table 10: Phillips-Perron Test (b_t^{ac} - 20 percent)

PP Test Statistic	-7.527986	1% Critical Value*		-3.6228
		5% Critical Value		-2.9446
		10% Critical Value		-2.6105
*MacKinnon critical values for rejection of hypothesis of a unit root.				
Lag truncation for Bartlett kernel: 3		(Newey-West suggests: 3)		
Residual variance with no correction				0.024799
Residual variance with correction				0.014095
Phillips-Perron Test Equation				
Dependent Variable: D(LB3,3)				
Method: Least Squares				
Date: 04/09/04 Time: 20:04				
Sample(adjusted): 1345 1380				
Included observations: 36 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LB3(-1),2)	-1.215140	0.173884	-6.988241	0.0000
C	0.000784	0.027036	0.028983	0.9770
R-squared	0.589548	Mean dependent var		0.009495
Adjusted R-squared	0.577476	S.D. dependent var		0.249289
S.E. of regression	0.162042	Akaike info criterion		-0.747965
Sum squared resid	0.892763	Schwarz criterion		-0.659992
Log likelihood	15.46337	F-statistic		48.83551
Durbin-Watson stat	2.057922	Prob(F-statistic)		0.000000

Source: table 1

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