



## ANALYSIS OF SUSTAINABILITY THEORIES

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### ABSTRACT

The theories of sustainability arise from debt crisis in developing countries and have maintained the same meaning and currency since the 1980s. The main purpose of the paper is to provide an overview of approaches to assessing fiscal and foreign sustainability. Sustainability, defined according to solvency situation, is in the range of intertemporal budget constraint of current economic policy. In this paper we made a theoretical analysis of fiscal and current account deficits sustainability. Finally sustainability relationship between fiscal and external deficits is discussed.

**Key words:** sustainability, fiscal deficits, current account deficits.

### INTRODUCTION

In an economy on the way of sustainable development, inner balance expresses full employment, reasonable budget deficit and price stability; Foreign balance expresses equity of incomes from foreign world and expense to foreign world, so source deficit expresses especially inner (fiscal) and foreign imbalances due to debt coverage and budget deficit and current accounts deficit; to finance the source need this way by foreign indebtedness is possible. In this context, after sustainability analysis of public sector deficit as sustainability indicator of fiscal policy, relation between theoretical analysis of current accounts sustainability and public sector deficit and current accounts deficits due to foreign deficit appeared at the end of applied economic policy is taken up theoretically for sustainability.

Sustainability is ability to perform inner and foreign obligations for country in general. Sustainability (solvency) is defined as present value budget constraint. In general meaning, if expected present value of future sources of country to service debt is equal to

nominal value of beginning debt stock of economy at least, it can be expressed that the economy has capacity to repay. Under these conditions, government will service its debt in market conditions. So, solvency condition needs provision of present value budget constraint of expected fiscal plans of government (1). This means that discounting present value of future trade surplus is equal to current foreign indebtedness, implying that the economy has solvency. In public financing, solvency implies the equity of discounting present value future budget surplus to current public debt.

### SUSTAINABILITY OF PUBLIC DEFICIT

Economists examine deficit problem in a different angle of view instead of size of deficit in any point of time. Economists determine sustainability of primary deficit (debt) by intertemporal solvency measuring the present value of debt. In fact, solvency condition is the event of performing current economic policy by taking present value borrowing constraint into consideration. If government gives budget surplus enough to pay accumulated debt and interest, it satisfies present value borrowing constraint. In other words, total current and expected future expenses out of interest expressed in terms of present value terms must not exceed the total incomes discounted. In this context, present borrowing value constraint (or solvency

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condition) will be followed by income and expenses out of interest (2). If these two parameters can not act together, risk of non-repayment debt by government will increase. Most practical approach to reach sustainability is to use government debt as indicator to distinguish non-sustainable fiscal policy from sustainable fiscal policy. However, theoretical literature is focused on whether current fiscal policy can be performed in future without threatening repayment capacity of government.

Analytic discussions of fiscal sustainability take a representative model as beginning point (3). In the model, government

$$B_t = - \sum_{j=0}^{\infty} R(t, t+j)^{-1} D_{t+j} + \lim_{T \rightarrow \infty} R(t, t+T)^{-1} B_{t+T+1} \quad [2]$$

Gives intertemporal budget constraint. Here,

$$R(t, t+j) = \prod_{k=0}^j R_{t+k}$$

is discount factor applied between period of  $t$  and  $t+j$ . Sustainability (or solvency) from equation no [2] needs excess of the present value of future primary budget surplus and present value total of debt stock in beginning and final debt stock. If present value of final debt stock is positive, debt will not be equal to zero up to infinity, even if a government rolls over its debt by repaying its main money and interest in each period by indebting. In other words, in that case government will fall into ponzi game.

In the case of a debtor, the condition of not falling into Ponzi game or transversality condition for creditors are accepted generally as synonymous of sustainability in long term (4). Transversality condition as mathematical term expresses that debt must not increase more than interest rate. Otherwise, second term in right side of equation no [2] does not equal to zero and present budget constraints cannot be ensured. In long term, if  $D_t - D_{t+1} / D_t - 1 < r$ ,

$\lim_{T \rightarrow \infty} R(t, t+T)^{-1} B_{t+T+1} = 0$  will be provided. This is mathematical expression of transversality condition in sustainability. Behaviours (or desirousness) of government creditors determine the sustainability of fiscal policies. Not falling into ponzi game implies that transversality condition must ensure  $\lim_{T \rightarrow \infty} R(t, t+T)^{-1} B_{t+T+1} \leq 0$ . So, sustainable fiscal policy is to perform needs of present value budget constraint. This condition is expressed by

realizing both intertemporal budget constraint and static budget constraint in each period. In closed economy version of such model there is no need to deal with complaints related to foreign debt, if we dispense with monetary thoughts, static budget constraint can be expressed by,

$$B_{t+1} = R_t B_t + D_t \quad [1]$$

Here,  $B_t$  is government debt stock in beginning period.  $R_t = 1 + r_t$  is discount factor applied between periods of  $t$  and  $t+1$ .  $D_t$  is fiscal deficit out of interest. If equation no [1] is solved

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

Sustainability necessitates that current government debt must be equal to net primary excess of current debt when principal deficits in present value terms are balanced with future primary excesses. In other words, current value of debt becomes equal to present value of expected future excesses when present value borrowing constraint is provided (5-8). The most important result of present value budget constraint is not to exceed out of aforesaid rule related to high budget deficit or high debt while future primary excesses that necessitate obeying aforesaid constraint, form applicable policy option. Transversality condition puts the constraint of not developing debt over interest rate. If high interest rate continues for a long time, debt can grow faster than economy and endless debt-output rate can be possible. Such possibility is not reasonable. So, it is discussed to put constraint over primary fiscal excess. This is because government can not increase public revenue more than revenue creating capacity of economy. In this case,

condition of  $D_{i+j} < \phi Y_{i+j}$  must be provided.

Here  $Y_{i+j}$  is output and  $\phi < 1$ . So,

$$B_t < \sum_{j=0}^{\infty} R(t, t+j)^{-1} \phi Y_{i+j} \quad [4]$$

is condition for sustainability. This condition brings up the need to limit debt rate, when interest rate is bigger than development rate.

While continuous budget deficits conflict with present value budget constraint,

continuous budget deficits (including interest) can be sustainable. A country giving primary surplus covering a part of interest cost of debt in each period can rollover its debt. In each period, totalitarian deficit (including interest) will exist but it will be accepted as sustainable since debt will grow less than interest rate. Present value budget condition expresses that government must give little deficit in following period after it provides the primary budget balance. This is because this situation conflicts with transversality condition. Similarly debt rattle gradually decreases to zero in economy developing with relative low interest rate and it is accepted as sustainable. In debts growing slightly over interest rate, if growth rate of output is greater than growth rate of debt, debt will be made to decrease in spite of violation of transversality condition. In conclusion, sustainability judgments based on present value budget constraint are made without applying any economic parameters over government debt stock, planned primary surplus (deficits) and government debt except interest rate.

### SUSTAINABILITY OF CURRENT ACCOUNTS DEFICITS

Difficulties met in financing domestic expenses from domestic sources make foreign indebtedting option a necessity and this situation becomes a problem especially for developing countries. In this framework, foreign debt

problem is dealt on the basis of sustainability of foreign debt; it is an examination area attracting attention and concern since 1980s when the literature related to the subject made its appearance. IMF providing fund for foreign deficit pays foreign sustainability attention very much. Logic of foreign sustainability also resembles to fiscal sustainability.

While current account deficits mean increase in foreign obligations of economy, current account surpluses mean decrease in foreign obligation stock. While evaluating continuous current account imbalances, it is needed to take factors effecting foreign obligations of economy into consideration. There is an important relation between current account imbalance and debt repayment capacity of country.

It expressed by real foreign money is net foreign debt obligations of a country. TB shows trade balance in real foreign money. Net foreign obligations are expressed by,

$$F_{t+1} = R_t^* F_t - TB_t \quad [5]$$

Here,  $R_t^* = 1 + r^*$  is world interest factor used to get present value of debt. While high interest rate increases the indebtedness of country, a positive trade balance causes an improvement in net indebtedness of country against rest of the world. If equation no [5] is solved, the expression of

$$F_t = \sum_{j=0}^{\infty} R^*(t, t+j)^{-1} TB_{t+j} + \lim_{T \rightarrow \infty} R^*(t, t+j)^{-1} F_{t+T+1} \quad [6]$$

is obtained.

$$R^*(t, t+j)^{-1} = \left( \prod_{k=0}^j R_{t+k}^* \right)$$

Here, This is intertemporal foreign constraint. In case any country cannot rollover its debt, it can serve debt by new foreign indebtedting. In these cases, to cut to give credit to this county will increase the comfort of creditors. Such case means to enter ponzi game that this cannot be at the end of balance.  $\lim_{T \rightarrow \infty} R^*(t, t+j)^{-1} F_{t+T+1} = 0$  is balance condition and means that net foreign obligations of country will not grow more than foreign interest rate. To put this as sustainability condition is expressed by,

$$F_t = \sum_{j=0}^{\infty} R^*(t, t+j)^{-1} TB_{t+j} \quad [7]$$

Equation no [7] express that foreign debt can be sustainable in case of foreign trade surpluses in present value term expected to serve net foreign obligations of a country is big enough.

### RELATION BETWEEN CURRENT ACCOUNTS AND PUBLIC SECTOR DEFICIT SUSTAINABILITY

For sustainability, relation between current accounts and public sector deficit is not examined systematically. However, there is not any direct relation between sustainability of public and current accounts, aforesaid sustainability is not inter-independent.

Analysis of aforesaid relation is not suitable to national revenue identity. National revenue identity is expressed by

$$TB_t = -D_t + S_t - I_t \quad [8]$$

Here,  $D_t$  is fiscal deficit out of interest,  $TB_t$

foreign trade balance,  $S_t$  private saving and  $I_t$  private investment. Parameters are expressed by same currency and if equation no [8] is calculated at net present value terms for all future periods, the expression of

$$\sum_{j=0}^{\infty} R^*(t, t+j)^{-1} TB_{t+j} = -\sum_{j=0}^{\infty} R(t, t+j)^{-1} D_{t+j} + \sum_{j=0}^{\infty} R(t, t+j)^{-1} (S_{t+j} - I_{t+j}) \quad [9]$$

is obtained. Equation no (9) can be rewritten as:

$$\left( F_t - \lim_{T \rightarrow \infty} R^*(t, t+j)^{-1} F_{t+T+1} \right) = \left( B_t - \lim_{T \rightarrow \infty} R(t, t+T)^{-1} B_{t+T+1} \right) + \sum_{j=0}^{\infty} R(t, t+j)^{-1} (S_{t+j} - I_{t+j}) \quad [10]$$

by using intertemporal budget equation [2] and intertemporal foreign constraint equation [6]. Here, assumption of  $R^*(t, t+j) = R(t, t+j)$  is made. This assumption is seen as appropriate to reality for a great economy having high capital movement. Because while present values of parameters for foreign sustainability are found, interest rate of great economies are used as world interest rate. When both fiscal and foreign sustainability is mentioned,

equation no [10] becomes like,

$$F_t = B_t + \sum_{j=0}^{\infty} R(t, t+j)^{-1} (S_{t+j} - I_{t+j}) \quad [11]$$

Such that if net foreign obligations are greater than government debt, private savings must exceed private investment in net value terms to meet foreign debt service in future.

If economy is fiscally sustainable but foreign position is in situation that cannot be sustainable, this situation is expressed by

$$F_t = B_t + \sum_{j=0}^{\infty} R(t, t+j)^{-1} (S_{t+j} - I_{t+j}) + \lim_{T \rightarrow \infty} R^*(t, t+T)^{-1} F_{t+T+1} \quad [12]$$

private saving is insufficient to meet foreign debt service. In conclusion, private sector net foreign obligations grow faster than foreign interest rate. For example, private sector can rollover net foreign obligations. Risk of not repaying on foreign debt service can be

mentioned in case of changing in macroeconomic policies.

Finally, if foreign policy is sustainable but fiscal policy is not sustainable, this situation is expressed by

$$F_t = B_t + \sum_{j=0}^{\infty} R(t, t+j)^{-1} (S_{t+j} - I_{t+j}) - \lim_{T \rightarrow \infty} R(t, t+T)^{-1} B_{t+T+1} \quad [13]$$

Governments finance its deficits by domestic borrowing. Any change in fiscal policy, government cannot perform its domestic debt service.

### CONCLUSION

A result development in communication and transport technologies, sustainability definable as desire and capacity of a country to pay current or future public sector or foreign debt obligation and come up by debt crisis in developing countries has been an examination area keeping its importance and currency since 1980s. Public deficit, foreign deficit and

relations of these deficits with each other have a special importance to determine sustainability of current economy policy, since budget deficits cause public sector debts, current accounts deficits to foreign debts. In this study, public sector deficit, current accounts deficit and theoretical relations of these two deficits with each other have been dealt with based on sustainability of mathematical dynamics.

Sustainability definition based on solvency has close relation with taxing and government expenses and is so simple for fiscal imbalances. In case of current account imbalance, sustainability definition is more

complex. To use a theoretical model to obtain standard to evaluate that whether actual current accounts deficits are over. Sustainability of current accounts covers interaction between investment and saving decision, public and private units in country as well as decisions lending of foreign investors.

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