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Original Contribution

CURRENT ACCOUNTS DEFICITS SUSTAINABILITY: IMPLICATIONS OF INTERTEMPORAL FOREIGN BORROWING CONSTRAINT FOR PAKISTAN

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ABSTRACT

Theory of intertemporal budget constraints is applied to current account deficits of Pakistan for 1980:1-2004:2 periods. The aim of this study is to demonstrate whether the foreign debt arising from deficit current accounts policies has sustainability in the current economic policies of Pakistan. By means of the revenues and expenditures of current accounts, it is tested if current account deficits are too large. The results obtained have demonstrated that current account deficits are not sustainable.

Key words: current account deficit, solvency condition, intertemporal foreign budget constraint, cointegration.

INTRODUCTION

Sustainability refers to the willingness and capability of a country to be able to pay its current and prospective public and foreign debt liabilities [1]. While the public debt stock increases to the same extent with the budget deficit in the current year, the foreign debt stock increases to the same extent with the current account deficit. In this context, the sustainability of the public debts and budget deficits mean the same, as the sustainability of current account deficits mean the same with the sustainability of the foreign debts [2]. In the literature, models have been established for primary deficits, the public debts and these models have been adapted to the current account deficits. There are two essential approaches in the literature with regard to sustainability: accounting approach and the present value approach [3]. The first approach encompasses the efforts carried out within the context of poor countries with heavy debts in order to determine the reasons for the global debt crisis, reduce global poverty, improve the income distribution and develop sustainability metrics with the support of the international community.

The second approach includes the efforts performed by the academic circles via relatively wider application of econometric techniques. The superiority of the present value approach to the accounting one is that it can be implemented for both the developed and developing countries and that it offers testable propositions, as well. This approach examines the problem of deficits from a different point of view instead of the magnitude of any deficits at any point in time. The present value approach determines the sustainability of the debt based on the condition of inter-temporal repayment capability which measures the present value of the debt. Actually, the repayment capability condition is the phenomenon of the execution of the current economic policy by taking into consideration the present value borrowing constraint. If the government provides adequate budget account surplus for the future in order to pay for the accumulated foreign debt and interests, then it fulfils the present value foreign borrowing constraint. Conversely, the total amount of expenditures incurred by the current regnum, expressed with the term 'present, and the expected primary foreign regnum should not increase the total amount of the discounted revenues obtained from the foreign regnum. In that

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context, the present value borrowing constraint (or the repayment capability condition) is determined by the revenue obtained from the primary foreign regnum and the route to be followed by the expenditures incurred by the foreign regnum [4]. If these two variables do not act together in the long term, the government shall have an increased risk in its inability to pay back its debt.

The mentioned constraint, which can be called the inter-temporal borrowing constraint is the technical criterion on whether the implemented current government policy shall have a current account surplus that will be enough to pay back the accumulated foreign debts and interests if the policy implemented by the government is causing foreign account deficits. The essential studies on the mentioned constrained were performed by Hamilton and Flavin [5], Wilcox [6], Trehan and Walsh [7], Hakkio and Rush [8]. Taking the propositions of these studies as basis, Baglini and Cherubini [9], Tanner [4], Ahmet and Rogers [10], Caparole [11], Bohn [13] implemented the inter-temporal budget constraint theory to the public deficits and current account deficits of many countries.

This study is composed of five sections. The first section lays down the literature. The second section explores the inter-temporal budget constraint theory for the current account deficits. The third section examines the condition for repayment capability and co-integration tests. The fourth section includes the analysis performed and the fifth section presents the results obtained.

INTERTEMPORAL FOREIGN BUDGET CONSTRAINT

The government is faced with a foreign budget constraint during every term. The foreign budget constraint faced by the government every term is expressed in the following way:

$$IM_t + (1+r)F_{t-1} = X_t + F_t \qquad (1)$$

In the equation above, F_t refers to the promissory notes issued by the government to the foreign market to provide funds. In the relevant periods, it is assumed that the exported promissory notes all have the same maturity. IM_t indicates the expenditures that the government incurs in the foreign regnum for goods and services procurements and the expenditures for transfers to the foreign regnum, the X_t indicates the revenues obtained from the foreign regnum by means of goods and services exportation and the transfers acquired from the foreign regnum. As for r_t, it denotes the real interest ratio during the term t. The left hand side of the equation specified as (1) refers to the expenditures incurred by the government to the foreign regnum during the term t, while its right hand side indicates the revenue that the government obtained from the foreign regnum during the same term. The variables in the equation (1), which expresses the foreign budget constraint that the government faces during any term t can be expressed in nominal or real terms, while they can also be normalized by being divided by the population or GDP. At this point, whether the interest ratio in the equation number (1) shall be taken as nominal or real depends on how the revenues and expenditures are expressed. When the variables are expressed in nominal terms, the nominal interest rate should be used; in real terms, the real interest rate can be used.[2] When the variables are expressed in the form of real GDP per person, r_t expresses real interest rate - growth rate per person and the r_t refers to the real interest rate – population growth rate when the variables are expressed per person.

The budget constraint for the term specified in the equation (1) is applicable to all the $t+i$ $(i=1,2,\text{L})$ terms. If this expression is prospectively extrapolated for the terms $t+1$, $t+2$, $t+3$…, the inter-temporal foreign budget constraint of the government shall be obtained:

$$F_o = \sum_{t=1}^{\infty} r_t \left(X_t - IM_t\right) + \lim_{n\to\infty} r_n F_n \qquad (2)$$

In this expression, it is defined as:

$$r_t = \prod_{s-1}^{t} F_s \quad \text{ve} \quad F_s = \frac{1}{1+r_s}$$

The most important element in the inter-temporal foreign budget constraint specified in the equation (2) is the last term expressed as $\lim_{n\to\infty} r_n F_n$ on the right hand side of the equation. Once this limit is equal to zero, namely, it is $\lim_{n\to\infty} r_n F_n$=0, the inter-temporal budget constraint expresses that the promissory notes stock is equal to the present

[2] In the relevant literature, it is frequently assumed that the real interest rates are fixed. It is not really realistic to assume that the nominal interest rates are fixed.

value of the current account surpluses. The fact that this limit is not zero means that the government has finances in the current account deficit by exporting new promissory notes. It is not possible for the government to maintain for a long time this situation which is termed the "Ponzi finance". In other words, the foreign debt cannot grow forever at a rate higher than the real interest rate. This situation is expressed as the unsustainability of the current account deficit. Efforts are taken to determine whether the current policy is sustainable by taking as basis the periods when similar policies were implemented, whether the present or short-term current government policy is sustainable. Thus, it is investigated whether the data of a period when a specific economic policy is implemented are harmonized with the condition $\lim_{n\to\infty} r_n F_n$=0. Supposing that the variables X and E are stochastic processes, the expected value for the limit specification for sustainability has to be equal to zero. Conversely, fulfilling the condition $E\left[\lim_{n\to\infty}(r_n F_n)\right]=0$ denotes that the current policy is sustainable.

The inter-temporal foreign budget constraint (2) is written as in the equation; however, this expression is empirically not suitable for the sustainability condition to be tested. On the other hand, it is possible to obtain an econometrically testable expression from the Equation (1) via a couple of algebraic adjustments. For this purpose, it should be assumed that the interest rates are fixed and that the unconditional expected value is equal to r [8]. The assumption about being fixed is not realistic for the nominal interest rates. This assumption can only be made for real interest rates. This necessitates the entire model to be expressed in real terms as in this study. (1) if rB_{t-1} is removed from both sides of the equation, the following expression is obtained:

$$E_t + (1+r)F_{t-1}) = X_t + F_t \qquad (3)$$

In this expression, it is defined as $E_t = IM_t + (i_t - i)F_{t-1}$. To be able to obtain a testable, alternative equation, the equation number (3) derived from the equation number (1) is extrapolated to reach the following expression:

$$F_{t-1} = \sum_{J=0}^{\infty} \beta^{j+1}(X_{t+J} - E_{t+J}) + \lim_{J\to\infty} \beta^{j+1} F_{t+j} \qquad (4)$$

Here, it is defined as $\beta = 1/(1+i)$. If the variables X and E of the equation (4) are re-arranged by being expressed in the form of the primary differences, it can be written as follows:

$$E_t + r_t F_{t-1} = X_t + \sum_{J=0}^{\infty}(\Delta X_t - \Delta E_t) + \lim_{n\to\infty}\beta^{t+J} F_{t+j} \qquad (5)$$

The left side of the expression given in the equation (5) indicates the expenditures incurred for goods and services procurements from the foreign regnum, the expenditures for transfers obtained from the foreign regnum and the debt interest payments.

The empirical studies performed have shown that the variables X and E followed the accumulative random walks with drift [8]. Departing from this point of view, if it is supposed that the level values of variables X and E are not fixed, however, their primary differences are fixed and it is defined as $MM = IM + r_t F_{t-1}$, the equation number (5) can be written again in the following way:

$$MM = \alpha + X_t + \lim_{J\to\infty} \beta^{j+1} + \varepsilon_t \qquad (6)$$

Here:

$$\alpha \equiv \sum \beta^{j-1}(\alpha_1 - \alpha_2) = \left[\frac{(1+r)}{r}\right](\alpha_1 - \alpha_2),$$

and $\varepsilon_t = \sum \beta^{j-1}(\alpha_{1+t} - \alpha_{2+t})$ are how it is defined. It is accepted that the limit of the final term in the equation number (6) is close to zero in infinity. If this acceptance is not taken, then a situation emerges where the debt can be cycled via debt till infinity. Such a situation does not comply with not only the economic rationality, but also the economic interests of the economic units (lenders and borrowers) supposed to act rationally.

If the final term in the equation no. (6) is equal to zero, the mentioned equation can be written in the form of regression equation as follows:

$$X_t = a + bMM_t + \varepsilon_t \qquad (7)$$

The regression equation number (7) constitutes the basis of the hypothesis which shall be tested. The null hypothesis to be tested is that the co-efficient b is equal to one, and the residual variable ε_t is fixed. Conversely, if the series MM and X are not fixed, the null hypothesis is that the co-efficient b is one and also that the variables MM and X are co-integrated. When the series MM and X are not fixed, it is not obligatory

for the co-efficient b to be equal to one [4]. When the variable MM is not fixed while the variable X is fixed, the series MM shall show a tendency to increase while the series X shall exhibit a tendency to be fixed. Thus, the co-efficient b will converge to zero in the infinity and there shall be no long-term relation between these two series. In that case, the conclusion that the inter-temporal budget constraint has been violated can be reached intuitively.

However, then the series MM and X are co-integrated and 0<b<1, the third term on the right side of the equation no. (6) shall converge to zero in infinity, hence inter-temporal budget constraint shall be ensured.

SOLVENCY CONDITION AND COINTEGRATION

Co-integration is a concept which is related to time series that are not fixed. The linear combinations of time series that are not individually linear can be fixed. The variables that have a co-integration relationship among them act together in the long-term. Conversely, there is a relationship of balance among them. To ensure the condition of sustainability in the equation no. (7), there should be a relation of co-integration among the variables based on the presupposition that they are not fixed. Within the scope of current account deficits that constitute the subject of the study, the presupposition shall be made that the series MM and X are not fixed. In such a case, the linear combination of series MM and X in the form of $X_t - aMM_t = v_t$ is not generally fixed, either. On the other hand, the series MM and X may have a co-efficient b which renders fixed a linear combination like $X_t - aMM_t = u_t$ b.

In this study, the Engle-Granger and Johansen co-integration tests shall be used to determine whether the variables are co-efficient or not. Within the framework of the statement specified in the equation (7), the co-integration test consists of two phases. The first stage is to subject the variables X and MM to the unit root test to determine whether each one is co-integrated at the primary level I(1). As a second step, the variable MM is subjected to regression over the variable X (or the variable X over the variable MM). Then, the equation $\hat{u} = X_t - \beta MM_t$ is tested by means of unit root test.

If the variables X and MM are co-integrated, the regression equation $\hat{u} = X_t - \beta MM_t$, namely, I(0), shall be fixed. On the other hand, if the variables X and MM are not co-integrated, the error term u is not fixed. Since the unit root tests are implemented on the residuals as "u", the hypothesis is expressed as "there is a unit root" or "the error term u is not fixed." Thus, the null and alternative hypothesis in the co-integration tests are expressed as follows:

H_o: the error term u is not fixed and the variables MM and X are not co-integrated.

H_1: the variables MM and X are co-integrated.

As expressed above, the null hypothesis within the scope of co-integration tests is mostly composed as a lack of co-integration relations. In other words, it is assumed that there are no co-integration relations between the variables X and MM. In that case, the null hypothesis will be applicable if no strong evidence to reject a null hypothesis can be reached.

Johansen co-integration test is an extended and developed version of the Engle-Granger Method and it provides possibility for making a co-integration analysis among two or more variables. The biggest advantage of Johansen co-integration analysis is that it provides possibility for making a co-integration analysis among variables without making any distinctions as internal-external.

It can be expressed as a VAR (Vector Auto regression) model consisting of n number of variables and n number of equations, which shall be subjected to co-integration analysis.

In such an equation system, there can be at most n-1 number of equation relations. These co-integration relations are technically expressed as co-integration vectors. In that case, there shall be at most one co-integration vector in the model consisting of two variables (X and MM) as in the equation no. (7). However, if the equation system includes a trend variable, the number of variables shall be three, hence there will be able to be two co-integration vectors. The number of co-integration vectors is termed as the co-integration rank (r). Thus, the null and alternative hypotheses that shall be formed to test the equation no (7) within the scope of Johansen co-integration test can be expressed as follows:

$H_0 : r = 0$

$H_1 : r > 0$

If the hypothesis H_0 cannot be rejected, the variables X and MM are not co-integrated. In that case, the condition for repayment capability has not been fulfilled. On the contrary, if the hypothesis H_0 is rejected, the fact that the variables X and MM are co-integrated, namely, the repayment capability, shall indicate the result that the debts are sustainable.

ANALYSIS AND FINDINGS

In the study, the 1980-Q1 period of Pakistan is taken as the start period and the duration that elapses from the period at stake till the year 2004 is examined based on quarterly data (1980Q1–2004-Q2). The data used in the study were obtained from the OECD database. While X denotes the current account revenues obtained by means of goods and services exportation and the transfers received from the foreign regnum, MM expresses the goods and services importation expenditures and transfer expenditures performed by the government to the foreign regnum including the MM interest. Since the data obtained are in the form of dollars, no adjustment is needed to express it as a real variable.

***Table 1**: ADF (Augmented Dickey-Fuller) Test Results*

Variable	*Trend*	*ADF test Statistics*	*Critical Values**	*Lag***
X	NA	-0.291235	-2.991878	0
ΔX	NA	-5.421907	-2.998064	0
MM	NA	-0.651576	-2.991878	0
ΔMM	NA	-4.065062	-2.998064	0
XSA	NA	-0.659424	-2.896346	1
ΔXSA	NA	-13.37092	-2.896346	0
MMSA	NA	-1.079673	-2.896346	1
ΔMMSA	NA	-16.40705	-2.896346	0

$*H_0$ To reject the hypothesis (Unit root available) according to the level of significance (5%) McKinnon critical values.
*** Indicates the delays according to the SIC criteria.*

In this study, whether the inter-temporal budget constraint has been fulfilled or not has been tested through the use of Engle-Granger and Johansen Co-integration methods. Both tests were also performed via the elimination of seasonal fluctuations in the series. The prefix SA was added before the relevant variable to indicate every seasonal fluctuation. The seasonal fluctuations were eliminated using the E-views 5 package program by means of X11 method. The special results performed with and without the elimination of seasonal fluctuations are given on **Table 2** and **Table 3**. Before testing whether the revenue and expenditure series of current account revenue and expenditure are co-integrated, it is necessary to test whether these variables are individually co-integrated at the first degree, namely, whether they are fixed. The ADF unit root test has been used to test whether the variables are fixed. The results obtained from the tests on being fixed are specified on **Table 1**. Since the trend variable was not found to be statistically significant in any of the ADF models that were tested, they were removed from the models. All the models contain fixed terms. For detecting the delay values, the AIC and SIC criteria were used. **On Table 1**, the results in which the delays obtained via SIC criterion are presented. In this chart, the test statistics in which the null hypothesis was rejected are specified in bold characters. It can be seen on the **Table** that the current account balance revenue and expenses are not fixed on level values; however, the primary differences of these variables are fixed. In that case, it is necessary to have a relation of co-integration between the variables X and MM in order to fulfil the inter-temporal repayment condition.

To detect a possible co-integration relation, Engle-Granger and Johansen co-integration tests were used. The summary results of the co-integration test performed using the methodology Engle-Granger is specified on **Table 2**. Judging by the first part of **Table 2**, it can be seen that the hypothesis that the residues derived from the regression $X_t = \hat{\alpha}_0 + \hat{\alpha}_1 MM_t + \hat{u}_t$ has a unit root cannot be rejected in the ADF test. The result that the variables X and MM are not co-integrated for the model in question is derived from here. In other words, it is concluded that

the inter-temporal repayment capability condition cannot be fulfilled in the co-integration tests actualized by using the Engle-Granger methodology. To detect the co-integration relation between the variables X and MM, the Johansen co-integration rank test was also implemented to compare with the results obtained via Engle-Granger methodology.

Table 2: *Co-integration Test of Engle-Granger*

Model: $X_t = \hat{\alpha}_0 + \hat{\alpha}_1 MM_t + \hat{u}_t$

α_0	α_1	Critical Value*	ADF Test Statistic
237.6140	0.789377	-2.897678	-2.546801
Model: $XSA_t = \hat{\alpha}_0 + \hat{\alpha}_1 MMSA_t$			
α_0	α_1	Critical Value*	ADF Test Statistic
242.5347	0.785841	-2.897678	-2.243442

* H_0 McKinnon critical values to reject to hypothesis (Unit root available) (5%).

Table 3: *Co-integration Rank Test of Johansen*

Variables	H_0	H_1	λ_{trace}	Critical Value (5%)
X and MM	$r = 0$	$r > 0$	8.940985	15.41
SAX and SAMM	$r = 0$	$r > 0$	14.440980	15.41

The test results were obtained according to the 5% confidence interval.

The results obtained from Johansen test are summarized on **Table 3**. As can be seen in the chart, the hypothesis $r = 0$ cannot be rejected for either model. This means that there is no co-integration vector. To sum up, the results obtained from the tests performed using Engle–Granger and Johansen methodologies indicate that the current account revenue and expenditure series for Pakistan are not co-integrated.

RESULTS

The governments, which have their essential aim as achieving the potential product level engage in economic relations with foreign countries. One of the fundamental objectives of the foreign trade policy is to keep the current account deficits occurring as a result of these economic transactions at a reasonable level. This situation requires that whether the current account deficits are very wide be determined by means of the inter-temporal repayment capability condition. In other words, it is whether the current foreign trade policy conducted by the government causes foreign trade deficits that are too large to be conducted presently and in the near future.

In the study, the items of the current account balance sheet that earn and lose foreign assets have been tested via Engle-Granger and Johansen co-integration methods to determine whether the current account deficits in Pakistan for the term :Q1–2004:Q2 are sustainable or not. The results obtained indicate that the inter-temporal foreign budget constraint determined in the equation no. (7) has not been fulfilled. Conversely, it is seen that the current account revenues and expenditures do not feature a progress in the same wavelength in the present value terms as of the period 1980:Q1–2004:Q2, which has been selected as the period to be studied. Hence, the inter-temporal repayment capability condition cannot be fulfilled. It can be concluded that the current foreign trade policy is not sustainable so long as there are no important structural policy changes in near future based on the failure to fulfil the repayment capability condition as of the studied period.

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