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Sustainability of budget deficits in Turkey with a structural shift*

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Abstract

The necessary and sufficient empirical condition for the consistency of the fiscal stance with intertemporal budget constraint, and thus the strong sustainability of fiscal deficits, is that the deficit process is stationary and stable. The weak sustainability condition requires that government revenues and expenditures including interest payments are cointegrated. The use of conventional tests (such as ADF and KPSS)

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for testing sustainability may be misleading when the processes generating fiscal deficits exhibit structural breaks possibly due to a policy regime change. Therefore, to investigate deficit sustainability, we employ not only the conventional tests but also recently developed procedures (Perron and Vogelsang (1992), Perron (1997) and Gregory and Hansen (1996)) which allow stationarity around an endogenously estimated structural break point under the alternative hypothesis. The evidence based on Turkish annual data from 1969 to 1998 suggests that Turkish fiscal policy does not satisfy the strong sustainability condition. The weak sustainability condition, on the other hand, appears to be satisfied, and a structural break in the cointegration vector took place in 1983. The estimated break point coincides with a policy regime change in the method of deficit financing - shift from monetization to debt finance. The weak sustainability of the deficit process implies that the government may run into problems marketing its debt if the current fiscal policy continues because the incentive for the government to default increases. A policy regime change altering the parameters of the deficit process may be needed to achieve a sustainable fiscal stance.

1. Introduction

There is a limit to the finance of budget deficits by issuing new debt since governments face an intertemporal budget constraint. A violation of the intertemporal budget constraint implies that the growth rate of government debt is greater than the growth rate of the economy at the current fiscal stance. So that fiscal policy cannot be sustained forever. Necessary and sufficient empirical condition for the consistency of the fiscal stance with an intertemporal budget constraint is for the deficit process to be stationary (Hamilton and Flavin (1986)), or for government revenues and expenditures including interest payments to be cointegrated (Trehan and Walsh (1991), Hakkio and Rush (1991) and Haug (1991))[1].

In the literature, the deficit sustainability issue is often investigated under an assumption that there is a single policy regime during the sample period. The sustainability of deficits, however, may not be invariant to a policy regime change. A policy regime change may lead to structural breaks either in the expenditures and/or revenues, hence in the deficit process itself. In such a case,

1 The most recent literature on testing for the budget deficit sustainability contains Cuddington (1997), Buiter (1997), Bohn (1998) and Artis and Marcellino (1998).

employing conventional tests (such as the augmented Dickey and Fuller (1979) and Kwiatkowski *et al.* (1992) tests, hereafter ADF and KPSS, respectively) for the orders of integration of the variables of interest would be misleading as these tests are known to be biased towards not-rejecting non-stationarity if the data generation process is, in fact, stationary around a broken mean and/or trend (see, Perron (1989, 1997) and Lee *et al.* (1997)). This is the case also for the tests of the null hypothesis of no cointegration (see, Gregory and Hansen (1996)).

The recent empirical literature which allow for an estimated structural break either in the individual series and/or in the cointegration vector in investigating deficit sustainability includes Quintos (1995), Haug (1995), Fountas and Wu (1996) and Crowder (1997). Quintos (1995) and Haug (1995) consider the Hansen (1992) recursive test of stability of the cointegration relation of interest. Crowder (1997) uses the Hansen and Johansen (1993) procedure to test the stability of the cointegrating vector. Fountas and Wu (1996) apply the Gregory and Hansen (1996) test, which allows for the inclusion of a sequentially estimated break point in the cointegration analysis. In this study, to investigate the integration properties of the series, we employ not only the ADF and KPSS tests, but also recently developed procedures (Perron and Vogelsang (1992) and Perron (1997)) which allow stationarity around an endogenous structural break point under the alternative hypothesis. We use a residual-based test suggested by Gregory and Hansen (1996) for the cointegration analysis.

In Turkey, high and persistent fiscal deficits have often been interpreted as a major source of severe inflation any periods lasting for more than two decades. In comparison to OECD and many developing countries, the size of the public debt relative to GNP has been relatively modest. However, the basic problem has been its financing[2]. Before the financial liberalisation programme of 1980, which contained a shift to a flexible exchange rate and market-determined interest rate policies, the Central Bank was the basic source of the deficit finance. With the new policy regime of post-1980, the government's access to Central Bank

[2] There are several comprehensive studies on Turkish fiscal policy. Recent studies include Celasun (1990), Önder *et al.* (1993), Atiyas and Sayın (1996) and Özatay (1994, 1997). Özatay (1994, 1997) investigate also the sustainability of fiscal policy. His results, based on the conventional unit root tests for various debt measures (discounted real debt stock, the size of the domestic debt relative to GNP and broad money), suggest the rejection of the sustainability.
Anand and VanWijnbergen (1989) propose an accounting approach to fiscal sustainability and an application to Turkey.

resources has been heavily restricted. After 1980, the share of money finance in total debt finance has steadily decreased reachind its lowest levels, while debt finance became the major source of finance especially after 1993. As Özmen (1998) notes, during the post-1980 period, the currency seigniorage as a percent of GNP has been relatively constant (around only 1%) in the face of fluctuating and accelerating severe inflation rates. The shift from central bank monetization to domestic debt finance is often explained as the government avoiding inflation acceleration through the corresponding money supply growth. However, commercial banks have become the major source of the finance, and with the reserve accommodation, the size of the banking system assets increased correspondingly. The reliance on domestic debt finance has yielded high real interest rates and extremely short debt maturities, thus leading to an interest payments explosion[3]. The sustainability of the deficit finance under these conditions appears to be an important issue which worths to be investigated. Consistent with the Lucas (1976) critique, the parameters of the deficit process may not be invariant to a policy regime change. Therefore, tests for deficit sustainability must allow for changes in the processes generating deficits.

The plan of the paper is as follows. In Section II, following the model developed by Quintos (1995), we provide a brief motivation of the use of a cointegration framework to analyse deficit sustainability. Section III presents the empirical procedures and results. In III.1 we consider the conventional models without breaks. The models which allow stationarity around endogenous broken trend/mean under the alternative hypothesis (Perron and Wogelsang (1992), Perron (1997) and Gregory and Hansen (1996)), and their results are presented in Section III.2. Section IV concludes.

[3] Interest payments on domestic debt (as a percent of GNP) increased from 1.6 % in 1986 to 6.0% in 1994 and to 10.6 % in 1998. The bulk of auctioned debt has been sold at maturities between three months and one year. The average real rate of return on auctioned government securities including tax was 34.3 % in 1996, 25.9 % in 1997, and 30.8 % in 1998.

2. Testing for deficit sustainability

Consider the following one-period government budget constraint:

$$\Delta D_t = GI_t - R_t \tag{1}$$

where D_t is real government debt, $GI_t = G_t + i_t D_{t-1}$ is real government expenditure inclusive of interest payments, R_t is real government revenues[4] and i_t is the real interest rate (assumed to be stationary (I(0)) around a mean i). Equation (1) states that in the absence of real seigniorage revenue, a government budget deficit has to be financed by new debt creation[5]. Defining $E_t = G_t + (i_t - i)D_{t-1}$, (1) can be written as

$$D_t = E_t - R_t + (1 + i)D_{t-1} \tag{2}$$

Forward substitution yields

$$D_t = \Sigma_{j=0}^{\infty} \mu^{j+1} (R_{t+j} - E_{t+j}) + \lim_{j \to \infty} \mu^{j+1} D_{t+j} \tag{3}$$

where $\mu = (1+i)^{-1}$. Using (1) and taking first differences of (3), we obtain:

$$GI_t - R_t = \Sigma_{j=0}^{\infty} \mu^{j+1} (\Delta R_{t+j} - \Delta E_{t+j}) + \lim_{j \to \infty} \mu^{j+1} \Delta D_{t+j} \tag{4}$$

For the intertemporal budget balance or deficit sustainability to hold, the

4 The budget constraint (1) excludes seigniorage since our primary concern is the sustainability of the debt finance process. Virtually, any deficit is sustainable if an unlimited inflation adjustment through money finance is allowed. An unsustainable fiscal stance, however, means that there is a limit to the debt finance and the deficit must eventually be financed via money creation (See, Sargent and Wallace (1981)).

5 The variables in (1) can also be nominal or deflated by GDP. The main results are invariant to he measurement of the variables (see, Cuddington (1997: 12)).

expected values of the limit terms in (3) and (4) must be zero. This condition implies that the government cannot retire its debt simply by issuing new debt perpetually. If the first difference terms in (4) are I(0), then GI_t - R_t must also be I(0). Thus, the condition for deficit sustainability can be tested by testing whether GI_t and R_t are cointegrated (if each of them are I(1)) with cointegrating vector (1, -1), or alternatively by testing for the stationarity of ΔD_t.

Quintos (1995) shows that a cointegration vector (1, -1) between GI_t and R_t or the stationarity of D_t is only a sufficient condition for deficit sustainability, and refers to it "strong" conditions of deficit sustainability. The "weak" condition, according to Quintos (1995), can be referred to a case when the budget constraint holds and R and GI are cointegrated with cointegrating vector (1 - b), 0<b<1. However, as Quintos (1995; 410) notes, "the condition 0<b<1 has serious policy implications because a government that continues to spend more than it earns has a high risk of default and would have to offer higher interest rates to service its debt". Thus, as Hakkio and Rush (1991; 433) note, b = 1 "is probably necessary" for the government to remain solvent.

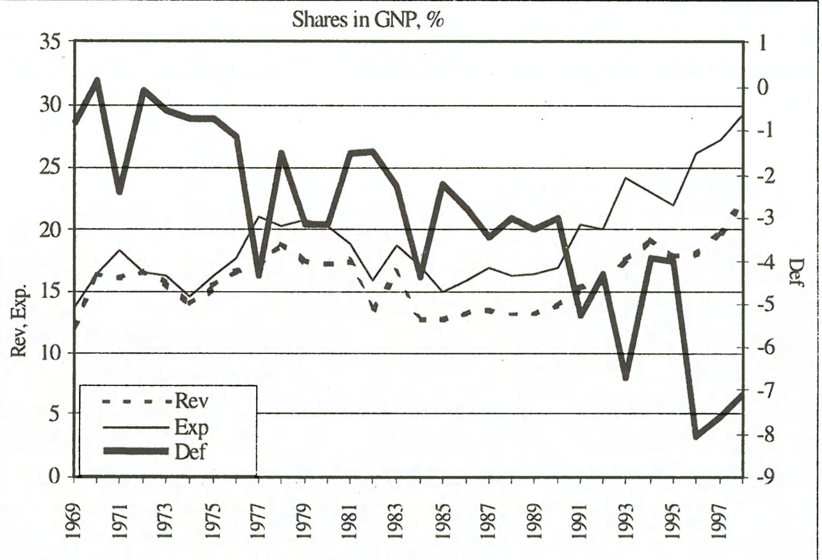
3. Emprical Results

Consider the following regression equation:

$$rev_t = a + bexp_t + u_t$$

where rev_t is government revenues as a percent of GNP and exp_t is government expenditures including interest payments as a percent of GNP, and u_t is a disturbance term. All variables are expressed as ratios relative to GNP in order to account for a growing economy. Figure 1 plots the data over the estimation sample 1969-1998.

Figure 1.
Revenues, Expenditures and Budget Deficits



Source: Undersecretariat of Treasury and Ministry of Finance

As already discussed, the weak sustainability condition is satisfied if both rev_t and exp_t are I(1), and cointegrated with $0<b<1$. For strong sustainability, the necessary and sufficient condition is $b=1$, that is $def_t = rev_t - exp_t$ is I(0)[6]. If there is a break either in rev_t, exp_t and/or def_t, then the use of conventional tests (such as ADF and KPSS) for their orders of integration or a cointegration between them may lead to biased results towards not-rejecting non-stationarity (see, Perron (1989, 1997), Lee *et al.* (1997) and see, Gregory and Hansen (1996). Thus, to investigate the integration properties of the series we employ

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6 Note that the strong sustainability condition does not require $a = 0$. As Ahmed and Rogers (1995) shows, a positive deficit is possible as long as the drift in rev_t exceeds the drift in exp_t enough to finance interest payments.

not only the ADF and KPSS tests, but also recently developed procedures (Perron and Vogelsang (1992) and Perron (1997)) which allow stationarity around an endogenously estimated structural break point under the alternative hypothesis. For the cointegration analysis, we use a residual-based cointegration test suggested by Gregory and Hansen (1996) that allows for the estimation of a structural break in the cointegration vector. In the following sections these procedures are briefly presented in the context of two generic I(1) variables y_t and x_t.

3.1. Models Without Breaks

The integration properties of the individual series are first investigated by conducting augmented Dickey-Fuller (1981) (ADF(k)) tests with the lag length (k) selected to remove any manifest serial correlation. The results recorded in Table 1 suggest that each of rev_t, exp_t and def_t is integrated of order one (I(1)). The non-stationarity of def_t suggests that exp_t and rev_t are not cointegrated with a cointegration vector (1, -1), hence the strong form of deficit sustainability is not satisfied. We also considered Kwiatkowski *et al.* (1992) (KPSS) tests for testing the null hypothesis of stationarity against the alternative hypothesis of a unit root. The results of the KPSS tests presented in Table 1 are consistent with those of the ADF tests.

Table 1

ADF and KPSS test statistics

	Levels				First Differences	
	ADF		KPSS		ADF	KPSS
Series	$\lambda_t(k)$	$\lambda_m(k)$	$\eta_m(k)$	$\eta_t(k)$	$\lambda_m(k)$	$\eta_m(k)$
Rev	-1.70(0)	-0.33(1)	0.32(1)*	0.23(1)*	-3.49(1)*	0.18(1)
Exp	-0.94(1)	0.09(1)	0.79(1)*	0.22(1)*	-3.85(1)*	0.19(1)
Def	-2.30(1)	0.42(2)	1.27(1)*	0.13(1)*	6.47(1)*	0.05(1)
5 % CV	-3.57	-2.97	0.463	0.146	-2.97	0.463

Notes: All the test regressions contain a constant term. The equations for λ_t and η_t include also a linear trend. Numbers in parentheses are the lags (k) used in the augmentation of the regressions. An asterisk (*) indicates that the relevant null is rejected at the 5 % level. The critical values for the ADF and KPSS are from MacKinnon (1991) and Kwiatkowski *et al.* (1992), respectively.

The following estimated static equation gives the results for the Engle and Granger (1987) two-step residual-based cointegration test between rev_t and exp_t under the assumption of no structural change:

$$\underset{}{rev_t} = \underset{(4.70)}{5.55} + \underset{(8.99)}{0.54}exp_t, \qquad R^2 = 0.743, \qquad ADF(1) = -1.87$$

where the values in parentheses are the t-ratios. The ADF(1) test result suggests that the residuals from the static equation are non-stationary (the 95 % CV is -3.56), hence the null hypothesis of no-cointegration cannot be rejected.

The results of the Johansen (1988) maximum eigenvalue (λ_{max}) and trace (λ_{trace}) tests[7] reported in Table 2 also support the non-rejection of no-

[7] We started with VAR (4) and and based our final choice of the VAR lag length k for Johansen analysis on the sequential likelihood ratio (LR) test of system reduction from VAR(k) to VAR(k-1) (VAR k→k-1). The approximate F form of the LR tests (adjusted for degrees of freedom, see

cointegration null. These cointegration test results imply that fiscal policy is not sustainable. However, this conclusion might be misleading if the long-run relationship between the revenues and expenditures shifts over time due to a structural change.

Table 2

Johansen Cointegration Analysis

Eigenvalues (λ)	0.343	0.011
Hypotheses	r=0	$r \leq 1$
λ_{max}	12.20(14.06)	0.33(3.76)
λ_{trace}	12.53(15.41)	0.33(3.76)

Notes: The values in parentheses are 95 % quantiles (from Table 2 of Osterwald-Lenum (1992)).

3.2. Models With Breaks

3.2.1. Integration Properties of the Data

As the KPSS and ADF tests are biased towards non-rejecting nonstationarity in the case of structural breaks, we also consider the tests developed by Perron (1997) and Perron and Vogelsang (1992) which allow for the presence of a change the trend and/or mean. Perron's (1997) innovational outlier model is based on the following regression:

$$y_t = \mu + \beta t + \theta DU_t + \delta D(T_b)_t + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + e_{t1} \tag{5}$$

Doornik and Hendry (1994)) yielded (VAR 4→3) = 0.78 (F(4,32)), (VAR 3→2) = 1.52 (F(4,36),and (VAR 2→1) = 1.05 (F(4,40)), and were all insignifiant. Thus VAR(1) is chosen. Furthermore, the null of no cointegration was not rejected for any k.

T_b $(1 < T_b < T)$ denotes the time structural break, $DU_t = 1(t > T_b)$ and $D(T_b)_t = 1(t = T_b + 1)$ with 1(.) the indicator function. Under the null hypothesis of a unit root, α is equal to 1. Under the innovational outlier model, the break is supposed affect the level of the series (y_t) gradually, so that, there is a transition period.

The Perron (1997) test allows a trend in the process which may be relevant for testing the nonstationarity of the revenue and expenditure processes. However, a deficit process which is stationary around a positive trend is not consistent with the notion of deficit sustainability. Thus, to test for sustainability, we omit the trend term from equation (5) and obtain the innovational outlier model of Perron and Vogelsang (1992):

$$y_t = \mu + \theta DU_t + \delta D(T_b)_t + \alpha y_{t-1} + \sum_{i=1}^{k} c_i \Delta y_{t-i} + e_{t2} \tag{6}$$

Perron and Vogelsang (1992) and Perron (1997) propose two methods for selecting T_b endogenously. First, T_b is chosen as $t^*_\alpha = \mathrm{Min}_{Tb} t_\alpha(T_b, k)$, that is, as the value which minimizes the t-statistic for testing the unit root null ($\alpha = 1$). Secondly, T_b is chosen to maximise the absolute value of t_θ (the t-statistic of the intercept change coefficient). The t-statistic on α to test the null $\alpha = 1$ at this T_b is denoted as $t^*_{\alpha,\theta} = t_\alpha(T^*_b, k)$, where T^*_b is T_b at the maximum estimated $|t_\theta|$.

The equations are estimated sequentially for $T_b = k_{max} + 1, ..., T-1$, where k_{max} is the maximum order of the lag truncation parameter k. For each sequence of tests, we started with $k_{max} = 4$, and following Perron (1997), selected the final k by employing a general-to-specific recursive procedure based on the significance of the coefficient of the last lag. Table 3 presents the results. The tests t^*_α and $t^*_{\alpha,\theta}$ yielded essentially the same results both for the time of the break T_b and the unit root null; to save the space, only the results for t^*_α are reported. The results of the Perron (1997) test suggest that the estimated $|t_\theta|$ is maximum at 1980 for both revenues and expenditures including interest payments (as shares of GNP). However, the non-stationarity null cannot be rejected for each of these series even if this estimated break point is taken into account.

Table 3

Sequential Unit Root Tests of Perron and Vogelsang (1992) andPerron (1997)

Series	μ	β	θ	δ	α	T_b	T^*
Rev	8.33	0.30	-4.94	3.59	0.38	1980	-3.77
	(3.55)	(3.61)	(-3.53)	(2.04)	(2.31)		
Exp	6.12	0.41	-5.14	2.02	0.52	1980	-2.84
	(2.58)	(3.10)	(-2.89)	(0.91)	(3.22)		
Def	-0.16	-0.21	-2.66	3.71	-0.22	1994	-6.90*
	(-0.35)	(-4.93)	(-3.25)	(2.88)	(-1.24)		
Def	-1.57		-2.87	2.30	0.27	1989	-3.98
	(-3.26)		(-3.34)	(1.49)	(1.44)		
Res	0.89	0.05	-3.22	2.07	-0.35	1982	-7.38*
	(2.20)	(1.35)	(-4.08)	(2.26)	(-1.90)		
Res	1.26		-2.35	1.63	-0.30	1982	-7.15*
	(4.35)		(-5.16)	(1.87)	(1.65)		

Notes: The truncation lag is estimated as k=0 for all the models. The values in parentheses are the t-ratios. The critical values for t^*_α (T = 60, the nearest to our sample size) are -5.92 (1 %) and -5.23 (5 %) for the Perron (1997) test, and -5.07 (1 %) and -4.37 (5 %) for the Perron and Vogelsang (1992) test. (*) indicates that the unit root null hypothesis is rejected at the 1 % level.

The results for def_t are quite interesting. Perron (1997) test suggests that deficits as a percent of GNP can be interpreted as a stationary process if allowance is made for the estimated level shift in 1994. This result may be interpreted as lending a support to the hypothesis that the deficit process is strongly sustainable. However, such an interpretation must be made with extreme caution as the regression equation contains a significant trend term. Accordingly, the deficit-GNP ratio increases by 0.21 every year on average. Stationarity around an increasing trend cannot be consistent with the notion of deficit sustainability. Thus, we omit the trend term and estimate the Perron and Vogelsang (1992) test regression. The results suggest that the deficit process is non-stationary (not strongly sustainable) even if the estimated mean shift in 1989 is taken into account. The results of the sequential unit root tests for the residuals from the static regression suggest the rejection of no-cointegration null around a broken-mean occurred after 1982. This result may lend support to the weak sustainability condition as the coefficient exp_t is smaller than unity in the cointegrating equation. However, since the critical values for the tests in Table 2 are relevant only for individual series, we may need to consider a formal test for the static regression residuals to obtain a more reliable inference. To this end, we employ the Gregory and Hansen (1996) procedure to test for the (weak) sustainability in the case of an endogenous structural break in the following section.

3.2.2. Cointegration and Testing for Sustainability

Gregory and Hansen (1996) have developed residual-based cointegration tests that allow for an endogenously determined structural break in the cointegration relationship. We consider the level shift model of Gregory and Hansen (1996) which takes the form:

$$y_t = \mu_1 + \mu_2 D_t + \beta x_t + u_t \qquad (7)$$

where $D_t = 1(t > [T\tau])$, $\tau \in (0,1)$ is an unknown parameter denoting the (relative) timing of the change point, 1(.) is the indicator function, and [] denotes integer part. In (7) μ_1 is the intercept term before the shift and μ_2 is the change in the intercept term due to the shift. The ADF statistic to test the nonstationarity of the residuals in (7), hence the null of no cointegration between the I(1) variables, at ô gives Gregory and Hansen's ADF* test:

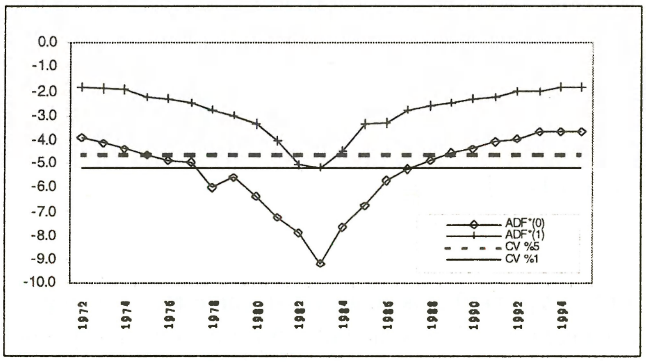
$$ADF^* = \inf_{\tau \in (N)} ADF(\tau)$$

Following Gregory and Hansen we consider N = (0.15, 0.85) and compute the test statistic for each integer point in the interval ([0.15T], [0.85T]). We are interested in the smallest value of ADF(τ) across all possible break points since small values of it provide evidence against the null of no-cointegration.

Figure 2 depicts the results of the sequential ADF* tests for k = 0 and k = 1 (ADF*(0) and ADF*(1) respectively). Regardless of the choice of k the test statistics is minimum in year 1983, and strongly significant at the 1% level suggesting a structural shift. This result is consistent with that of the Perron and Vogelsang (1992) test for the static regression residuals which suggested a mean shift after 1982. This break date could be attributed to the policy regime change for the mode of financing budget deficits from Central Bank monetisation to debt financing.

Figure 2

Sequential ADF*Tests



The estimated cointegrating regression corresponding to the estimated structural break in 1983 is:

$$rev_t = 4.90 - 1.80D83_t + 0.63exp_t, \qquad R^2 = 0.866, \quad ADF(1) = -5.12$$
$$(5.57) \quad (-4.99) \qquad (13.21)$$

where $D83_t = 1(t \geq 1983)$. To obtain a reliable statistical inference for the estimated coefficients, we consider also the results of the fully-modified OLS (FM-OLS) procedure proposed by Phillips and Hansen (1990). The FM-OLS procedure with Parzen lag (=1) window yielded essentially the same results:

$$rev_t = 4.87 - 2.01D83_t + 0.64exp_t$$

$$(6.95) \quad (-7.21) \qquad (17.08)$$

The cointegration result suggests that the Turkish fiscal stance satisfies the weak sustainability condition when the break in the process occurred in 1983 is taken into account. However, as noted by Quintos (1995), the weak sustainability condition itself is inconsistent with the government's ability to market its debt in the long-run. Therefore, it is necessary to test whether the strong sustainability condition is satisfied.

The Wald test for the restriction that the coefficient of exp_t is unity in the FM-OLS equation yielded 92.98 which is distributed as a $\chi^2(1)$ variate. Thus, the restriction imposed by the strong sustainability condition is rejected at every level of significance[8]. This means that the debt-GNP ratio is diverging,

[8] Note that virtually the same results are obtained from the Johansen procedure for the VAR(1) system augmented with $D83_t$. The procedure yielded $\lambda_{max}(\lambda_{trace})$ for the null hypotheses of $r = 0$ and $r \leq 1$ yielded 36.6(35.2) and 0.56(0.56), respectively. Thus, r=0 null is strongly rejected in favour of one cointegration vector. The estimated cointegration vector normalised on the revenues variable is (1, -0.55). An LR test of the restriction that the vector is (1, -1) yields a statistic of 24.7 which is distributed as a $\chi^2(1)$ variate. Thus the strong sustainability condition is not satisfied. These results should be interpreted with a caution as the distributions of λ_{max} and

indicating that fiscal policy is not sustainable. If the current debt finance policy is continued, the government may be facing further problems in marketing its debt even at systematically higher real interest rates and much shorter maturities due to rising probability of debt default. Therefore, a policy regime change to alter to parameters of the deficit process is needed to achieve a sustainable new fiscal stance.

4. Concluding notes

In this study we tested whether the Turkish fiscal stance is consistent with the intertemporal budget constraint using both the conventional procedures and the recently developed methods which allow for the estimation of endogenous structural breaks in the processes generating deficits. The results from the conventional procedures which assume a single policy regime over the estimation period suggest that the budget deficit process does not satisfy even the weak sustainability condition. However, when the estimated structural break in the deficit process that occurred in 1983 is taken into account, the results suggest that revenues and expenditures including interest payments are cointegrated. Thus, the Turkish fiscal stance appears to satisfy the weak sustainability condition. However, neither of the tests provide reliable evidence for rejecting the hypothesis that the deficits are not strongly sustainable.

The estimated break point roughly coincides with a policy regime change in Turkey. An important step of the financial liberalisation policies of the post-1980 period was the effective restriction of the government's access to Central Bank's resources to finance its deficits. Especially after 1983, debt finance became the major source of finance. The heavier reliance on domestic debt finance after the second half of the1980s yielded high real interest rates and extremely short debt maturities, thus leading to an interest payments explosion. Consistent with the Lucas (1976) critique, the parameters of the deficit process, hence the sustainability of deficits, appears not to be invariant to such policy changes.

λ_{trace} may not be invariant to the inclusion of $D83_t$.

The rejection of the strong sustainability of deficits has important policy implications. The weak sustainability condition, *per se*, does not rule out a diverging debt-GNP ratio in the long-run. Under this condition, the policy makers have incentives to default on their debt through debt monetisation or some other means. A fiscal policy under which government debt grow over time at a faster rate than the growth rate of the economy cannot be interpreted as sustainable. If continued, it may lead to further accelerated problems for marketing the government debt.

To conclude, the empirical evidence provided by this study supports the argument that the policy of financing the deficit by issuing new debt cannot be sustained under current macroeconomic conditions. The sustainability condition is, in essence, a forward-looking concept as neatly explained by Artis and Marcellino (1998). It assumes that the future path of fiscal policy resembles that of the sample period. A policy regime change, however, can transform the deficit process into a sustainable one. The ultimate consequence of the non-sustainable fiscal stance is a policy regime change to alter the coefficients of the deficit process and/or a change in the macroeconomic conditions due to the eventual monetisation of the domestic debt. There is a limit to debt finance as suggested by the pioneering study of Sargent and Wallace (1981). That is, the solvency constraint rules out everlasting "Ponzi games": The government cannot forever pay the interest on the debt simply by borrowing more. Sooner or later, the fiscal stance must be changed. The policy regime change needed to alter the coefficients of the deficit process implies, by definition, also a change in the monetary policy stance[9]. The consequence is that, tight monetary policy (restricting the government's access to the Central Bank's resources to avoid inflation acceleration) may not be sustainable in the long-run. Thus, the comment of Sargent and Wallace (1981, p. 2) on the dilemma of the U.S. Fed

[9] The policy regime change may also be defined to include a change in the mode of deficit finance (such as financing the deficit via non-bank public instead of the heavy reliance on the commercial banking system) and/or changes in the revenue and spending processes. The former has an important benefit in that it limits the expansionary effect of debt finance on broad money. The scope for the latter may be rather limited due to fiscal rigidities, complementarity of public and private investments, and/or income distribution relationships.

in the early 1980s appears to be valid also for the Turkish case in the late 1990s: "...With the budget persistently in deficit and real interest rates exceeding the economy's growth rate, the Fed must choose between fighting present inflation with 'tight' monetary policy now or fighting future inflation with 'easy' monetary policy now. Put differently, without help from the fiscal authorities, fighting current inflation with tight monetary policy must eventually lead to higher future inflation"

References

AHMED, S. AND J.H. ROGERS (1995), "Government budget deficits and tradedeficits:Are present value constraints satisfied in long-term data?" InternationalFinance Section Discussion Paper No. 494, Washington, D.C.: Federal Reserve Board.

ANAND, R. AND S. VAN WIJNBERGEN (1989), "Inflation and Financing of Government Expenditure: An introductory analysis with an application to Turkey", *World Bank Economic Review*, 3(1), 17-38.

ARTIS, M.J. AND M. MARCELLINO (1998), "Fiscal Solvency and Fiscal Forecasting in Europe", *CEPR Discussion Paper*, No. 1836.

ATIYAS, I. AND S. SAYIN (1998), "A Political Economy Perspective on Turkish Budget Deficits", Boğazici Journal, 12(1), 55-79.

BOHN, H. (1998), "The Behavior of U.S. Public Debt and Deficits", *The Quarterly Journal of Economics*, August, 949-963.

BUITER, W.H. (1997,) "Aspects of Fiscal Performance in some Transition Economies under Fund-Supported Programmes", London School of Economics, Center for Economic Performance Discussion Paper No. 333.

CELASUN, M. (1990), "Fiscal Aspects of Turkish Adjustment in the 1990s", in Arıcanlı, T. and D.Rodrik (eds), *The Political Economy of Turkey: Debt, Adjustment and Sustainability*, London: Macmillan.

CROWDER, W.J. (1997), *The U.S. Federal Intertemporal Budget Constraint: Restoring Equilibrium Through Increased Revenues or Decreased Spending?*, Mimeo, University of Texas, Arlington.

CUDDINGTON, J.T. (1997), "Analyzing the Sustainability of Fiscal Deficits in Developing

Countries", The World Bank, Policy Research Working Paper, No: 1784

DICKEY, D.A. AND FULLER, W.A. (1979), "Distribution of the Estimators for Autoregressive Time Series with a Unit Root", *Journal of the American Statistical Association*, 74, 427-431.

DOORNIK, J.A. AND HENDRY, D.F. (1994), PCFiml 8.0: Interactive Econometric Modelling of Dynamic Systems, International Thompson Publishing, London.

ENGLE, R. AND C.W.J. GRANGER (1987), "Cointegration and Error-correction: Representation, Estimation and Testing", *Econometrica*, 251-76.

FOUNTAS, S. AND WU, J-L. (1996), "Are the Greek Budget Deficits too Large?", *Applied Economics Letters*, 3, 487-90.

GREGORY, A.W. AND B.E. HANSEN (1996), "Residual-basedTtests for Cointegration in Models with Regime Shifts", *Journal of Econometrics*, 70, 99-12.6

HAKKIO, C.S. AND M. RUSH (1991), "Is the Budget Deficit too Large?", *Economic Inquiry*, 29, 429-45.

HAMILTON, J.D. AND FLAVIN, M.A. (1986), "On the Limitations of Government Borrowing: A Framework for Emprical Testing", *American economic Review*, 76,808-19

HANSEN, B.E (1992), "Tests for Parameter Instability in Regression with I(1) Processes", *Journal of Business and Economic Statistics*, 10, 321-335.

HANSEN, H. AND S. JOHANSEN (1993), Recursive Estimation in Cointegrated VAR Models, unpublished manuscript(University of Copenhagen, Copenhagen).

HAUG, A.A. (1991), "Cointegration and Government Budget Constraints: Evidence for the U.S.",*Journal of Business and Economic Statistics*, 97-101.

HAUG, A.A. (1995), "Has Federal Budget Policy Changed in Recent Years?" *Economic Inquiry,*33, 104-18.

JOHANSEN, S. (1988), "Statistical Analysis of Cointegration Vectors", *Journal of Economic Dynamics and Control*, 231-54.

KWIATKOWSKI, D., PHILLIPS, P.C.B., SCHMIDT, P., AND Y. SHIN (1992), "Testing the Null Hypothesis of Stationarity Against the Alternative of a Unit Root", *Journal of Econometrics*, 54, 159-78.

LEE, J., HUANG, C. AND Y. SHIN (1997), "On Stationarity Tests in the Presence of Structural Breaks", *Economic Letters*, 55, 165-72.

LUCAS, R. (1976), "Econometric Policy Evaluation: A Critique", in K. Brunner and A. H. Meltzer (Eds.), *The Phillips Curve and Labor Markets*, 19-46, Amsterdam: North-Holland.

MACKINNON, J. (1991), "Critical Values or Cointegration Tests", in Engle, R.F. and C.W.J. Granger (eds.), *Long-Run Economic Relationships*, 267-76, Oxford: Oxford University Press.

OSTERWELD-LENUM, M. (1992), "A Note with Quantiles of the Asymptotic Distribution of the maximum Likelihood Cointegration Rank Test Statistics", *Oxford Bulletin of Economics and Statistics*, 54, 461-72.

ÖNDER, İ., O. TÜREL, N.K. EKINCI AND C. SOMEL (1993), *Türkiye'de Kamu Maliyesi, Finansal Yapı ve Politikalar*, İstanbul: Tarih Vakfı Yurt Yayınları.

ÖZATAY, F. (1994), "The Sustainability of Public Sector deficits: The Case of Turkey", CBRT Discussion Paper No. 9402.

ÖZATAY, F. (1997), "Sustainability of Fiscal Deficits, Monetary Policy and Inflation Stabilization: The case of Turkey", *Journal of Policy Modelling*, 19(6), 661-81.

ÖZMEN, E. (1998), "Is Currency Seigniorage Exogenous for Inflation Tax in Turkey?" *Applied Economics*, 30, 545-52.

PERRON, P. (1989), "The Great Crash, The Oil Price Shock, and The Unit Root hypothesis", *Econometrica*, 57(6), 1361-1401.

PERRON, P. (1997), "Further Evidence on Breaking Functions in Macroeconomic variables", *Journal of Econometrics*, 80, 355-85.

PERRON, P. AND T.J. VOGELSANG (1992), "Nonstationarity and Level Shifts with an Application to Purchasing Power Parity", *Journal of Business and Economic Statistics*, 10(3), 301-20.

PHILLIPS, P.C.B. AND B.E. HANSEN (1990), "Statistical Inference in Instrumental Variables Regression with I(1) Processes", *Review of Economic Studies*, 57, 99-125.

SARGENT, T.J., AND N. WALLACE (1981), "Some Unpleasant Monetarist Arithmetic", *Federal Reserve Bank of Minneapolis Quarterly Review*, 5, 1-17.

QUINTOS, C.E. (1995), "Sustainability of the Deficit Process with Structural Shifts", *Journal of Business and Economic Statistics*, 13(4), 409-17.

VOGELSANG, T.J. AND PERRON, P. (1998), "Additional Tests for a Unit Root Allowing for a Break in the Trend Function at an Unknown Time, *International Economic Review*, 39(4), 1073-1100.

Özet

Yapısal bir kaymayla Türkiye'deki bütçe açıklarının sürdürülebilirliği

Mali durumun dönemlerarası bütçe kısıtı ile tutarlılığının, dolayısıyla bütçe açıklarının güçlü sürdürülebilirliği hipotezinin gerekli ve yeterli ampirik koşulu bütçe açığı sürecinin durağan ve istikrarlı olmasıdır. Zayıf sürdürülebilirlik koşulu ise gelirlerin ve faiz ödemelerini de içeren harcamaların eşbütünleşmesini gerektirir. Mali açıkları yaratan süreçlerin politika rejimi değişikliği ve benzeri nedenlerden dolayı yapısal kırınım göstermeleri durumunda, sürdürülebilirlik hipotezinin sınanmasında yaygın kullanılan testlerin (ADF ve KPSS gibi) sonuçları yanıltıcı olabilir. Dolayısıyla, bu çalışmada, yalnızca bu testler değil, tahmin edilen içsel kırınım noktası etrafında durağanlığın alternatif hipotez altında sınanabildiği yeni yöntemler de (Perron ve Vogelsang 1992, Perron 1997, Gregory ve Hansen 1996) kullanılmaktadır. 1969-1998 dönemi Türkiye yıllık verilerine dayanan çalışmanın sonuçları mali politikanın güçlü sürdürülebilirlik koşulunu sağlamadığını önermektedir. Zayıf sürdürülebilirlik koşulu ise sağlanmakta ve eşbütünleşme vektöründe içsel kırınım noktası 1983 yılı olarak tahmin edilmektedir. Bu kırınım noktası bütçe finansman biçiminde bir politika rejimi değişikliğinin (Merkez Bankası finansmanından, borç finansman biçimine) başladığı bir döneme karşılık gelmektedir. Bütçe açığı sürecinin zayıf sürdürülebilirliği sonucu, şimdiki mali politikalarda ısrar edilmesi durumunda, yetkililerin temerrüd (default) eğiliminin artmasıyla, iç borç finansmanında sorunların yaşanabileceğini işaret etmektedir. Sürdürülebilir bir mali durum için bütçe açığı sürecinin parametrelerini değiştiren bir politika rejimi değişikliği gerekli görülmektedir