ASSESSING CURRENT ACCOUNT SUSTAINABILITY IN THE ORGANIZATION OF TURKIC STATES: A THRESHOLD NONLINEAR ANALYSIS

TÜRK DEVLETLERİ TEŞKİLATI'NDA CARİ DENGE SÜRDÜRÜLEBİLİRLİĞİNİN DEĞERLENDİRİLMESİ: EŞİKLİ DOĞRUSAL OLMAYAN BİR ANALİZ

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Abstract

This paper examines the sustainability of the current account balance among countries in the Organization of Turkic States (OTS) from 1991 to 2023, employing both traditional linear unit root tests and the more recent KSS and TAR nonlinear stationarity procedures. The results show that each country's current account balance follows a threshold (regime-dependent) stationarity pattern rather than a simple unit root process, suggesting that standard, uniform policy prescriptions may be inadequate. Consequently, implementing a differentiated policy framework—tailored to low-, medium-, and high-risk scenarios—could enable more effective management of external imbalances and foster sustainable economic growth across OTS member countries.

Keywords: current account balance, transition economies, linear unit root, nonlinear stationarity, ESTAR model, TAR estimation

Öz

Bu çalışma, Türk Devletleri Teşkilatı'na (TDT) üye ülkelerin 1991–2023 dönemi cari denge sürdürülebilirliğini, hem geleneksel doğrusal birim kök testleri hem de son dönemde geliştirilen KSS ve TAR gibi doğrusal olmayan durağanlık yöntemlerini kullanarak incelemektedir. Analiz sonuçları, incelenen ülkelerin cari denge serilerinin basit bir birim kök sürecinden ziyade eşik (rejime bağlı) durağanlık gösterdiğini, dolayısıyla farklı risk düzeylerindeki dengesizliklerin farklı politika araçlarıyla yönetilmesi gerektiğini ortaya koymaktadır. Bu kapsamda, TDT üyesi ülkelerin düşük, orta ve yüksek risk düzeylerine göre farklılaştırılmış bir politika çerçevesi benimsemeleri, dış dengesizliklerin etkin bir şekilde yönetilmesine ve sürdürülebilir ekonomik büyümeye katkı sağlayabilir.

Anahtar Kelimeler: cari denge, geçiş ekonomileri, doğrusal birim kök, doğrusal olmayan durağanlık, ESTAR modeli, TAR tahmini

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Introduction

The current account balance, a key indicator of a country's macroeconomic health, represents the net flow of goods, services, income, and current transfers between a country and the rest of the world. It plays a pivotal role in the balance of payments and is a crucial reflection of a nation's economic stability. In many developing economies, a significant current account deficit often signals the potential for financial or currency crises. Historically, countries such as Mexico, Turkey, East Asian nations, Brazil, and Argentina have experienced severe economic instability linked to persistent current account deficits. Therefore, monitoring the sustainability of the current account balance is essential for maintaining macroeconomic stability[1].

Various analyses indicate that a current account deficit exceeding 4% of GDP may serve as an early warning sign of an impending economic crisis[2]. Once deficits surpass 5% of national income, however, they carry substantial risks, including slower income growth and exchange rate distortions [3]. These thresholds further emphasize the importance of evaluating current account dynamics—particularly in developing and transition economies.

In this context, this paper investigates a central research question: Are the current account balances of the developing economies within the Organization of Turkic States (OTS) sustainable in the long run, and do they exhibit nonlinear and regime-dependent behavior? The OTS countries—most of which have undergone substantial transformations from centrally planned to market economies since the dissolution of the Soviet Union in 1991—have faced macroeconomic instability and persistent external imbalances. These structural changes make them particularly vulnerable to trade and financial shocks, reinforcing the need for a deeper understanding of external sector sustainability.

Assessing current account sustainability in OTS nations is critical, as prolonged external deficits can lead to excessive foreign debt accumulation, increased susceptibility to financial crises, and constraints on long-term economic growth. A comprehensive evaluation of these dynamics enables policymakers to formulate effective fiscal, monetary, and trade strategies aimed at enhancing external

1 Labonte, Marc. (2005). *Is the U,S, Current Account Deficit Sustainable?* Report. CRS

2 Dornbusch, Rudiger. F. (1990). *Macroeconomics*, McGraw-Hill, International Edition.

3 Freund, Caroline and Warnock, Frank. (2007). *4 Current Account Deficits in Industrial Countries: The Bigger They Are, the Harder They Fall?*. G7 Current Account Imbalances: Sustainability and Adjustment, edited by Richard H. Clarida, Chicago: University of Chicago Press, 2007, pp. 133-168. arkets Finance and Trade, 42(1). pp.33–49.

stability and sustainable development. A widely recognized method for assessing current account sustainability is to examine the stationarity of current account data. If a unit root is present, it suggests that external shocks have permanent effects, leading to unsustainable imbalances. Conversely, stationarity implies that current account positions revert to equilibrium, indicating sustainability.

Traditional unit root tests such as the Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests assume linear adjustment processes. However, these may fail to capture structural asymmetries and nonlinear dynamics common in transition economies. To address this limitation, this study applies the Kapetanios-Shin-Snell (KSS) nonlinear unit root test, which accounts for complex, nonlinear adjustments. Nonetheless, since the KSS test may not fully capture regime shifts, we further utilize the Threshold Autoregressive (TAR) unit root procedure—specifically designed to detect nonlinear behavior and structural breaks. The main findings of this study show that each country's current account balance follows a threshold (regime-dependent) stationarity pattern rather than a simple unit root process. This implies that external positions respond differently depending on the regime, and thus standard, uniform policy prescriptions may be inadequate across the region.

The remainder of the paper is structured as follows: Section 2 reviews the relevant literature, Section 3 provides an overview of current account sustainability in the OTS countries, Section 4 details the econometric methodology, and Section 5 presents the empirical findings. Section 6 discusses the estimation results and their policy implications. The final section concludes the study.

1. Existing Literature on Current Account Sustainability in Transition Economies

Empirical studies on the stationarity of the current account can be broadly categorized into two main groups [4]. The first group relies on traditional methods such as linear univariate and panel unit root tests or co-integration approaches to evaluate current account sustainability [5]. The second group applies more recently

4 Esra Hasdemir and Tolga Omay and Zulal S Denaux, (2019). *Testing the Current Account Sustainability for BRICS Countries: Evidence from a Nonlinear Framework*, Economics Bulletin, Volume 39(1), pp.310-320.

5 *See:* Apergis, N., Katrakilidis, K. P., & Tabakis, N. M (2000). *Current account deficit sustainability: The case of Greece.* Applied Economics Letters, 7(9), pp.599–603. Baharumshah, A. Z., Lau, E. and Fountas, S. (2003), *On the sustainability of current account deficits: evidence from four ASEAN countries*, Journal of Asian Economics, 14, pp. 465-487. Matsubayashi, Yoichi (2005). *Are US current account deficits unsustainable? Testing for the private and government intertemporal budget constraints.* Japan and the World Economy, 17(2), pp.223-237. Liu, Peter C, and Evan Tanner. (1996). *International Intertemporal Solvency in Industrialized Countries: Evidence and Implications*. Southern economic journal

developed nonlinear techniques, which allow for asymmetric or regime-dependent behavior, offering richer insights into the dynamics of external balances [6].

The examination of current account sustainability in emerging and transition economies has received considerably less attention than in industrialized nations [7]. One early contribution addressing this gap is Holmes (2006), who uses ADF unit root tests in both univariate and panel forms within a Seemingly Unrelated Regression (SUR) framework to evaluate sustainability in 16 Latin American countries. While fewer than half of the countries show sustainability under univariate ADF tests, the SUR framework—which accounts for cross-equation correlation—reveals mean reversion in six additional countries. This suggests that the sustainability of external deficits in such regions may be underestimated when using standard linear tests alone. In 2013 J.C. Cuestas investigates current account sustainability in Central and Eastern European transition economies. Employing both unit root and fractional integration tests, the study finds that the current account-to-GDP ratios follow a stationary, mean-reverting process in most countries. This supports the view that external deficits in transition economies may be sustainable over the long run.[8].

In contrast, a 2014 study by Ş. Bozoklu and V. Yılancı expand this discussion to a larger set of countries classified under the Morgan Stanley Emerging Markets Index. Their analysis utilizes both linear and nonlinear panel unit root tests, combined with a sequential selection method. The results suggest that the intertemporal budget constraint does not hold for most of the countries in the sample—except Indonesia, which is deemed sustainable only in the nonlinear context. The authors interpret these findings as evidence of unsustainable deficits and recommend fiscal and monetary policy adjustments to reduce vulnerabilities, including policies that promote domestic savings and mitigate long-term debt burdens.[9].

A more recent contribution is the 2021 study by B. Garg and K.P. Prabheesh, which evaluates current account sustainability in seven countries—four

62(3): pp. 739–749 Holmes, M.J., Otero, J. and Panagiotidis, T. (201 (2010), *On the Stationarity of Current Account Deficits in the European Union*. Review of International Economics, 18, pp.730-740.

6 *See:* Chortareas, Georgios E, Kapetanios, George and Uctum, Merih. (2004). *An Investigation of Current Account Solvency in Latin America Using Non Linear Non-Stationarity Tests.*Studies in Nonlinear Dynamics & Econometrics 8(1), 2004. Aydin Cecen, Linlan Xiao. (2014). *Capital flows and current account dynamics in Turkey: A nonlinear time series analysis*. Economic Modelling (39), pp. 240-246. Taştan,Serkan and Kıvanç Halil Arıç. (2015). *Is Current Account of Turkey Sustainable? Evidence from Nonlinear Unit Root Tests.* Romanian Economic Journal XVIII: 57, pp. 95-114.

7 Holmes, Mark. J. (2006). *Do Latin American countries have an ıncentive to default on their external debts? A perspective based on long-run current account behavior.* Emerging Markets Finance and Trade, 42(1). pp.33–49.

8 Cuestas, Juan C. (2013). *The current account sustainability of European transition economies.* Journal of Common Market Studies 51(2). pp 232-245

9 Bozoklu, Şeref,and Yılancı, Veli. (2014). *Current account sustainability in emerging markets: An analysis with linear and nonlinear panel unit root tests.* Atatürk Üniversitesi İktisadi Ve İdari Bilimler Dergisi, 28(4), 251-264.

developed and three emerging market economies—that experienced persistent deficits following the 2008 global financial crisis. Using conventional unit root and co-integration methods, the authors initially conclude that the current accounts are unsustainable in all cases. However, when structural break techniques are applied, the results change significantly: five of the seven countries exhibit mean reversion post-crisis. This finding underscores the importance of accounting for external shocks and regime changes when assessing current account dynamics[10].

While these studies contribute to our understanding of current account behavior in emerging and developing regions, their conclusions vary widely depending on sample composition, time period, and method. Moreover, the specific case of the Organization of Turkic States (OTS)—comprising newly formed post-Soviet transition economies—has not yet been studied in the context of current account sustainability.

To the best of our knowledge, no previous research has directly examined the stationarity of the current account in OTS countries. This paper aims to address that gap by applying both conventional and nonlinear econometric methods to a focused sample of OTS countries spanning Central Asia and the Caucasus.

In addition to filling this regional gap, our study offers a methodological contribution by applying the Threshold Autoregressive (TAR) framework. This approach allows us to identify regime-dependent stationarity, revealing that adjustment mechanisms tend to be activated only after current account imbalances exceed certain critical thresholds. Earlier studies using linear methods typically assume symmetric and continuous adjustment, which may overlook these types of nonlinear dynamics. By contrast, our results provide a more nuanced understanding of external adjustment processes in the OTS region—one that reflects both structural change and exposure to external shocks.

2. Current Account Sustainability in Countries of the Organization of Turkic States

The Organization of Turkic States forms a strategically important economic bloc, connecting the resource-rich economies of Central Asia with the dynamic markets of Eastern Europe and Anatolia. Its member states—Azerbaijan, Kazakhstan, Kyrgyzstan, Uzbekistan, Turkey, Turkmenistan, and Hungary—have

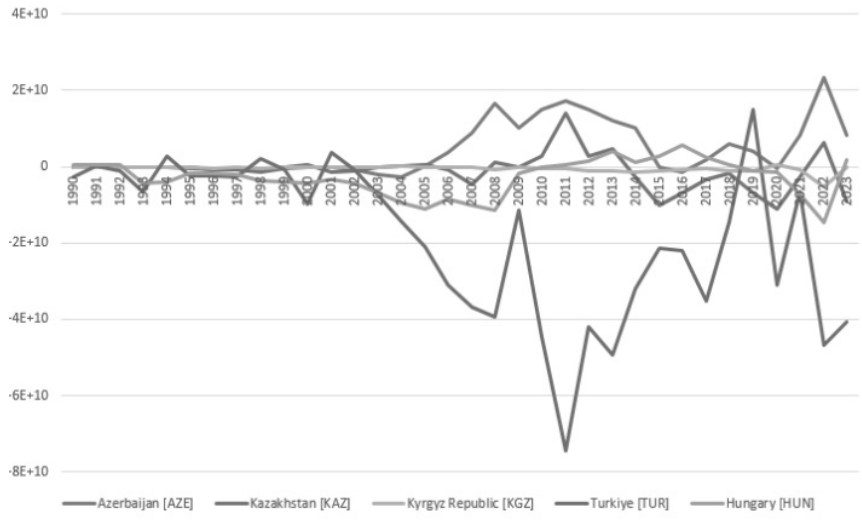
10 Bhavesh Garg, K.P. Prabheesh, (2021). *Testing the intertemporal sustainability of current account in the presence of endogenous structural breaks: Evidence from the top deficit countries.* Economic Modelling 97, pp. 365-379.

distinct economic structures, with most transitioning from centrally planned to market-oriented systems, with Turkey being the exception. Despite these structural differences, OTS countries face shared challenges in maintaining current account sustainability. Given the pivotal role of balance of payments dynamics and external debt in influencing trade balances, capital flows, and fiscal policies, evaluating current account sustainability is essential for understanding the long-term economic stability and regional integration of OTS nations.

Key determinants of current account sustainability in OTS economies include heavy reliance on natural resource exports, particularly in Central Asian countries such as Kazakhstan, Azerbaijan, and Turkmenistan. This dependence makes these nations vulnerable to fluctuations in global commodity prices. Moreover, limited export diversification often results in trade deficits when domestic production fails to meet demand.

Countries like Turkey and Azerbaijan have attracted substantial foreign direct investment (FDI) due to their strategic geographic positions and ongoing economic reforms. However, both still face challenges in improving their investment climates to ensure sustainable capital inflows. Additionally, Turkey's reliance on foreign borrowing requires careful exchange rate management to avoid external debt crises. High inflation rates undermine export competitiveness and increase import costs, while poorly managed fiscal deficits exacerbate external imbalances.

Graph 1: Current Account Performance of OTS in 1991-2023



Source: Calculations based on World Bank Data Bank – World Development Indicators

Graph 1 illustrates the annual current account balances of OTS economies between 1991 and 2023, revealing considerable variation in their external positions. Azerbaijan recorded notable surpluses from the mid-2000s to the early 2010s, driven by strong hydrocarbon exports and favorable global oil prices. Kazakhstan, dependent on commodity exports (particularly oil and metals), alternates between mild surpluses and deficits in response to volatile markets. The Kyrgyz Republic, with its smaller economy and limited export base, consistently runs modest deficits overshadowed by larger regional economies. Türkiye, on the other hand, sustains predominantly negative current account balances, propelled by robust domestic demand, high energy imports need, and significant import dependence—resulting in deficits in the tens of billions of dollars. Meanwhile, Hungary, which experienced persistent deficits in the 1990s and early 2000s, shifted to periods of balance and even surplus following the global financial crisis, but has recently returned to mild deficits amid rising energy costs and pandemic-related disruptions.

Overall, OTS economies exhibit a wide range of current account performances—from Azerbaijan's and Kazakhstan's commodity-driven surpluses, through the Kyrgyz Republic's persistently modest deficits, to Türkiye's substantial negative balances and Hungary's transition from chronic deficits to intermittent surpluses and back to mild deficits. These patterns underscore the diverse impacts of resource endowments, market conditions, and policy frameworks across the region. Consequently, evaluating current account sustainability in OTS member states is crucial, as prolonged external deficits can escalate foreign debt, increase exposure to financial crises, and curtail long-term economic growth. A comprehensive assessment of these dynamics further enables the development of effective fiscal, monetary, and trade policies that bolster external stability, enhance resilience to economic shocks, and foster sustainable development—ultimately supporting deeper regional integration within this strategically significant economic bloc.

3. Applied Methodology

This study applies linear unit root tests to evaluate the stationarity of the current account balance series, including the Dickey-Fuller[11], Phillips-Perron

11 Dickey A., Fuller, Wayne A. (1979). *Distribution of the Estimators for Autoregressive Time Series with a Unit Root*. Journal of the American Statistical Association, 74(366a), pp.427–431.

(PP)[12], and Kwiatkowski-Phillips-Schmidt-Shin(KPSS)[13] tests. The Augmented Dickey-Fuller test addresses autocorrelation by incorporating lagged values in the following regression model:

$$\Delta y_t = \alpha y_{t-1} + x_t' \delta \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + e_t \quad (1)$$

The null hypothesis of a unit root (H_0: $\alpha = 0$) is tested against the alternative of stationarity (H_1: $\alpha < 0$), using the conventional t-statistic:

$$t_\alpha = \frac{\widehat{\alpha}}{s_e(\hat{a})}$$

where $\hat{a}$ is the estimated coefficient and $\widehat{s_e(\hat{a})}$ is its standard error.

Unlike the ADF test, the PP test employs a non-parametric method to correct for serial correlation and heteroscedasticity. Meanwhile, the KPSS test differs by assuming stationarity under the null hypothesis, whereas both the ADF and PP tests assume a unit root as the null.

Traditional unit root tests may fail to detect stationarity in nonlinear series. To address this, this study employs nonlinear tests, such as the KSS test, to better capture current account dynamics. The Kapetanios-Shin-Snell (KSS)[14] test accounts for nonlinearities using the ESTAR model, where the transition speed between regimes is governed by θ.

$$\Delta y_t = \gamma y_{t-1} [1 - exp(-\theta y_{t-1}^2)] + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + \varepsilon_t \quad (2)$$

Since θ is not identified under the null hypothesis (H_0: $\theta = 0$), the test applies a first-order Taylor approximation, resulting in the following auxiliary regression:

$$\Delta y_t = \delta y_{t-1}^3 + \sum_{i=1}^{p} \beta_i \Delta y_{t-i} + e_t \quad (3)$$

The unit root hypothesis ($\delta = 0$) is tested using the nonlinear t-statistic:

$$t_{NL} = \frac{\widehat{\delta}}{s.e.(\hat{\delta})}$$

where $\hat{\delta}$ is estimated via OLS.

12 Phillips, Peter C. B., Perron, Pierre. (1988). *Testing for a Unit Root in Time Series Regression.* Biometrika. 75 (2), pp.335–346.

13 Denis Kwiatkowski, Peter C.B. Phillips, Peter Schmidt, Yongcheol Shin. (1992) *Testing the null hypothesis of stationarity against the alternative of a unit root: How sure are we that economic time series have a unit root?*Journal of Econometrics 54(1-3), pp. 159-178.

14 George Kapetanios, Yongcheol Shin, Andy Snell. (2003). *Testing for a unit root in the nonlinear STAR framework.* Journal of Econometrics 112(2), pp.359-379.

The Threshold Autoregressive (TAR) model, introduced by W. Enders and C.W.J. Granger in 1998 extends conventional unit root tests by incorporating nonlinear dynamics[15]. In contrast to traditional linear models, it allows the time series to display different behaviours when values lie above or below a specified threshold, making it particularly useful for detecting structural breaks. Building on the Dickey-Fuller test, the TAR model enables the series to follow distinct autoregressive processes in different regimes, thereby highlighting shifts in its underlying dynamics. Enders - Granger extended the Dickey-Fuller, unit root test as follows:

$$\Delta y_t = I_t \rho_1 [y_{t-1} - \alpha_0] + (1 - I_t)\rho_2 [y_{t-1} - \alpha_0] + \varepsilon_t \quad (4)$$

where I_t is the Heaviside indicator function, defined as:

$$\text{It} = \begin{cases} 1 \text{ if } y_{t-1} \geq 0 \\ 0 \text{ if } y_{t-1} < 0 \end{cases}$$

The Momentum Threshold Autoregressive (M-TAR) model is a variation of the TAR model that introduces a momentum effect, capturing the persistence of shocks by considering whether the change in y_{t-1} is positive or negative. The M-TAR model is expressed as:

$$\Delta y_t = I_t \rho_1 y_{t-1} + (1 - I_t)\rho_2 y_{t-1} + \sum_{i=1}^{p-1} \beta_i \Delta y_{t-i} + \varepsilon_t \quad (5)$$

where the Heaviside indicator function is redefined as:

$$\text{It} = \begin{cases} 1 \text{ if } \Delta y_{t-1} \geq 0 \\ 0 \text{ if } \Delta y_{t-1} < 0 \end{cases}$$

In the TAR model, the series' behavior at time t depends on whether y_{t-1} is above or below the threshold, allowing for different dynamics in each regime. In contrast, the M-TAR model captures momentum effects by considering whether the previous change in y_{t-1} was positive or negative, thus accounting for the persistence of shocks over time.

To test for the presence of a nonlinear unit root in both models, the following hypothesis is proposed: $H_0: \rho_1 = \rho_2 = 0$ implying that both regimes (below and above the threshold) exhibit a unit root and the series follows a random walk process without stationarity. However, alternative hypothesis based on at least one of ρ_1 or ρ_2 is significantly different from zero, indicating that the series is stationary in at least one regime, meaning it does not follow a random walk and has a

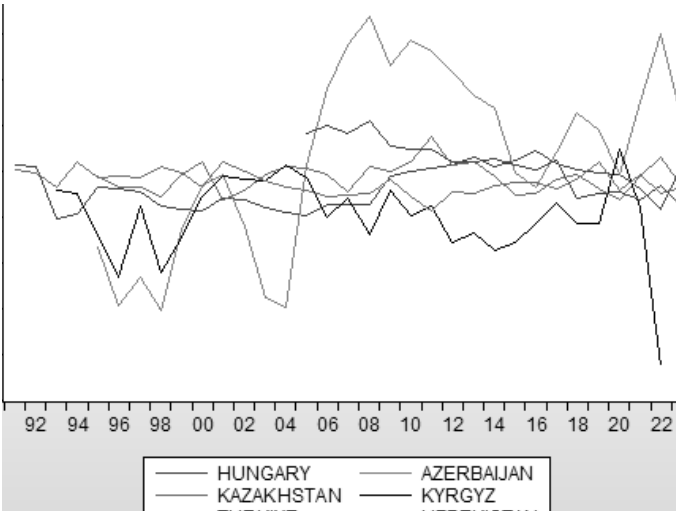
15 Enders, Walter and Granger, Clive. W. J. (1998). *Unit-root tests and asymmetric adjustment with an example using the term structure of interest rates.* Journal of Business and Economic Statistics, 16(3), pp.304–311.

nonlinear adjustment mechanism. The test statistic is calculated as the ϕ-statistic for the TAR model and the ϕ*-statistic for the M-TAR model. If these values exceed the critical thresholds provided by Enders- Granger, the null hypothesis is rejected, suggesting that the series is stationary.

4. Data and Estimation Results

This study examines the current account sustainability hypothesis by analyzing annual data on each OTS nation's current account balance (as a percentage of GDP) from 1991 to 2023.

Graph 2: Demeaned Series of Current Account Balance in Countries of OTS



Source: Calculations based on World Bank Data Bank – World Development Indicators

Graph 2 presents the demeaned series for six OTS countries, illustrating deviations from each country's mean external position over time. Overall, the data reveal considerable fluctuations around the zero line, indicating periods of surplus or deficit relative to each nation's average. While some countries display relatively stable fluctuations, others exhibit more pronounced variations or possible structural shifts, suggesting differing degrees of external balance volatility. These observations underscore the importance of investigating country-specific structural and policy factors driving such disparities. Moreover, the mixed patterns imply that some series may be non-stationary, highlighting the need for formal statistical tests to supplement visual assessments.

The analysis begins with the standard linear ADF unit root test, with results presented in Table 1. The findings suggest that Hungary and the Kyrgyz Republic follow an I (1) process, indicating non-stationarity in levels but stationarity in first differences. Kazakhstan, however, appears I (0), remaining stationary in levels across most specifications. Turkey and Uzbekistan show evidence of trend- or mean-stationarity, implying they may be classified as I (0) when appropriate deterministic components are included. Azerbaijan presents mixed results in levels but leans toward I (1) due to strong stationarity after differencing.

Table 1: Augmented Dickey-Fuller Unit Test Results

t-Statistic At Level						
	Azerbaijan	**Hungary**	**Kazakhstan**	**Kyrgyz Rep.**	**Turkey**	**Uzbekistan**
With intercept	-2.5716	-2.2938	-3.5894**	-2.6848*	-3.9214***	-0.5670
With intercept and trend	-2.5669	-3.1416	-3.5212*	-2.6558	-4.2068**	-3.7853**
Without intercept and trend	-2.6249**	-1.1362	-2.3558**	-2.8250***	-0.4828	-0.9049
t-Statistic At First Difference						
With intercept	-3.9902***	-5.1662***	-5.7712***	-4.5927***	-9.2639***	-4.4491***
With intercept and trend	-3.9694**	-5.1390***	-5.6400***	-4.5223***	-9.1073***	-4.2825***
Without intercept and trend	-4.0434***	-5.2758***	-5.8962***	-4.6242***	-9.3911***	-6.1640***

Notes: *, **, and *** denote rejection of the null hypothesis at 10%, 5%, and 1% significance levels respectively and appropriate lag length based on SIC.

Given that ADF test outcomes can be influenced by model specification (e.g., intercept, trend) and potential structural breaks, additional tests such as Phillips–Perron (PP) and KPSS are used for robustness. Table 2 shows that PP results align with the ADF test, confirming that Azerbaijan, Hungary, and the Kyrgyz Republic are I (1), while Kazakhstan remains I (0) across all specifications. Turkey is also I (0) when a constant or trend term is included, whereas Uzbekistan exhibits trend stationarity I (0) with a deterministic trend).

Table 2: Phillips–Perron (PP) Unit Root Test Results

t-Statistic At Level						
	Azerbaijan	**Hungary**	**Kazakhstan**	**Kyrgyz Rep.**	**Turkey**	**Uzbekistan**
With intercept	-1.6191	-2.3205	-3.6359**	-2.6848*	-3.9815***	-0.1296
With intercept and trend	-1.9582	-3.1462	-3.5707*	-2.6558	-4.3116***	**-5.1378*** **
Without intercept and trend	-1.7141*	-0.9873	-2.3558**	-2.8250***	-1.2399	-0.9049
t-Statistic At First Difference						
With intercept	-3.9648***	-5.0345***	-12.0528***	-4.3476***	-12.0942***	-13.8540***
With intercept and trend	-3.8932**	-5.0170***	-13.2093***	-4.2580**	-12.9464***	-14.2384***
Without intercept and trend	-4.0442**	-5.1804***	-12.3693***	-4.3609***	-12.0838***	-6.1553***

Notes: *, **, and *** denote rejection of the null hypothesis at 10%, 5%, and 1% significance levels respectively and appropriate lag length based on SIC.

KPSS results in Table 3 further support these classifications. Kazakhstan consistently appears I (0), while Turkey and Uzbekistan maintain I (0) behavior when an appropriate deterministic structure is considered. In contrast, Azerbaijan, Hungary, and the Kyrgyz Republic are predominantly classified as I (1).

Table 3: KPSS Unit Root Test Results

t-Statistic At Level						
	Azerbaijan	**Hungary**	**Kazakhstan**	**Kyrgyz Rep.**	**Turkey**	**Uzbekistan**
With intercept	0.3961*	0.3432	0.1309	0.1880	0.3254	0.5651**
With intercept and trend	0.1325*	0.1212*	0.1270*	0.1000	0.1295*	0.0675
t-Statistic At First Difference						
With intercept	0.2100	0.2081	0.5000**	0.1824	0.2461	0.5000**
With intercept and trend	0.2291***	0.1136	0.5000***	0.0980	0.2990***	0.4722***

Notes: *, **, and *** denote rejection of the null hypothesis at 10%, 5%, and 1% significance levels respectively and appropriate lag length based on SIC.

Conventional unit root tests may fail to capture nonlinear adjustments or structural breaks in the data-generating process, potentially leading to ambiguous conclusions. To address this limitation, we further examined the data for signs of nonlinearity and structural instability. Specifically, we employed LM-type[16] tests for general nonlinearity and structural stability and applied the Bai–Perron[17] test to detect potential shifts in the series' mean.

Table: 4 Bai-Perron Structural Break Test Results

Azerbaijan		Hungary		Kazakhstan		Kyrgyz Rep.		Turkey		Uzbekistan	
Break Dates	*LWZ Criterion Value*	*Break Dates*	*LWZ Criterion Value*	*Break Dates*	*LWZ Criterion Value*	*Break Dates*	*LWZ Criterion Value*	*Break Dates*	*LWZ Criterion Value*	*Break Dates*	*LWZ Criterion Value*
(1) 2005	-3.9266	(1) 2009	-6.4796	(0)	-6.7599	(0)	-4.685827	(1) 2003	-7.3448	(2) 2009 2018	-7.3403

Notes: Values in parentheses indicate the number of breaks over the observation period. The appropriate lag length was determined according to SIC.

As reported in Table 4, Hungary, Turkey, and Uzbekistan exhibit significant structural breaks, likely reflecting the influence of global financial and political developments. In contrast, Kazakhstan and the Kyrgyz Republic show no substantial structural disruptions, suggesting a relatively stable economic environment. Additionally, the LM linearity test results in Table 5 indicate pronounced nonlinearity across most countries, implying that a linear model may not be the most appropriate framework for analyzing these series.

Table: 5 LM Test Results

	F-Statistic					
	Azerbaijan	**Hungary**	**Kazakhstan**	**Kyrgyz Rep.**	**Turkey**	**Uzbekistan**
d=1	47.0708***	4.6492**	1.3908	1.2099	0.0833	40.1327***
d=2	45.3815***	8.9460***	5.3276*	0.7721	0.0029	32.4186***
d=3	38.5404***	12.5125***	4.0965*	1.3710	0.0011	24.6250***

Notes: *, **, and *** denote rejection of the null hypothesis at 10%, 5%, and 1% significance levels respectively

16 *See:* Teräsvirta, Timo (1994). *Specification, estimation, and evaluation of smooth transition autoregressive models.* Journal of the American Statistical Association, 89(425), pp.208–218. Chien-Fu Jeff Lin, Timo Teräsvirta (1994). *Testing the constancy of regression parameters against continuous structural change*. Journal of Econometrics 62(2), pp.211-228.

17 Bai, Jushan and Perron, Pierre (2003). *Computation and analysis of multiple structural change models.* Journal of Applied Econometrics. 18 (1), pp. 1–22.

The results of the KSS nonlinear unit root test, presented in Table 6, further support these findings. None of the t-statistics are sufficiently negative relative to the corresponding KSS critical values, indicating that the unit root null hypothesis cannot be rejected for any country. This suggests that even within the KSS (ESTAR) framework, which allows for smooth, nonlinear transitions, the data continue to exhibit unit root behavior. Thus, there is no evidence of nonlinear mean reversion in these series.

Table 6: KSS Test Results

t-Statistic					
Azerbaijan	**Hungary**	**Kazakhstan**	**Kyrgyz Rep.**	**Turkey**	**Uzbekistan**
1.1548	2.2897	3.7907	6.5692	2.7236	2.1353

Notes: Asymptotic critical values for the KSS test statistics at 1%, 5%, and 10% significance levels are −2.82, −2.22, and −1.92 for the test with the raw data, −3.48, −2.93, and −2.66 for the test with the demeaned data, and −3.93, −3.40, and −3.13 for the test with the demeaned and de-trended data, respectively[18].

This study applies the TAR unit root procedure to identify abrupt regime shifts in time series data that smooth-transition models, such as the KSS test, may overlook. As shown in Table 7, Azerbaijan exhibits threshold stationarity, with a significantly negative coefficient in Regime 1 and a weaker but still negative coefficient in Regime 2, leading the joint ADF test to reject the unit root hypothesis. Hungary shows a similar pattern, with a strong negative coefficient in Regime 2 and a weaker mean-reverting coefficient in Regime 1, confirming threshold stationarity. Kazakhstan demonstrates mean reversion in both regimes, supported by a significant lagged difference term in Regime 1, indicating nonlinear adjustment. The Kyrgyz Republic also shows threshold stationarity, with negative coefficients in both regimes and additional inertia in one regime. Turkey's results indicate a clear tendency toward equilibrium across both regimes, with distinct short-run dynamics. Finally, Uzbekistan presents strong evidence of threshold stationarity, with significantly negative lagged level coefficients in both regimes, rejecting the unit root null when threshold effects are considered.

18 George Kapetanios, Yongcheol Shin, Andy Snell. (2003). *Testing for a unit root in the nonlinear STAR framework*. Journal of Econometrics 112(2), pp.359-379.

Table 7: TAR Unit Root Results

	Azerbaijan	Hungary	Kazakhstan	Kyrgyz Rep.	Turkey	Uzbekistan
Coefficient of Regime1 (I = 1)	-1.2114***	-0.7719*	-1.6814***	-1.8385***	-1.7867***	-2.9865***
Coefficient of Regime2 (I = 0)	-0.7029*	-1.2743***	-1.5915**	-1.8728**	-2.1438***	-1.0929***
F-statistic of Joint Stationarity	6.6655***	13.6014***	10.7400***	8.2900***	25.1551***	40.6652***

Notes: *, **, and *** denote significance at 10%, 5%, and 1% significance levels respectively.

Notably, the joint stationarity F-statistics are significant at conventional levels for all countries, indicating that the regime-specific coefficients jointly reject the null hypothesis of a unit root.

These results suggest that external adjustment dynamics in OTS countries are nonlinear and regime-dependent. The strength and speed of mean reversion appear to differ depending on the level or direction of the current account imbalance. In practice, this means that mild deficits may persist without triggering corrective mechanisms, while more pronounced imbalances activate stronger adjustment responses—either through market-based corrections or policy intervention. This highlights the importance of recognizing threshold behaviour in current account dynamics, particularly for countries exposed to capital flow volatility, commodity dependence, or structural transition processes.

5. Discussion of Estimation Results and Policy Implications

The empirical evidence from our threshold-based analysis indicates that current account sustainability in the OTS countries is regime-dependent. This means that external imbalances are not corrected uniformly over time but rather adjust asymmetrically depending on the size and direction of the imbalance. In particular, the adjustment mechanisms tend to be weak or absent when deficits are moderate, but become more active and pronounced once imbalances surpass critical thresholds.

This pattern has important implications for economic interpretation. It suggests that small or moderate current account deficits may persist without triggering strong corrective forces, especially when they are viewed as tolerable by markets or policymakers. However, once imbalances grow beyond a certain

point—often as a result of external shocks, commodity price volatility, or financing pressures—adjustment tends to occur more abruptly. The shift from weak to strong mean reversion highlights the nonlinear nature of external sustainability in the region.

These dynamics reflect the structural diversity of the OTS economies. Several member states are highly dependent on commodity exports, making them vulnerable to terms-of-trade shocks and fluctuations in global demand. Others, like Turkey, are deeply integrated into global capital markets and are more exposed to changes in investor sentiment and external financing conditions. These differences influence how and when each country adjusts to external imbalances and help explain the heterogeneity in sustainability outcomes revealed by the TAR model.

From a policy perspective, the presence of threshold-based behavior underscores the need for more flexible and context-specific approaches. When external imbalances are small, automatic stabilizers and gradual structural reforms may be sufficient. However, in high-deficit regimes—when thresholds are breached—more assertive responses such as exchange rate realignments, tighter monetary policy, or coordinated fiscal adjustments may be necessary. Recognizing the asymmetric nature of external adjustment can help policymakers avoid underreacting to persistent deficits or overcorrecting during moderate fluctuations. In this sense, our findings highlight the importance of early monitoring mechanisms and differentiated policy tools tailored to regime-specific risks.

Conclusion

This study investigates the sustainability of current account balances in the countries of the Organization of Turkic States (OTS) from 1991 to 2023 using both conventional linear unit root tests and advanced nonlinear approaches, specifically the Kapetanios-Shin-Snell (KSS) and Threshold Autoregressive (TAR) models. While linear methods provide mixed results, our key finding is that the current account balances of all OTS countries follow a regime-dependent (threshold) stationarity process. This indicates that sustainability varies by economic regime and that adjustment mechanisms are activated only when external imbalances surpass certain critical thresholds.

Our findings reveal both consistency and divergence with previous studies on current account sustainability. For instance, the mean-reverting behavior identified in Turkey and Uzbekistan aligns with J.C. Cuestas[19], while the conditio-

19 Cuestas, Juan C. (2013). *The current account sustainability of European transition economies.* Journal of Common Market Studies 51(2). pp 232-245

nal stationarity observed in Azerbaijan and the Kyrgyz Republic contrasts with the largely unsustainable patterns reported by Ş. Bozoklu and V. Yılancı[20]. Our regime-dependent findings extend M.J.Holmes[21] by capturing asymmetric adjustments overlooked in standard linear tests, and they echo B.Garg and K.P. Prabheesh[22], in emphasizing the importance of structural breaks and nonlinearities. Unlike many earlier models, our threshold-based approach shows that current account sustainability is not uniform but depends on the size and direction of imbalances.

Overall, the paper contributes to the literature by providing one of the first empirical assessments of current account sustainability across the OTS region using nonlinear time series techniques. By identifying the threshold nature of adjustment, we offer a more nuanced understanding of external sustainability in transition economies. Future research may build on this work by exploring the determinants of regime shifts and integrating external sustainability with broader macro-financial risk frameworks.

20 Bozoklu, Şeref,and Yılancı, Veli. (2014). *Current account sustainability in emerging markets: An analysis with linear and nonlinear panel unit root tests.* Atatürk Üniversitesi İktisadi Ve İdari Bilimler Dergisi, 28(4), 251-264.

21 Holmes, Mark. J. (2006). *Do Latin American countries have an ıncentive to default on their external debts? A perspective based on long-run current account behavior.* Emerging Markets Finance and Trade, 42(1). pp.33–49.

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