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What Do International Reserves Mean for Turkey's Economic Growth in the Long-run?

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Abstract

The theoretical considerations do not yield a persuasive answer on the net effect of reserves on economic growth as this effect may go either a positive or negative direction. Similarly, the empirical literature on the relationship between the two provides ambiguous findings. Hence, this study attempts to examine the long-run dynamics of Turkey's international reserves - economic growth nexus for the period 1990-2020, employing the Autoregressive Distributed Lags (ARDL) bounds testing approach to cointegration. The empirical evidence suggests a significant and positive but minimal effect of international reserves on economic growth.

Keywords: *International Reserves, Economic Growth, Cointegration.*
JEL Codes: *C22, F21, F30.*

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Özet

Uluslararası Rezervler Türkiye'nin Uzun Dönem Ekonomik Büyümesi İçin Ne İfade Ediyor?

Teorik değerlendirmeler, rezervlerin ekonomik büyüme üzerindeki net etkisi konusunda ikna edici bir yanıt vermemektedir; nitekim bu etki pozitif ya da negatif yönde ortaya çıkabilir. Benzer şekilde, ampirik literatür de bahsi geçen iki değişken arasındaki ilişkiye dair belirsiz bulgular ortaya koymaktadır. Bu nedenle, bu çalışma, eşbütünleşmeye yönelik Otoregresif Dağıtılmış Gecikmeler (ARDL) sınır testi yaklaşımını kullanarak Türkiye'de uluslararası rezervler-ekonomik büyüme bağıntısının uzun dönem dinamiklerini 1990-2020 dönemi için incelemeye çalışmaktadır. Ampirik kanıtlar, uluslararası rezervlerin ekonomik büyüme üzerinde önemli ve olumlu; ancak minimal bir etkisi olduğunu göstermektedir.

Anahtar Kelimeler: *Uluslararası Rezervler, Ekonomik Büyüme, Eşbütünleşme.*
JEL Kodları: *C22, F21, F30.*

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1. Introduction

The Central Bank of the Republic of Turkey (the CBRT) defines international reserves (external reserves of foreign reserves) as ready-to-use convertible assets controlled by the monetary authorities and accepted as an international payment instrument. In this sense, holdings of convertible foreign currency assets, SDR, International Monetary Fund (IMF) reserve position, and holdings of monetary gold are classified as international reserves. In particular, international reserves are mainly held to support and build confidence in monetary and exchange rate management policies, assist the Treasury in meeting its domestic and external debt obligations in foreign currency, limit the vulnerability to unexpected domestic and external financial shocks during times of crisis, and enhance the credibility of the country in international markets in the sense of the country is able to meet its external obligations (IMF, 2004). In this regard, international reserves are one of the main

macroeconomic variables. As a matter of fact, especially financial crises affecting several emerging economies in Latin America and Asia in the 1990s following the surge in capital flows towards these economies during the 1990s together with the structural transformation in the global economy in terms of more liberalized real and financial markets after the 1980s, and 2008 global financial crisis has brought broad recognition on the critical importance of international reserves management. In this context, many scholars have directed their attention to the link between the accumulation of international reserves and economic growth as emerging market economies have started accumulating foreign reserves stocks to mitigate the negative external shocks (Bussière et al., 2015). Hence, increasing demand for reserves raised questions on the level of optimal reserve. Naturally, it is important to determine in which situations reserves are necessary and in which situations they are a burden in the sense of varying demand for reserves between countries. As a matter of fact, when macro-financial conditions are stable, and respective risks and uncertainties are low, a high-level of reserves turns into a cost rather than an advantage. In this context, Matsumoto (2018) emphasizes that holding reserves creates an opportunity cost, provided that the interest rate on foreign loans is higher than the return on reserve assets. More importantly, he suggests that reserve accumulation leads to a reduction in the short-run consumption level as it imposes higher taxes for firms forcing them to increase their external borrowing to offset the tax burden partially, thus crowding out private investment (Benli, 2019). On the contrary, when market volatilities and related uncertainties and risks are high, reserves holdings come to a critical position (Kılcı, 2021). Countries retain reserves as an important monetary tool and as a means of self-insurance against financial crises. In other words, a high level of external reserves acts as a sort of insurance against the risk associated with the possible withdrawal of portfolio investments which could lead to a deep recession.

During the last decades, international reserves holdings have increased at an unprecedented pace. According to the IMF International Financial Statistics (IFS), worldwide international reserves (excluding gold) of $0.9 trillion in 1990 reached an

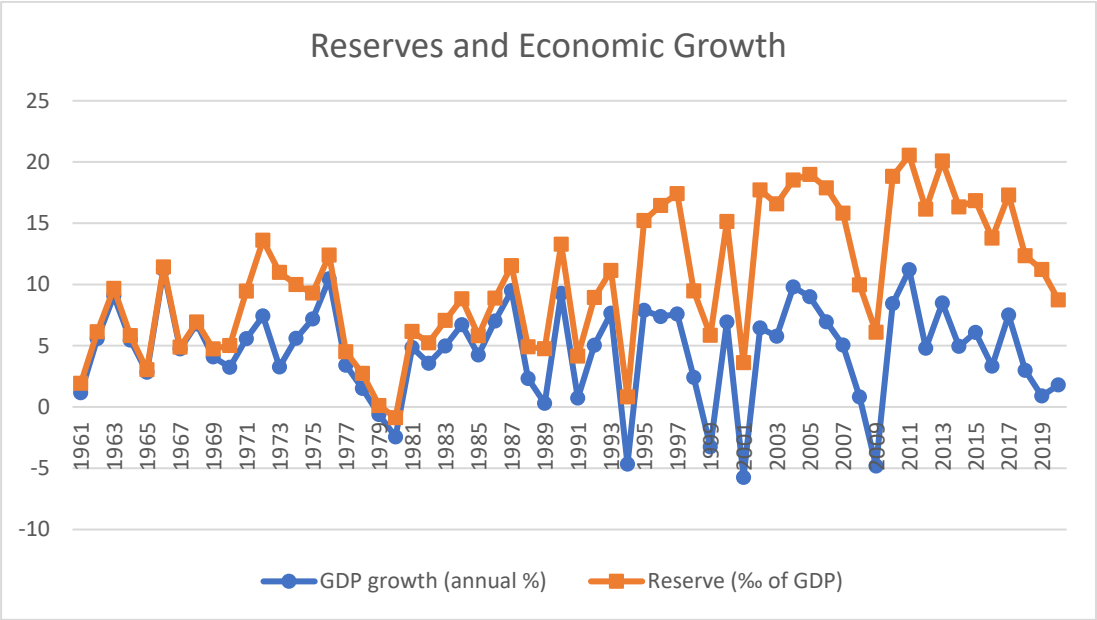
estimated $13.9 trillion in 2021, nearly a 15-fold increase over the last three decades. Emerging and developing economies accounted for 57.2 percent of global reserves in 2021 (down from its peak of 65.7 percent in 2014), up from 20 percent in 1990 and 35.7 percent in 2000 (IMF, 2022), with China and Japan alone holding 23.8 percent and 9.7 percent of global international reserves, respectively.

Although central banks accumulate international reserves for a wide variety of reasons, the literature identifies three main motives: A precautionary motive, a mercantilist motive (sometimes referred to as export competitiveness), and a by-product of other policies (e.g., maintaining financial stability, limiting exchange rate overshooting, and supporting market liquidity) (Santiago, 2019; Laser and Weidner, 2020). A typical explanation of why countries hold reserves emphasizes the precautionary role of hoarding reserves, reflecting the need for self-insurance against exposure to shocks from the financial market as they have been confronted with rising exchange rate risks by growing international capital flows. The mercantilist motive, on the other hand, follows export-led growth strategies and regards reserves accumulation as a by-product of export competitiveness as reserves may promote exports by influencing the exchange rate (through undervaluation) (Dooley et al., 2003; Aizenman and Lee, 2007; Laser and Weidner, 2020). However, this strategy may not be functioning properly in countries where exports are highly dependent on imports. Rising exchange rates, reflected in import prices, in such countries lead to a general increase in the prices of goods and services and create inflationary pressure. As a matter of fact, the ratio of imported inputs in products such as chemistry, automotive, iron, and steel, which have a significant share in Turkey's exports, varies by 65-75%. Therefore, the possible positive effect of an increase in exchange rates remains down due to rising costs of imported inputs and, thus, higher prices of export products (Memis et al. 2014). On the other hand, especially emerging markets with large external liabilities denominated in foreign currency, hold reserves to smooth exchange rate volatility or provide liquidity to the market (Hausmann et al., 2001; Calvo and Reinhart, 2002; Aizenman and Marion, 2003). Indeed, emerging markets

are more vulnerable to volatile currency swings as these countries have become favored destinations for capital inflows starting in the early 2000s (IMF, 2013). In this sense, reserves holdings appear to be an important player for emerging economies such as Turkey.

According to the IFS, as of 2020, Turkey holds about $50 billion of reserves, excluding gold (down from its peak of $110.9 billion in 2013 and $78.5 billion in 2019 after a substantial contraction due to the recent global financial and economic crises partly caused by the COVID-19 pandemic) and this figure accounts for 0.38 percent of total international reserves. Figure 1 below illustrates the trends of GDP growth rate and total reserves excluding gold as a percentage of GDP for the period 1961-2019, suggesting a seemingly close relationship between the two. Therefore, we may reasonably expect a preliminary result of a significant relationship between international reserves and economic growth. However, it is an important task to determine the channels in the reserves-growth nexus.

Figure 1. Reserves and Economic Growth



Source: The World Bank - World Development Indicators (WDI) Database

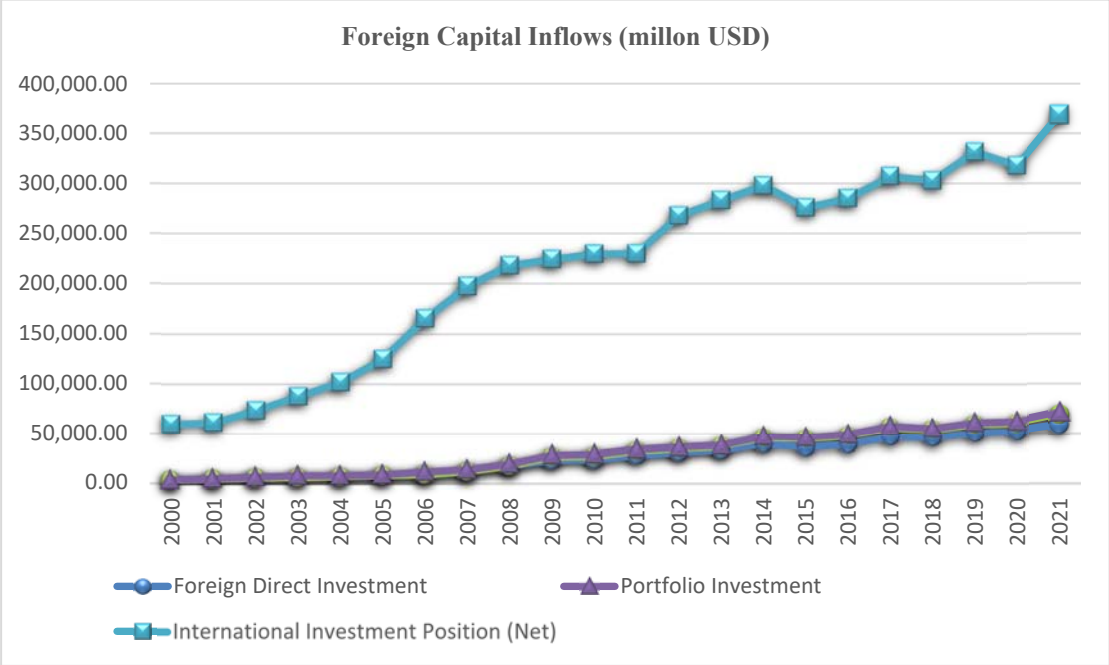
How external reserves accumulation affects economic growth and what the motivations for accumulating reserves are clearly related issues as the motivations we mentioned earlier are important contributors to sustainable economic growth. Especially emerging economies, most developing countries spend considerable attention and resources to accumulate foreign reserves and design their policies accordingly to increase external reserves. This is mainly based on the virtues attributed to international reserves. First of all, reserves act as a shield against external shocks by financing imbalances in external payments and supporting foreign exchange and monetary policies, and thus contributing to macroeconomic stability. External reserves accumulation also creates an opportunity for countries to undervalue exchange rates, so that it enables them to enjoy export externalities by creating a competitive advantage in international markets and triggers export-led growth. Furthermore, reserves may promote economic growth by easing external borrowing and creating a better climate for foreign investment, as an adequate level of international reserves may well serve as an indicator of the international creditworthiness of a country. This, in turn, promotes economic growth by increasing the ratio of investment/GDP and capital productivity (Polterovich and Popov, 2003; Kriesler and Cruz, 2010; Sula and Oguzoglu, 2021).

From another point of view, reserves entail costs as well. Since the return on reserves held in liquid foreign assets is lower than the interest rate on foreign lending and may be domestically invested with higher returns, high levels of reserves may likely to create a social cost by preventing the exploitation of potential investment opportunities, which can undermine or even offset the potential benefit of reserves accumulation on economic growth in the long run (Elhiraika and Ndikumana, 2007; Matsumoto, 2018; Sula and Oguzoglu, 2021).

In short, the theoretical considerations do not provide a persuasive answer on the net effect of reserves on economic growth as this effect may go either a positive or negative direction. In light of this fact, the main purpose of this study is to assess the net impact of international reserves accumulation on Turkey’s economic growth.

Investigating this issue in the context of Turkey is an important task as the country has accumulated a significant level of international reserves last three decades, and the same period can also be characterized by the high volume of foreign capital inflows as depicted in Figure 2. On the other hand, despite the arguments we discussed above and the potential significant effect of reserves on economic growth, there are relatively few studies devoted to assessing this issue, especially for individual countries, and almost none in the context of Turkey.

Figure 2. Foreign Capital Inflows into Turkey



Source: Statistical Data of the CRBT

2. Literature Review

Despite the fact that assessing the external reserves – economic growth nexus has important policy ramifications, especially for developing economies, as discussed earlier, the literature examining the relationship between the two is still limited and ambiguous, predicting insignificant or negative as well as a positive effect under certain conditions. A synopsis of studies in the literature is provided in Table 1.

Table 1. Literature Summary

Author	Country	Period	Estimation Technique	Major Findings
Karkakis (1997)	Greece	1976-1992	Johansen-Juselius ML Tests	There is a systematic long-run relationship between real income, real reserves, the average propensity to import, and the interest rate on the eurodollar.
Blanchard et al. (2010)	27 Emerging Economies	2007-2009	OLS	There is no significant role of international reserves in explaining output collapse during the 2008-2009 global financial crisis.
Llaudes R., et al (2010)	57 Developing Countries	2008-2009	OLS	Pre-crisis reserve holdings helped countries to mitigate the effect of the 2008-2009 global financial crisis.
Dominguez et al. (2011)	187 Countries	2000-2011	OLS	Pre-crisis reserve holdings are associated with higher GDP growth after the 2008-2009 global financial crisis.
Sula and Oguzoglu (2021)	120 Developed and Developing Countries	1981-2010	System GMM	International reserves have a positive effect on economic growth. However, as the opportunity cost of holding reserves increases, this effect weakens.
Bussiere et. al (2015)	112 Emerging Economies	2008-2009	OLS and 2SLS	The high level of reserves helped countries with relatively short-term debt to mitigate the effect of the 2008-2009 global financial crisis.
Nwafor (2017)	Nigeria	2004-2015	OLS	External reserves have no significant effect on economic growth.
Nwosa (2017)	Nigeria	1981-2014	OLS	External reserves have a significant positive impact on economic growth.
Bentum-Ennin (2014)	5 West African Countries	1984-2009	Panel Data Models and Locally Weighted Scatterplot Smoothing (LOWESS)	Panel data analysis indicates that international reserves accumulation promotes economic growth. However, LOWESS analysis implies a U-shaped relationship between international reserves and economic growth.

Author	Country	Period	Estimation Technique	Major Findings
Akinboyo et al. (2016)	Nigeria	2000-2013	Gregory and Hansen Cointegration Test and Modified Wald Statistic of Toda and Yamamoto	External reserves drive both the short- and long-run economic growth. There is a unidirectional causality from international reserves to economic growth.
Kaphle (2021)	Nepal	1975-2018	Johansen Cointegrattion Test and VECM	There is a cointegrating relationship between reserves and economic growth, and foreign exchange reserves contribute to economic growth.
Fukuda and Kon (2010)	135 Developing Countries	1980-2004	OLS	Increased foreign exchange reserves may promote investment and economic growth. However, this positive impact disappears when controlled the effect through investment.
Cruz and Kriesler (2010)	11 Developing Countries and Sub-Saharan Africa	1996-2005	Simulation	The excess of external reserves may be a potential resource to boost economic growth.
Krušković and Maričić (2015)	Brazil, China, and Russia	1993-2012	Panel Regression – Granger Causality Test	Increased foreign exchange reserves enhance GDP growth. There is a unidirectional causality from foreign exchange reserves to economic growth.

3. Data and Methodology

This study empirically examines the long-run dynamics of Turkey's international reserves - economic growth nexus for the period 1990-2020, controlling for investment and labor. The summary of variables under consideration and their descriptive statistics are presented in Table 2 and Table 3, respectively. All the variables are transformed into their natural log form prior to the analysis.

Table 2. Summary Variables

Target Variable	Proxy Variable	Symbol	Explanation	Source
Economic Growth	Real GDP per capita	Y	GDP per capita (constant 2015 US$)	World Bank - WDI
Domestic Investment	Real Gross Fixed Capital Formation	K	Gross fixed capital formation (constant 2015 US$)	World Bank - WDI
Total Labor Force	Labor Force	L	People ages 15 and older who supply labor to produce goods and services during a specified period.	World Bank - WDI
International Reserves	Total Reserves minus Gold	R	Reserves of IMF members held by the IMF, SDR, and foreign exchange holdings under the control of monetary authorities (Excluding gold).	World Bank - WDI

Table 3. Descriptive Statistics

Statistics	lnY	lnK	lnL	lnR
Observation	31	31	31	31
Mean	8.959	25.510	19.996	2.128
Max	9.396	26.367	17.322	2.449
Min	8.576	24.670	16.772	1.232
Std. Dev.	0.277	0.592	0.169	0.363
Skewness	0.254	0.065	0.693	-1.492
Kurtosis	1.684	1.497	2.104	3.955

Note: Author's Calculations

For the purpose of the study, we adopt a multivariate growth model in which real GDP per capita is a function of real investment, labor force, and international reserves as a percentage of GDP as follows:

$$lnY_t = \alpha_0 + \alpha_1 lnK_t + \alpha_2 lnL_t + \alpha_3 lnR_t + \varepsilon_t \quad (1)$$

The estimated coefficients in this equation only capture the long-run effect of the explanatory variables on the dependent variable. Therefore, estimating both the short- and long-run effects of the variables requires an error correction model (ECM). Specifically, this study employs a cointegration analysis based on the ARDL bounds

testing approach (Pesaran and Shin, 1999; Pesaran et al., 2001). This approach has several advantages over the existing conventional cointegration techniques such as the Engle & Granger (1987), Johansen & Juselius (1990), and Johansen (1995) procedures. First of all, the bounds testing procedure is based on a modified F-test which remains valid regardless of whether the underlying time series are purely I(0), I(1), or fractionally integrated (Pesaran et al., 2001). Nevertheless, the series should not be I(2) within the ARDL framework, invalidating the F-statistics and the critical values provided. The bounds testing is also applicable and more efficient for small and finite sample sizes. The ARDL methodology yields unbiased estimates of the long-run model and valid t-stats in the presence of autocorrelation and irrespective of whether some regressors are endogeneous (Harris and Sollis, 2003). Furthermore, bound testing can estimate the long-run and short-run coefficients simultaneously. In the context of this study, the ARDL (p, q) ECM (Pesaran & Shin, 1999; Pesaran et al., 2001) will be specified as:

$$\Delta lnY_t = \beta_0 + \beta_1 lnY_{t-1} + \beta_2 lnK_{t-1} + \beta_3 lnL_{t-1} + \beta_4 lnR_{t-1} + \sum_{i=1}^{p} \beta_{5i} \Delta lnY_{t-i} + \sum_{i=0}^{q} \beta_{6i} \Delta lnK_{t-i} + \sum_{i=0}^{q} \beta_{7i} \Delta lnL_{t-i} + \sum_{i=0}^{q} \beta_{8i} \Delta lnR_{t-i} + v_t \quad (2)$$

where β_1-β_4 are the long-run parameters, whereas β_5-β_8 are the short-run parameters.

Based on the cointegration analysis, which is on the grounds of ARDL, in order to establish the long-run relationship (cointegration) between the variables in the model, at the first stage, the significance of the lagged level relationships is tested by calculating F or Wald statistics where H_0: $\beta_1=\beta_2=\beta_3=\beta_4=0$ and H_A: $\beta_1=\beta_2=\beta_3=\beta_4\neq0$. Pesaran et al. (2001) provide two tables representing the extreme cases of variables being I(0) or I(1), which determine the critical bound values. If the F statistic is above the critical value of the upper bound, the null hypothesis is rejected, suggesting a cointegrating relationship between the variables. Narayan and Narayan (2005),

however, argue that these critical values are based on the large sample sizes, and accordingly, Narayan (2005) presents a set of critical values for small sizes (30 to 80). Therefore, this study relies on the critical values provided by Narayan (2005) in determining the cointegration between the variables as we have a short data span ranging from 1990 to 2020 (31 observations).

After detecting the presence of the long-run relationship between the variables, in the second stage of the procedure, Equation 2 is estimated based on the AIC or SIC. The error correction term (ECT) and short-run coefficients, on the other hand, are obtained using an ECM:

$$\Delta lnY_t = \theta_0 + \sum_{i=1}^{p} \theta_{1i} \Delta lnY_{t-i} + \sum_{i=0}^{q} \theta_{2i} \Delta lnK_{t-i} + \sum_{i=0}^{q} \theta_{3i} \Delta lnL_{t-i} + \sum_{i=0}^{q} \theta_{4i} \Delta lnR_{t-i} + \lambda ECT_{t-1} + \mu_t \quad (3)$$

where λ is the speed of adjustment term, showing how much of the effect of a shock in the short term would disappear in the long-run. ECT_{t-1} is expressed as the residuals' one period lagged value, derived from the cointegration model.

4. Empirical Findings

ARDL bounds test assumes that the variables are either I(0) or I(1). Therefore, we must ensure that none of the variables are I(2) so that can avoid the possibility of a spurious regression. Hence, this section starts with determining the order of integration of all variables using ADF and *PP* unit root tests. The results are given in Table 4, and the findings from both tests suggest that all the variables under consideration are integrated of order 1.

Table 4. Unit Root Tests

	ADF		PP	
Variable	C	C/T	C	C/T
lnY_t	-0.014(0)	-2.559(0)	0.136(4)	-2.605(3)
ΔlnY_t	-5.482(0)***	-5.375(0)***	-6.025(6)***	-5.947(6)***
lnK_t	-0.744(0)	-2.618(0)	-0.692(3)	-2.685(1)
ΔlnK_t	-5.845(0)***	-5.745(0)***	-5.943(4)***	-5.767(3)***
lnL_t	0.686(0)	-1.413(0)	0.728(2)	-1.439(3)
ΔlnL_t	-4.831(0)***	-5.077(0)***	-4.915(3)***	-5.080(2)***
lnR_t	-2.204(0)	-1.325(0)	-2.203(5)	-0.442(6)
ΔlnR_t	-5.566(0)***	-4.282(1)**	-5.568(1)***	-12.070(17)***

Note: The lag lengths and appropriate bandwidths in parentheses, which are determined by SIC and Newey-West Bandwidth criteria for the tests, respectively. ***, **, * represent the significance levels at %1, %5, and %10, respectively.

The results of the bounds test are displayed in Table 5. The findings suggest that the null hypothesis of no cointegration can be rejected at a 1 percent significance level for all models, indicating that the estimated relationships are not spurious.

Table 5. Bounds Test

Model	Optimal Lagged Length	F-stat
F(lnY_t/ lnK_t, lnL_t, lnR_t)	(1, 1, 0, 1)	161.01***
	Critical Values	
Significance Level	Lower Bound	Upper Bound
%1	5.33	7.06
%5	3.71	5.02
%10	3.01	4.15

Note: Optimal lagged length is chosen based on AIC. *** is as described before. The critical values obtained from Narayan (2005) (Unrestricted intercept and no trend).

As determined a statistically significant cointegration between the series under consideration, we now can estimate the short- and long-run dynamics. Table 6 provides the results for the ECM of the ARDL cointegration test, while the long-run coefficients are presented in Table 7. Regarding the ECM, the lagged error correction terms (ECT_{t-1}) are statistically significant at the 1% level with a coefficient of -0.81. This suggests the system's stability and convergence towards an equilibrium path in case of any disturbance in the system. Specifically, in the case of a deviation of real GDP per capita from its long-run equilibrium, 81% of the deviation disappears in the first period. In other words, it takes about 1.25 years for the effect of a shock to disappear.

Table 6. ECM

Variable	Coefficient	S.E.	t-stat
ΔlnL	0.028	0.066	0.423
ΔlnR_t	0.001	0.009	0.062
ECT_{t-1}	-0.807***	0.030	-26.982
Constant	-6.472***	0.241	-26.842

Note: *, ** and *** are as described before.

On the other hand, the long-run analysis reveals a positive and significant but minimal effect of international reserves on economic growth. Specifically, a one percent increase in the share of total reserves in GDP leads to a rise in real GDP per capita by about %0.024. The findings also suggest that investment and labor positively and significantly affect long-run economic growth.

Table 7. Long-Run Analysis

Dep. Var.: lnY_t

Variable	Coefficient	S.E.	t-stat
lnK_t	0.331***	0.011	29.580
lnL_t	0.499***	0.034	14.823
lnR_t	0.024***	0.008	3.015

Note: *, ** and *** are as described before.

Finally, in order to establish the fitness and stability of the models, this section ends with residual and stability diagnostics, and the results are given in Table 8. The findings indicate no problems of serial correlation, specification error, and heteroscedasticity, and the model has a normal distribution.

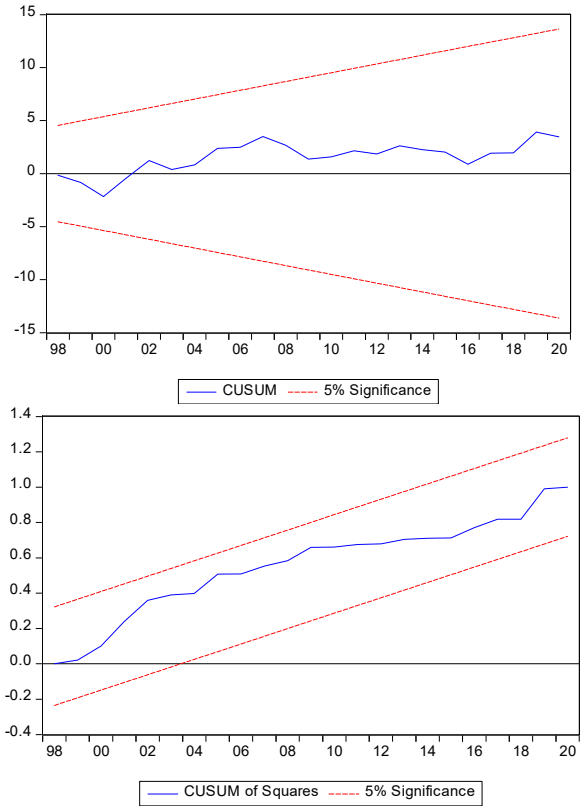
Table 8. Statistical Diagnostics

Diagnostics	Model A
R^2	0.969
Adjusted R^2	0.966
F Stat	272.906(0.000)
BPG Het. Test	4.230 (0.646)
BG Ser. Corr. LM Test	0.180 (0.105)
Ramsey RESET Test	0.004 (0.947)
J-B Normality Test	1.681 (0.431)

Note: Probability values in parentheses.

In addition, we also display the results of the cumulative sum of recursive residuals (CUSUM) and CUSUM of Squares tests to be able to investigate the stability of long-run coefficients in Figure 3. As the curves lie inside the confidence bands, the obtained graphs, suggest that the long-run coefficients are stable.

Figure 3. CUSUM and CUSUM of Squares



5. Conclusion

The literature on the external reserves – economic growth nexus is still limited and ambiguous. However, it can be argued that there is a consensus on the fact that the importance of reserves differs periodically. In periods when markets are volatile and, accordingly, uncertainties and risks are higher, reserves have an important function in reducing such volatilities and risks by acting as an insurance tool. Nevertheless, the financial globalization process after the 1980s has been accompanied by frequent and painful financial crises, which makes countries see a high level of external reserves as a sort of self-protection tool against crises. Therefore, during the last decades, international reserves holdings have increased at an unprecedented pace. On the other

hand, when the market is stable and, thus, risks and uncertainties are lower, a high level of reserves turns into costs.

In light of the arguments in the literature, this study attempts to analyze the impact of international reserves on economic growth in Turkey. The empirical evidence suggests a positive and significant but minimal effect of international reserves on economic growth. Specifically, a one percent increase in the share of total reserves in GDP leads to a rise in real GDP per capita by about %0.024. Thus, the significant and positive effect of international reserves on economic growth should not be interpreted as referencing excessive accumulation of reserves. It is a critical task to determine the optimum level of external reserves given the economic conditions of countries.

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