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# Inflation-driven Economy Policy in the Light of the Exchange Rate and the Interest Rate on RGDP in Turkey

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This study investigates the reflections on the trio of exchange rate, nominal interest rate and inflation, on Turkey's Real Gross Domestic Product (RGDP). In the analysis using annual time series data covering the years 1985–2020 obtained from the Turkish Statistical Institute, the Vector Autoregression (VAR) and Nonlinear Autoregressive Distribution Lag (NARDL) models are used with restricted variables. The existence of cointegration also encourages the application of the Vector Error Correction (VECM) model to examine the causal relationships between these variables. Nonlinear ARDL test results and other tests reveal some long-term effects. Research results show that inflation-based growth does not occur in the short term and negatively affects growth in the long term. Due to Turkey's significant current account deficit and heavy reliance on imported energy and inputs, currency devaluation is ineffective in boosting exports, highlighting the challenges of promoting export growth under these economic conditions. Moreover, it turns out that policies that reduce interest rates, as well as the depreciation of the Turkish lira against the exchange rate due to inflation, harm the economy in general. These effects serve as a crucial wake-up call for proponents of the export-led growth model.

## Introduction

Fluctuations in inflation and interest rates, as well as unexpected changes and depreciation of the national currency, will cause both direct and indirect effects on the production and marketing of goods in Turkey. The direct effect is especially evident when the use of imported inputs is high, as in Turkey. This will lead to a

significant increase in the cost of exported goods, a decrease in productivity and therefore a decrease in market capacity. In addition, indirect effects arise from the substitution effect and the price elasticity of domestic products. These effects occur when the demand for imported goods changes. The elasticity of substitution between domestic and imported goods plays an important role here.

According to the Spider Web theorem of Ezeikel (1938) and Kaldor (1934), if the demand curve is more elastic and flatter, price changes after seasonal movements will approach equilibrium. Conversely, if the supply curve is more elastic and flatter, price changes will deviate from market equilibrium and require government intervention to adjust demand in favour of domestic products. Therefore, it would not be right to intervene before it is determined whether price fluctuations are due to supply or demand.

It is predicted that, in the short term, the increase in the exchange rate will change demand by reducing the presence of imported goods in the market and by increasing exports due to the depreciation of the local currency in domestic production. To what extent can this be valid for countries that use high imported inputs and energy today? In the long run, it is thought that increasing energy and input prices and costs due to inflation and high interest rates will negatively affect domestic production and general welfare. As a result, domestic producers may face difficulties and consumer welfare may decrease significantly due to resource transfers to producers.

The aim of this study is to investigate the impact of exchange rate, interest rate and inflation on Turkey's Real Gross Domestic Product (RGDP) using annual time series data from 1985 to 2020. Using the Vector Autoregression (VAR) model with limited variables and the Vector Error Correction (VECM) model based on cointegration, the study examines the causal relationships between these variables.

This study assumes that exchange rate, interest rate and inflation significantly affect Turkey's Real Gross Domestic Product (RGDP). Specifically, the following hypotheses are proposed.

**$H_0$:** Changes in exchange rates, interest rates and inflation have a measurable impact on Turkey's GDP.

**$H_1$:** Inflation does not contribute to short-term economic growth. In the long run, inflation negatively affects economic growth.

In this study, an evaluation was made limited to the effects of inflation, exchange rate and interest rate on RGDP. It is hoped that research will guide developing economies by shedding a different light on the problem of export-led growth.

It is clear that exchange rates, inflation, and interest rates have significant effects on Gross Domestic Product (GDP). Examining this in more detail highlights the importance of examining these relationships.

### *Exports and Imports*

It is widely believed that when a country's currency appreciates, its exports decrease. While it is true that a stronger currency can make exported goods more expensive

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and potentially reduce demand abroad, this view is not without its complexities. In today's global economy, a stronger currency can make it easier to finance these critical imports, especially for countries that are dependent on imported energy and inputs. Conversely, currency devaluation or inflation-related depreciation is often used as a strategy for export-led growth in many developing countries. However, for countries that are heavily dependent on imported energy and inputs, such as Turkey, this can worsen trade deficits and threaten sustainable production. As a result, net exports can fall, negatively impacting GDP.

#### *Foreign Direct Investment (FDI) and Foreign Portfolio Investment (FPI)*

A strong currency can attract foreign investors looking for higher returns, while a weak currency can deter them. This inflow or outflow of investment directly affects economic growth and GDP.

#### *Consumer Spending*

Unstable prices and inflation erode purchasing power and lead to lower consumer spending, a key component of GDP.

#### *Interest Rates*

High inflation often prompts central banks to raise interest rates, which can increase the cost of borrowing and reduce both consumer spending and business investment. This can slow economic growth. Additionally, high inflation and exchange rates affect wages. As wages rise to keep up with inflation, the cost of production increases, leading to higher prices and a lower standard of living.

#### *Saving and Debt*

High interest rates encourage saving rather than spending, which can reduce consumption and affect GDP. In addition, high borrowing costs can lead to difficulties in repaying debt, potentially leading to bankruptcies and economic crises. Overall, these variables interact in complex ways to affect GDP through multiple channels, including trade, investment, consumption, and financial stability.

It is predicted that only trade openness, export-leading policies and growth-oriented targets with high income inequality will, as Turkey observed, increase environmental pollution (Çetin *et al*. 2015, 2022; Ozturk *et al*. 2022). In my study it is observed that export-led policies and currency devaluation are unrealistic in Turkey, to increase exports and growth. With only a –7% correction rate for equilibrium, no short- or long-term causality from these variables to GDP was observed. There is a long-term and short-term causality from RGDP to CPI, but there is no causality from NIR and REER to CPI.

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The Nonlinear ARDL (NARDL) test results reveal long-run effects, indicating that increases in CPI_p and NIR_p significantly raise RGDP, while decreases in CPI_n and NIR_n, as well as changes in REER_p and REER_n, reduce RGDP (see Appendix D).

Politicians often overestimate short-term economic performance. The depreciation of the Turkish lira due to inflation does not affect GDP positively and challenges the export-led growth model.

When we look at the previous literature, the exchange rate per SDR (Special Drawing Rights) has not been used in studies investigating the effect of the three variables in my model. This competence is also important in this respect. In 1969, SDR was determined as 0.888671 grams of pure gold equivalent to 1 dollar (nominal value), and 1 dollar was considered equal to 1 SDR (Ousmène Jacques Mandeng 2019)

This study is also important in terms of helping the government make more effective and appropriate decisions and filling this gap in the literature.

This model is estimated to improve the literature on the trilemma of exchange rate inflation and interest rate effects on GDP.

This article is designed as follows: the second section is a literature review, the third and fourth sections are model estimation, interpretation and discussion, and the fifth section has findings, conclusion and recommendations.

## Literature Review

What makes this study different is showing and confirming that there is no causality from exchange rates, inflation and interest rates to GDP in both the short and long term.

It shows that there is long-term and short-term causality from RGDP to CPI. However, it is shown that there is no causality from NIR and REER to CPI.

It challenges the effectiveness of inflationary policies and currency devaluation in developing countries.

This study criticizes politicians' overestimation of short-term economic performance.

And it also questions the validity of the export-led growth model based on currency depreciation and inflation.

Theoretically, it is clear that exchange rate differences affect GDP, as confirmed in the Nyeadi *et al*. (2014) article, and the exchange rate has negative effects on trade, and ignoring this will create problems in trade. Differences arising from the exchange rate have some effects on trade and GNP, the most important of which can be listed as follows.

Most previous studies noted a parallel increase in inflation and exchange rates. Maintaining a stable exchange rate can be achieved by keeping inflation within a certain range. Alba and Park (2005) found that indexing the Turkish Lira (TL) to the exchange rate stabilized purchasing power parity. This stability will significantly reduce the economy, especially the negative effects created by the exchange rate, and

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the negative effects on inflation and interest rates, as determined in my study. These changes will also affect exports, imports and net export revenues, which are also included in the expenditures and output model of the Keynesian economy and significantly affect production. If exchange rate changes increase exports and reduce imports, the effect is positive; if the opposite occurs, the effect is negative.

In the literature, asymmetric effects are found among those who research export leading growth (Delatte and López-Villavicencio 2012; Maka 2013; El bejaoui 2013; Benlialper *et al*. 2017; Baharumshah *et al*. 2017; Forero and Vega 2016; de Melo Modenesi *et al*. 2017). How the exchange rate will affect the general level of prices may be different in periods of recession and expansion. In this study, the effects of inflation on the real effective exchange rate and interest rate on growth are analysed using the VECM model.

The correlation between exchange rate, inflation and interest rate and GDP growth rate has been investigated in different ways. Mahonye and Zengeni (2019) and Taderera *et al* (2021) revealed the contractionary effects of exchange rate changes on inflation and growth. In another study, Adjei *et al*. (2020) examined the effects of exchange rate on economic growth in West Africa.

Atiga *et al*. (2014) investigated the effects of the exchange rate on the growth of Ghanaian trade. In their study, they concluded that the exchange rate does not have any effect on product exports. However, they observed that the development in Gross Domestic Product, total investment and savings had an impact on exports.

Genç and Artar (2014) stated that there is a long-term correlation between the trade of developing countries and the effective exchange rate. They also observed that changes in exchange rates do not affect exports, but there is a negative relationship between exports and savings and GDP.

In another study on trade in which Turkey had two independent variables, it was observed that the exchange rate had a direct effect on net exports (Gherman *et al*. 2013). Bakhromov (2011) investigated the effect of exchange rate on global trade in Uzbekistan and observed that exchange rate volatility has long-term negative effects on net export revenues.

Alam (2010), in his study examining the effects of Bangladesh's exports on real exchange rate depreciation, did not observe a positive relationship between the depreciation of the local currency, Taka, and export earnings.

Zakaria (2013) observed that the change and fluctuation in exchange rate international trade has significant effects on Malaysian trade. Sandu and Ghiba (2011) stated that foreign exchange instability affects the trade balance negatively.

Sana and Saqib (2012) examined the impact of exchange rate instability on foreign trade for Pakistan. According to this study, a negative relationship was observed between real exchange rate and export. Srinivasan and Kalaivani, (2012) examined exchange rate instability and exports for the Indian economy. Accordingly, it was observed that there was an inverse relationship between the two variables.

Gupta and Eichengreen, (2012) determined that the exchange rate has significant effects on the development of exports. Likewise, Thorbecke (2012) questioned the correlation between the exchange rate and German exports from a different

perspective. Accordingly, the effect of exchange rate change on exports of consumer goods was found to be high, while the same effect was found to be low in exports of capital goods.

In another study, Hall *et al*. (2010) stated that exchange rate instability may have positive effects on capital markets in developed countries compared with developing countries.

Ling and Mun (2008) examined the relationship between the exchange rate and the trade balance and observed that there is a positive relationship in terms of domestic incomes, but a negative relationship in terms of foreign incomes.

When investigating the relationship between exchange rate and GDP, as in my study, Almohaisen (2015), Zakaria (2013), Alam (2010), Bakhromov (2011), Sandu and Ghiba (2011), Sana and Saqib (2012), Srinivasan and Kalaivani (2012), Gupta and Eichengreen (2012), Nyeadi *et al*. (2014), Bakhromov (2011), Gherman *et al*. (2013) used annual time series data, but different methods and tests. On the other hand, some other studies used panel data (see Gupta and Eichengreen 2012; Genç and Artar 2014; Hall and Hondroyianns *et al*. 2010; Thorbecke 2012).

As mentioned above, some studies, including Zakaria (2013), Ling and Mun (2008) and others, found a positive relationship between exchange rate and RGDP, as observed in my study. Other studies, for example Almohaisen (2015), Thorbecke (2012), Nyeadi *et al*. (2014), Alam (2010), Twarowska (2015), Sana and Saqib (2012), Srinivasan and Kalaivani (2012), Bakhromov (2011) observed a negative relationship. In studies examining the effects of exchange rate volatility and an increase in gross national product (GDP), it is seen that there is a positive, negative or no relationship between the exchange rate and GNP.

Similar monetary policies, which seriously affected both the economy and the welfare of society, were implemented by devaluing the Turkish lira nine times in the past. Such monetary policies continue to be implemented in many developing countries, especially Turkey. However, if the devaluation of currency and the development of the economy were true, there would be high inflation in developed countries. Almohaisen (2015), who conducted a study on this subject, observed that the increase in prices triggered inflation and, as a result, both the exchange rate and foreign trade were negatively affected.

Anyone can present a study in whatever direction they believe. However, I believe that the existing studies and the results of this impartial study create important findings in terms of the relationship between exchange rate and growth. First of all, the findings clearly show that the effects of exchange rate, interest rate changes and inflation only affect GDP in the long term, and there is no causality on GDP in the short term. Inflation policies can only work if production is done with domestic input.

## Model Specification and Data Collection

This study employs restricted VAR; that is, a Vector Error Correction Model (VECM) and Nonlinear Autoregressive Distribution Lag model testing.

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The period from 1985 to 2020 is an important period in Turkey's economic history, marked by high inflation and price volatility. It provides insights into long-term economic trends by providing a comprehensive analysis of the impact of inflation and policy responses during this period. Data are from the Turkish Statistical Institute and the World Bank.

The variables became stationary after taking the first derivative. As a result, I decided to use the VECM vector autoregressive model (VAR). Since the trace and maximum eigenvalues of statistics were higher than the test critical values and the probability values were less than 0.05, it allowed us to use restricted VAR.

The use of Ordinary Least Squares (OLS) in the Vector Error Correction Model (VECM) offers simplicity and efficiency for analysing linear relationships between variables. OLS provides unbiased and consistent estimates in linear regression models. In VECM, the error correction term estimates short-term deviations and the speed of adjustment toward long-term equilibrium. OLS provides consistent results, especially in large samples, and is widely accepted. The underlying assumptions of OLS remain valid within the VECM framework, making it an effective method for estimating linear models.

The model is specified as follows:

$$RGDP = \beta_0 + \beta_1 NIR_t + \beta_2 CPI_t + \beta_3 REER_t + \varepsilon_t \quad (1)$$

where
$RGDP$ = Real GDP growth rate
$NIR$ = Nominal Interest Rate
$CPI$ = Consumer Price Index
$REER$ = Real Effective Exchange Rate
$B_0$ = Intercept
$B_{1,2,3}$= Coefficients for Independent variables
$\varepsilon$ = Error term

## Data Estimation and Empirical results

### *Correlogram Results*

Table 1 shows the autocorrelation and partial correlation of the variables considered. Regarding the predictions after the first difference, variables become stationary. There is no autocorrelation and partial correlation after the first difference and probability values are higher than 0.05.

Appendix C shows the BDS test results. According to the results of Appendix C, the probability values of BDS denote the significance for all independent variables. This has meant that the considered variables are not linear and not stationary.

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**Table 1.** Correlogram results.

| At first difference probability values | | | |
|---|---|---|---|
| *RGDP* | *CPI* | *NIR* | *REER* |
| 0.667 | 0.550 | 0.040 | 0.550 |
| 0.871 | 0.608 | 0.078 | 0.608 |
| 0.904 | 0.346 | 0.119 | 0.346 |
| 0.327 | 0.412 | 0.206 | 0.412 |
| 0.451 | 0.519 | 0.213 | 0.519 |
| 0.506 | 0.619 | 0.167 | 0.619 |
| 0.423 | 0.702 | 0.136 | 0.702 |
| 0.513 | 0.793 | 0.074 | 0.793 |
| 0.611 | 0.858 | 0.103 | 0.858 |
| 0.436 | 0.837 | 0.145 | 0.837 |
| 0.522 | 0.375 | 0.144 | 0.375 |
| 0.420 | 0.328 | 0.147 | 0.328 |
| 0.484 | 0.291 | 0.180 | 0.291 |
| 0.486 | 0.301 | 0.194 | 0.301 |
| 0.528 | 0.362 | 0.207 | 0.362 |
| 0.470 | 0.345 | 0.260 | 0.345 |

*Source*: Author's estimation.

**Table 2.** ADF Unit root test results.

| | Intercept no trend | | Intercept and trend | |
|---|---|---|---|---|
| Variables | Level | First difference | Level | First difference |
| *CPI* | –1.663552 ** | –9.064815*** | –2.321278*** | –3.704960 *** |
| | (0.4392) | (0.0000) | (0.4109) | (0.0375) |
| *NIR* | –0.632187*** | –8.026712 *** | –1.866725*** (0.6495) | –4.744668*** |
| | (0.8502) | (0.6495) | | (0.0034) |
| *REER* | –0.871865*** | –5.037185*** | –1.011882 *** | –5.007382 *** |
| | (0.7853) | (0.0002) | (0.9293) | (0.0015) |
| *RGDP* | –6.122560*** | –6.026181*** | | |
| | (0.0000) | (0.0001) | | |

*Note*: *, ** and *** indicate the rejection of the null hypothesis of non-stationarity at 10%, 5% and 1% significance levels, respectively.
*Source*: Author's calculations.

### *Unit Root Test results*

Table 2 shows the Augmented Dickey-Fuller test results. Regarding the test results, independent parameters become stationary after first differentiation, and all became significant at 10%, 5% and 1% respectively.

### *Cointegration Test Results*

As can be observed in the cointegration test results in Table 3, there are more than four cointegration models because trace statistic values are higher than test critical

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**Table 3.** Johansen cointegration test results.

| | Trace | | | Maximum eigenvalue | | |
|---|---|---|---|---|---|---|
| Null hypo | Trace statistic | Critical value (5%) | Probability** | Max-eigen statistic | Critical value (5%) | Probability ** |
| $r \leq 0$ * | 75.59855 | 47.85613 | 0.0000 | 31.67640 | 27.58434 | 0.0140 |
| $r \leq 1$ * | 43.92215 | 29.79707 | 0.0006 | 22.56771 | 21.13162 | 0.0312 |
| $r \leq 2$ * | 21.35443 | 15.49471 | 0.0058 | 12.70483 | 14.26460 | 0.0869 |
| $r \leq 3$ * | 8.649605 | 3.841466 | 0.0033 | 8.649605 | 3.841466 | 0.0033 |

*Note*: *, ** and *** indicates the rejection of the null hypothesis of non-stationarity at 10%, 5% and 1% significance levels, respectively.
*Source*: Author's estimation.

**Table 4.** Lag order selection test results.

| Lag | Log | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | –1218.038 | NA | 1.74e+28 | 76.37738 | 76.56060 | 76.43812 |
| **1** | **–1127.151** | **153.3713*** | **1.63e+26*** | **71.69697*** | **72.61305*** | **72.00062*** |
| 2 | –1115.395 | 16.90007 | 2.24e+26 | 71.96218 | 73.61113 | 72.50876 |
| 3 | –1109.048 | 7.536685 | 4.69e+26 | 72.56551 | 74.94733 | 73.35502 |
| 4 | –1086.863 | 20.79867 | 4.24e+26 | 72.17894 | 75.29362 | 73.21137 |

*Lag 1 values are used for our model.
*Source*: Author's estimation.

values. Similarly, for the Max Eigen statistic values exemption of the at most 2 value all values become higher than the test critical value. This has meant our variables have a long run relationship, and the considered variables are cointegrated.

### *Lag Selection*

Table 4 gives the values for the lag length. Lag 1 values are used for our model for the lag length and time, where the lowest values are determined and preferred. Accordingly, the analysis of the VAR model for Lag 1 latency time for the Final Prediction Error (FPE), Akaike Information Criteria (AIC) and Hannan-Quinn Information Criteria (HQ) Schwarz information criterion (SC) will be continued.

### *Granger Causality*

In Table 5, the Granger causality test results are illustrated. Regarding the test results, there is unidirectional causality from RGDP to NIR and CPI. And from CPI to NIR. The bold indicates that independent variables have an influence on dependent variables.

$$\begin{aligned} \boldsymbol{D(RGDP)} = {} & \boldsymbol{C(1)} * (\boldsymbol{RGDP(-1)} + \boldsymbol{3.08627723431} * \boldsymbol{DCPI(-1)} \\ & - 4.50468848476 * DNIR(-1) - 7.67254350631e-11 * DREER(-1) \\ & - 3.23225711079) + C(2) * D(RGDP(-1)) + \boldsymbol{C(3)} * \boldsymbol{D(DCPI(-1))} \\ & + \boldsymbol{C(4)} * \boldsymbol{D(DNIR(-1))} + \boldsymbol{C(5)} * \boldsymbol{D(DREER(-1))} + \boldsymbol{C(6)} \end{aligned} \quad (2)$$

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**Table 5.** Granger causality test results.

| Pairwise Granger Causality Tests | | | |
|---|---|---|---|
| Date: 04/27/24 Time: 21:15 | | | |
| Sample: 1985 2020 | | | |
| Lags: 2 | | | |
| Null Hypothesis: | Obs | F-Statistic | Prob. |
| DREER does not Granger Cause RGDP | 33 | 0.00144 | 0.9986 |
| RGDP does not Granger Cause DREER | | 0.06947 | 0.9330 |
| DNIR does not Granger Cause RGDP | 33 | 1.30776 | 0.2864 |
| RGDP does not Granger Cause DNIR | | 4.84281 | 0.0156 |
| DCPI does not Granger Cause RGDP | 33 | 0.33996 | 0.7147 |
| RGDP does not Granger Cause DCPI | | 2.96852 | 0.0507 |
| DNIR does not Granger Cause DREER | 33 | 0.15318 | 0.8587 |
| DREER does not Granger Cause DNIR | | 0.05445 | 0.9471 |
| DCPI does not Granger Cause DREER | 33 | 0.09563 | 0.9091 |
| DREER does not Granger Cause DCPI | | 0.07974 | 0.9236 |
| DCPI does not Granger Cause DNIR | 33 | 4.47857 | 0.0205 |
| DNIR does not Granger Cause DCPI | | 0.05701 | 0.9447 |

*Source*: Author's estimation

$$\begin{aligned} \boldsymbol{D(DCPI)} &= C(7) * ( RGDP(-1) + 3.08627723431 * DCPI(-1) \\ &\quad - 4.50468848476 * DNIR(-1) - 7.67254350631e-11 * DREER(-1) \\ &\quad - 3.23225711079 ) + C(8) * D(RGDP(-1)) + C(9) * D(DCPI(-1)) \\ &\quad + \boldsymbol{C(10)} * \boldsymbol{D(DNIR(-1))} + \boldsymbol{C(11)} * \boldsymbol{D(DREER(-1))} + C(12) \end{aligned} \tag{3}$$

$$\begin{aligned} \boldsymbol{D(DNIR)} &= C(13) * ( RGDP(-1) + 3.08627723431 * DCPI(-1) - 4.50468848476 * DNIR(-1) \\ &\quad - 7.67254350631e-11 * DREER(-1) - 3.23225711079 ) \\ &\quad + \boldsymbol{C(14)} * \boldsymbol{D(RGDP(-1))} + \boldsymbol{C(15)} * \boldsymbol{D(DCPI(-1))} + C(16) * D(DNIR(-1)) \\ &\quad + C(17) * D(DREER(-1)) + C(18) \end{aligned} \tag{4}$$

$$\begin{aligned} \boldsymbol{D(DREER)} &= C(19) * ( RGDP(-1) + 3.08627723431 * DCPI(-1) - 4.50468848476 * DNIR(-1) \\ &\quad - 7.67254350631e-11 * DREER(-1) - 3.23225711079 ) \\ &\quad + C(\boldsymbol{20}) * \boldsymbol{D(RGDP(-1))} + C(\boldsymbol{21}) * \boldsymbol{D(DCPI(-1))} + \boldsymbol{C(22)} * \boldsymbol{D(DNIR(-1))} \\ &\quad + C(23) * D(DREER(-1)) + C(24) \end{aligned} \tag{5}$$

### *Long-run Equation Ordinary Least Squares (OLS) for RGDP*

Table 6 estimates from equation (2), long-run effects for *RGDP* from Ordinary Least Squares (OLS). The speed of adjustment for the long run is –7% for bringing the whole system into equilibrium. Although the probability value is higher than 0.05, there is long run causality from independent variables *NIR*, *CPI* and *REER* to the

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**Table 6.** OLS long run causality results for *RGDP*.

| | Coefficient | Std. error | t-Statistic | Probability |
|---|---|---|---|---|
| **C(1)** | **–0.074729** | 0.063112 | –1.184070 | 0.2467 |
| C(2) | –0.363197 | 0.288697 | –1.258056 | 0.2191 |
| C(3) | 0.000117 | 0.131693 | 0.000887 | 0.9993 |
| C(4) | –0.065926 | 0.155556 | –0.423807 | 0.6751 |
| C(5) | –2.86E–12 | 1.63E–11 | –0.175913 | 0.8617 |
| C(6) | –0.281979 | 0.980333 | –0.287636 | 0.7758 |

*Note*: Bold text indicates that this is the coefficient, and its negative sign supports the results, helping to bring the entire system to equilibrium.
*Source*: Author's estimation.

**Table 7.** Wald test results for RGDP.

| Dependent variable | Independent variable | Chi square | Probability |
|---|---|---|---|
| *RGDP* | *CPI* | 7.87E-07 | 0.9993 |
| | *NIR* | 0.179613 | 0.6717 |
| | *REER* | 0.030945 | 0.8604 |

*Source*: Author's calculations.

*RGDP*. This has meant independent variables *NIR*, *CPI*, and *REER* have influence on *RGDP*.

When we look at *RGDP* dependent short run causality with regard to whether the independent variables *CPI*, *NIR* and *REER* have short run causality, it follows from the results from the estimates that there is no short run causality running from independent variables *CPI*, *NIR*, *REER* to *RGDP* (see Table 7).

Table 8 estimates equation (3), the long-run effects for *CPI* and speed of adjustment for the long run is –0.8% for bringing the whole system into equilibrium. This has meant only *RGDP* has some effects on *CPI*, but *NIR* and *REER* have no values to influence the *CPI*.

For equation (3) there is short run causality for only *RGDP* to influence *CPI*, and for *NIR* and *REER* there is no short run causality for *CPI* (see Table 9)

For equation (4), the long-run causality estimation is illustrated in Table 10. The speed of adjustment for the long run must be negative to bring the whole system into equilibrium. Unfortunately, it is positive 43% for NIR. And independent variables *CPI*, *RGDP* and *REER* have some influence on NIR in the long run. Probability values for *CPI*, *RGDP* and *REER* are less than 0.005 and significant.

For equation (4) there is no short run causality running from *RGDP*, *CPI* and *REER* to influence *NIR* (see Table 11).

For equation (5), *REER*, the speed of adjustment for the long run is the very high positive number 4.15 for bringing the whole system into equilibrium. This has meant independent variables *NIR*, *RGDP*, and *CPI* have an influence on *REER* (see Table 12).

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**Table 8.** Long run causality results for CPI long run.

| | Coefficient | Std. error | t-statistic | Probability |
|---|---|---|---|---|
| **C(7)** | **–0.008964** | 0.158966 | –0.056392 | 0.9554 |
| C(8) | 1.878509 | 0.727175 | 2.583299 | 0.0155 |
| C(9) | –0.399371 | 0.331710 | –1.203977 | 0.2390 |
| C(10) | 0.303524 | 0.391815 | 0.774660 | 0.4453 |
| C(11) | –7.50E–11 | 4.10E–11 | –1.830019 | 0.0783 |
| C(12) | 0.084745 | 2.469274 | 0.034320 | 0.9729 |

*Note:* Bold text indicates that this is the coefficient, and its negative sign supports the results, helping to bring the entire system to equilibrium.
*Source*: Author's calculations.

**Table 9.** Wald test results for CPI short run.

| Dependent variable | Independent variable | Chi square | Probability |
|---|---|---|---|
| *CPI* | *RGDP* | 6.673432 | 0.0098 |
| | *NIR* | 0.600098 | 0.4385 |
| | *REER* | 3.348970 | 0.0672 |

*Source*: Author's calculations.

**Table 10.** Long run causality results for NIR long run

| | Coefficient | Std. error | t-statistic | Probability |
|---|---|---|---|---|
| **C(13)** | **0.434966** | 0.110362 | 3.941264 | 0.0005 |
| C(14) | 1.130999 | 0.504839 | 2.240317 | 0.0335 |
| C(15) | –0.465622 | 0.230288 | –2.021908 | 0.0532 |
| C(16) | 0.429915 | 0.272016 | 1.580472 | 0.1256 |
| C(17) | –2.70E–11 | 2.84E–11 | –0.949847 | 0.3506 |
| C(18) | –0.018800 | 1.714286 | –0.010966 | 0.9913 |

*Source*: Author's calculations.

For equation (5) there is no short run causality running from *CPI*, *RGDP* and *NIR* to affect *REER* (see Table 13).

### *NARDL Estimation Results*

In Appendix D, nonlinear ARDL estimation results are illustrated. In the first section of the table the impact of the *CPI* on *RGDP* is illustrated.

According to the data obtained from Appendix D, we can see that the coefficients $CPI_p$ and $CPI_n$ are 0.064617 and –0.149144, respectively. However, these are not long-term coefficients. To find the long-term coefficients, the negative of each $CPI_p$ and $CPI_n$ coefficient needs to be divided by the *RGDP* coefficient (–1). Therefore, the

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**Table 11.** Wald test results for *NIR* short run.

| Dependent variable | Independent variable | Chi square | Probability |
|---|---|---|---|
| *NIR* | *RGDP* | 5.019021 | 0.0251 |
| | *CPI* | 4.088111 | 0.0432 |
| | *REER* | 0.902210 | 0.3422 |

*Source*: Author's calculations.

**Table 12.** Long run for equation (4) for *REER* long run.

| | Coefficient | Std. error | t-Statistic | Probability |
|---|---|---|---|---|
| C(19) | –4.151445 | 8.38E+08 | –0.049560 | 0.9608 |
| C(20) | –4.40E+08 | 3.83E+09 | –0.114892 | 0.9094 |
| C(21) | –1.16E+08 | 1.75E+09 | –0.066203 | 0.9477 |
| C(22) | 13076014 | 2.06E+09 | 0.006333 | 0.9950 |
| C(23) | –0.494472 | 0.215923 | –2.290045 | 0.0301 |
| C(24) | –2.03E+09 | 1.30E+10 | –0.156299 | 0.8770 |

*Source*: Author's calculations.

**Table 13.** Wald test results for REER short run.

| Dependent variable | Independent variable | Chi square | Probability |
|---|---|---|---|
| REER | RGDP | 0.013200 | 0.9085 |
| | CPI | 0.04383 | 0.9472 |
| | NIR | 4.01E–05 | 0.9949 |

*Source*: Author's calculations.

long-term coefficient was obtained as –0.33126 for $CPI_p$ and –0.7645 for $CPI_n$. Clearly, both long-run coefficients are positive. Therefore, the long-run equation or cointegration equation is as follows:

$$RGDP = 0.33\ CPI\_p + 0.76\ CPI\_n + 15.33\ REER\_p + 8.0\ REER\_n + 6.6\ NIR\_p + 4.5\ NIR\_n \tag{6}$$

Regarding the Appendix D estimation results, it is observed that the dependent variable probability values for the first lag *RGDP* (–1) are not significant but for the second lag *RGDP* (–2) becomes significant. However, probability values for *CPI* as a regressor becomes insignificant. Given equation (6), it is estimated that a 1% increase in $CPI_p$ (positive) leads to a 0.33% increase in *RGDP*. And a 1% decrease in $CPI_n$ (negative) leads to a 0.76% decrease in *RGDP*.

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Similarly, a 1% decrease in *CPI_p* (positive) leads to a 16% decrease in the second lag of *RGDP* (–2) and a 1% decrease in *CPI_n* (negative) leads to a 0.37% increase in second lag *RGDP* (–2).

For the rest of the estimations, the following results have been obtained: the first lag of *REER* and *NIR* significantly influence *RGDP*. After estimation of the long run coefficients for the first lag of *REER* and *NIR* the following results were obtained. One unit change in *REER_p* and *REER_n* reduces *RGDP* by –15.33 and –8%, respectively. And again, a 1% change in *NIR_p* increases *RGDP* by 6.66 and *NIR_n* negatively affects and decreases *RGDP* by –4.5%. Note that positive coefficient signs of variables indicate a proportional relationship with the dependent variable, whereas negative coefficient signs indicate an inverse relationship with the dependent variable.

### *Variance Decomposition Results*

In Appendix B, the variance decomposition results for *RGDP* estimate the fluctuation in *NIR* more than other considered variables. And *RGDP* and *REER* affects *CPI* more than *NIR*. Results show that *RGDP* and *CPI* affects *NIR* more than *REER*. And finally, the variance decomposition results of *REER* specify that change in *RGDP* is the main source of fluctuation in the exchange rate.

### *Impulse Response Results*

The results show that the response of *RGDP* to the exchange rate is positive but all other parameters have some negative response to *REER*. The exchange rate and *NIR* have positive response to *RGDP*. And *NIR* also have a positive response to *CPI*. But against this, all variables have a negative response to *NIR*.

## Results and Discussion

This article analysed the causality between *REER*, *CPI*, *NIR* and *RGDP* growth rate for the Turkish economy. There is no doubt that exchange rate volatility has effects on trade and GDP growth rate. Depreciation in the Turkish lira causes some direct and indirect effects.

This study examines the effects of exchange rates, inflation and interest rates on economic growth. The findings show that the common practice in developing countries of using inflationary policies and devaluing the currency to boost exports and growth is unrealistic.

As a further analysis of the short- and long-run relationships between *RGDP* and its regressors, the Nonlinear ARDL (NARDL) test results reveal some long-run effects. Specifically, a 1% increase in *CPI_p* results in a 33% increase in *RGDP*, while a 1% decrease in *CPI_n* results in a 0.76% decrease in *RGDP*. Moreover, a 1-unit change in *REER_p* and *REER_n* reduces *RGDP* by 15.3% and 8%, respectively. Finally, a 1% increase in *NIR_p* increases *RGDP* by 6.66% t, while a 1% decrease in *NIR_n* negatively affects *RGDP*, decreasing it by 4.5% (see Appendix D).

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I have to state that, in the short run, some producers may have an effect on profits and perhaps employment, but no causality has been observed on *RGDP*, neither in the long run nor in the short run. And the correction rate to ensure balance in the long run has been determined to be only –7%. Nyeadi et al. (2014) has some effects from exchange rate differences and *CPI* to *RGDP*, as confirmed in their article.

There are some impacts from regressors to *RGDP* in the long run and in the short run. But also, from *RGDP* to *CPI* some effects are observed. *NIR* and *REER* have no values to influence the *CPI* and no causality from *REER* and NIR to *CPI* in the short run and in the long run. However, independent variables *CPI*, *RGDP* have some influence on *NIR* both in the long run and in the short run and probability values for *CPI*, *RGDP* are less than 0.05 and it is significant (see Tables 9 to 13).

Regarding to the Wald test results on Table 12 and Table 13, *CPI*, *RGDP* and I have no influences on *REER* both in the short and long run.

Politicians often use nominal values and exaggerate figures to present better short-term economic performance, but research results have shown that the variables have mostly long-term causality.

The study provides a deeper understanding of the interaction between *REER*, inflation and interest rates in developing economies. It shows that the depreciation of the Turkish lira through inflation and the manipulation of nominal interest rates and exchange rates do not positively affect *RGDP* in the short term. This situation serves as a warning against the export-led growth model based on increasing inflation. Turkish President Erdoğan has been criticized for ignoring the connection between interest rates and inflation, especially in light of the interest rate cuts in 2021, which led to an increase in inflation from 20% to 80%, negatively affecting the entire economy and negatively affecting welfare.

This article examines the impact of exchange rates, inflation and interest rates on economic growth. The findings show that inflationary policies and currency devaluation aimed at increasing exports and growth in developing countries are unrealistic. With a correction rate of only –7% for equilibrium, no short- or long-term causality from these variables to GDP was observed. In contrast, Delatte and López-Villavicencio (2012); Maka (2013); El bejaoui (2013); Benlialper *et al*. (2017); Baharumshah *et al*. (2017); Forero and Vega (2016); de Melo Modenesi *et al*. (2017) found in their study that there is a short or long-term causality from these variables to GDP. However, these studies stated that the asymmetric effects of exchange rates, inflation and interest rates on economic growth generally depend on economic conditions such as recession or expansion. Therefore, based on the results of my study, it can be concluded that export-based growth by devaluing the currency or inflationary policies is not a very realistic approach today.

Again, in my study, it was observed that there is a long- and short-term causality from *RGDP* to *CPI*. There is no causality from NIR and *REER* to *CPI*. While politicians generally implement inflationary policies based on short-term economic performance, the results of the study shed light on these potentially wrong policies. The depreciation of the Turkish lira due to inflation does not affect GDP positively. This approach is not correct, especially in countries such as Turkey, which produces

using imported energy and inputs and adopts an export-based growth model. Those who try to increase exports through the depreciating Turkish Lira must give up this political tool.

In the goods market, it is generally believed that depreciation of the local currency due to fluctuations in the exchange rate makes exports cheaper and increases their volume, while at the same time reducing imports (the opposite can also occur) (IMF, WP03/200). In fact, foreign market competition clearly affects the demand for domestic products. This study shows that the direct effects of inflation and exchange rates on production are not very important in the short term. In the long run, especially in countries such as Turkey that are highly dependent on imported inputs and energy, the impact of external factors, inflation and exchange rates on domestic production, and therefore on exports and imports, depends not only on these variables, but also on: the country's ability to become self-sufficient and it is able to produce and sell using its own resources. This study contributes to the literature by demonstrating a consistent lack of causality and highlighting the need for stable economic conditions for effective policy implementation.

### *Policy Implications*

*Inflationary policy measures and currency depreciation*: Previous studies often suggested that these could stimulate exports and growth. This study challenges this view by showing no positive impact on GDP and suggests that these strategies are unrealistic for sustainable growth in developing countries.

*Export-led growth model*: While many studies support this model, this research shows that relying on devaluation and inflation to increase exports is ineffective in countries such as Turkey, which use high amounts of imported inputs and have a high current account deficit. It is recommended that these strategies be abandoned in favour of more sustainable economic policies.

*Political aspects and performance*: This study uniquely emphasizes how politicians often exaggerate short-term economic successes, an issue that has been insufficiently explored in previous research. While stressing the importance of more honest and transparent economic reporting, I also want to highlight the impact of politics on the economy within this context.

## Conclusion and Recommendation

The result of the closure during the pandemic period has caused serious difficulties and transportation in the supply chain from the supply side. Problems were encountered in the shipment from China to Turkey and other EU countries, especially the One Belt One Road (OBOR) project. The shipment and delivery of goods, which previously took four weeks, were significantly delayed during the pandemic due to the closure of customs. These delays and similar obstacles impact product quality, causing spoilage, while the fees for goods held at customs also drive

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up the cost and price of the product. In addition to the already high prices of imported energy, the costs driven up by the pandemic continue to escalate the prices of imported inputs. However, Turkey has strong production potential, especially when compared with other EU countries, thanks to its younger population. This youthful and dynamic demographic positively influences the behavior of both entrepreneurs and consumers (*The Economist* 2022). Besides, Turkey has high reserves that can be used both in agriculture and industry production, such as textiles and mining, but it can be very expensive these days for the reasons mentioned above. Therefore, an export-based production model with an inflationary monetary policy is not effective. The effort to increase trade by depreciating the value of the Turkish lira seriously increases the prices of imported inputs and increases the cost of production and prices even more, owing to the more expensive exchange rate. Citizens are getting poorer day by day and the country is being dragged into debt. As a result, Turkish manufacturers prefer to move to other cheaper countries where the production cost is cheaper.

The preference for production in lower-cost countries stems from the goal of reducing the high share of imported inputs in both production and exports, while aiming for more widespread and affordable production and market share. In recent years, tariffs imposed by the USA have negatively impacted Turkey's exports, particularly with 50% tariffs on steel (where Turkey is the sixth largest exporter) and 20% tariffs on aluminium (where it ranks 31st). Additionally, Turkey has a high dependency on imported inputs, such as energy, gas, and oil, which make up around 50% of its total input usage. Over time, this reliance has contributed to a significant current account deficit. Turkey's external debt, which stood at approximately 38% of GDP in 2008, nearly doubled to 70% (around US$450 billion) by 2021. This is notably high compared with other developing nations. For a developing economy, such levels of external debt result in a substantial financial burden and increased capital outflows, particularly when compared with other countries (OECD, 2021 Turkey report).

I would like to point out that switching to a fixed exchange rate may be beneficial, especially in the short term, in periods when inflation is excessive and exchange rates are high. This practice can be effective in controlling inflation by reducing the demand for foreign currency. This may provide an advantage in both imports and exports for a short time. As mentioned in Agbo's (2023) study, the effects of inflation cause serious volatility in commodity prices. While studies point out that price volatility affects production, attention is drawn to the need for manufacturers, risk managers, traders and policymakers to obtain more detailed information on this subject.

### *Suggestions for Better Measures*

Policymakers should take into account the study's findings that traditional methods such as currency devaluation and inflationary policies do not support long-term economic growth.

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As determined in the study of Barguellil *et al*. (2018), unsustainable strategies should be abandoned, stable economic conditions should be created, price volatility should be minimized, and factors that negatively affect economic growth should be reduced.

The study calls for a re-evaluation of the export-led growth model and warns against using inflation and currency depreciation as tools for economic growth, with particular emphasis on the Turkish context.

In summary, this study contradicts previous research by providing a critical reassessment of common economic policies in developing countries with high imported input use, showing the ineffectiveness of inflationary policies and currency devaluation in increasing exports for sustainable growth, and calling for more reliable economic strategies. As stated in Çetin *et al.*'s (2018) and Çetin and Ecevit's (2017) studies, the Turkish government should facilitate and support access to finance to increase more sustainable and environmentally friendly production techniques.

Another negative effect of high inflation is on nominal interest rates. When the Central Bank increases interest rates, the money supply in the market may decrease, but high interest rates negatively affect investors. Therefore, instead of increasing returns, the money supply can be reduced by increasing stock and bond prices.

For the economy to be stable, the money supply must be under control. For this, open market operations can be applied. A contractionary monetary policy can be used to reduce the money supply and fight inflation. In such cases, the money supply in the market can be controlled by selling bonds with lower prices. The money supply can also be reduced by controlling the funds rate. This will affect the rate at which banks borrow money from the government. However, it may be necessary to lend at higher rates to increase the amount of money.

The second tool can increase the provisions on the amount of money banks have to hold.

The third method is to introduce practices aimed at reducing the money supply. Money supply can be controlled with similar applications. Increasing interest rates on bonds helps the entrepreneur pay off his or her debt to the government or to increase the investor's demand for bonds. But governments had to want it. As is known, many economic models and measures do not care about people's well-being, which can lead to a poverty regime. Therefore, it is necessary to be well-intentioned and to act carefully and diligently while implementing economic policies.

The trade deficit in Turkey is known to exceed US$110 billion in 2022 (Reuters, 2023). The foreign trade deficit in 2023 has exceeded US$56 billion in the first half of the year. It should be said that the Currency Protected Deposits implemented in Turkey also create a serious financial burden and it is not easy to maintain. Therefore, serious fiscal discipline is required to stop the increase in the exchange rate and to slow down inflation somehow. First, the government needs to reduce its spending. It also needs to raise interest rates, because it looks like it has no alternative monetary policy left. It is not advisable to increase the tax burden on citizens through higher special consumption taxes and indirect taxes. A more effective approach is to

boost income by increasing production. Compared with EU countries, where the tax rate is around 25%, Turkey's tax rate exceeds 70%. In order to implement fiscal policies, to ensure fiscal discipline and monetary policy to be more effective, and to reduce the deficit in the economy, the upper income group should be effectively involved.

## Abbreviations

NARDL: Nonlinear auto regressive distribution lag
ARDL: Auto regressive distribution lag
BDDK: Banking Regulation and Supervision Board
CB: Central Bank
AIC: Akaike Information Criterion
CPI: Consumer Price Index
FPE: Final Prediction Error
FDI: Foreign direct Investment
FPI: Foreign Portfolio Investment
HQ: Hannan-Quinn Information Criterion
SC: Schwarz info criteria
NIR: Nominal Interest Rate
REER: Real Effective Exchange Rate
RGDP: Real Gross Domestic Production
OBOR: One Belt One Road
OECD: Organisation for Economic Cooperation and Development
SDR: Special Drawing Right is an artificial 'basket' currency used by the IMF. As an international reserve value, the SDR is determined by a basket of currencies from some advanced economies – the UK pound, US dollar, euro, yuan, and yen. The SDR has already been evaluated in gold from the very beginning, 2019.
VAR: Vector Autoregressive Distribution lag
VECM: Vector Error Correction Model

## Conflict of Interest

The author states that there is no conflict of interest.

## Declaration

The datasets used and/or analysed during the current study are available from the author on reasonable request.

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## References

**Adjei M, Bo Y, Nketiah E, Adu-Gyamfi G and Obuobi B** (2020) The effects of remittances on economic growth in West Africa. *Journal of Human Resource and Sustainability Studies* **8**(3).

**Agbo HMS** (2023) Forecasting agricultural price volatility of some export crops in Egypt using ARIMA/GARCH model. *Review of Economics and Political Science* **8**(2).

**Alam R** (2010) The link between real exchange rate and export earning: a counteraction and Granger causality analysis on Bangladesh. *International Review of Business Research Papers* **6**(1), 205–215.

**Alba JD and Park D** (2005) An empirical investigation of purchasing power parity (PPP) for Turkey. *Journal of Policy Modeling* **27**(8), 989–1000.

**Almohaisen RA** (2015) Effects of real exchange rate volatility on Jordanian International Trade. *Current Research Journal of Economy Theory* **7**(1), 11–13. https://doi.org/10.19026/crjet.7.2110

**Atiga O, Nyeadi JD and Atogenzoya CA** (2014) The impact of exchange rate movement in export: empirical evidence from Ghana. *International Journal of Academic Research in Accounting, Finance and Management Sciences* **4**, 41–48. https://doi.org/10.6007/IJARAFMS/v4-i3/980

**Baharumshah AZ, Sirag A and Soon SV** (2017) Asymmetric exchange rate pass-through in an emerging market economy: the case of Mexico. *Research in International Business and Finance* **41**(April), 247–259. https://doi.org/10.1016/j.ribaf.2017.04.034

**Bakhromov N** (2011) The exchange rate volatility and the trade balance: case of Uzbekistan. *Journal of Applied Economics and Business Research* **1**(3), 149–161.

**Barguellil, Ben-Salha O and Zmami M** (2018) Exchange rate volatility and economic growth. *Journal of Economic Integration* **33**(2), 1302–1336 http://doi.org/10.11130/jei.2018.33.2.1302

**Benlialper A, Cömert H and Öcal N** (2017) Asymmetric exchange rate policy in inflation targeting developing countries. Working Paper, No. 86/2017, Hochschule für Wirtschaft und Recht Berlin, Institute for International Political Economy (IPE), Berlin.

**Çetin M, Ecevit and Yucel AG** (2018) Structural breaks, urbanization and $CO_2$ emissions: evidence from Turkey. *Journal of Economics and Business Research*, **8**, 122–139.

**Çetin M, Aslan A and Sarıgül SS** (2022) Analysis of the dynamics of environmental degradation for 18 upper middle-income countries: the role of financial development. *Environmental Science and Pollution Research* **29**, 64647–64664 https://doi.org/10.1007/s11356-022-20290-2

**Çetin M and Ecevit E** (2017) The impact of financial development on carbon emissions under the structural breaks: empirical evidence from Turkish economy. *International Journal of Economic Perspectives* **11**(1), 64–78.

**Çetin M, Seker F and Cavlak H** (2015) The impact of trade openness on environmental pollution: a panel cointegration and causality analysis. *Regional Economic Integration and the Global Financial System*. https://doi.org/10.4018/978-1-4666-7308-3.ch017

**De Melo Modenesi A, Luporini V and Pimentel D** (2017) Asymmetric exchange rate passthrough: evidence, inflation dynamics and policy implications for Brazil (1999–2016). *The Brazilian Economy since the Great Financial Crisis of 2007/2008*. Springer International Publishing. https://doi.org/10.1007/978-3-319-64885-9_4

**Delatte AL and López-Villavicencio A** (2012) Asymmetric exchange rate pass-through: evidence from major countries. *Journal of Macroeconomics* **34**(3), 833–844. https://doi.org/10.1016/j.jmacro.2012.03.003

**El bejaoui HJ** (2013) Asymmetric effects of exchange rate variations: an empirical analysis for four advanced countries. *International Economics* **135–136**, 29–46. https://doi.org/10.1016/j.inteco.2013.10.001

**Ezekiel M** (1938) *The Quarterly Journal of Economics* **52**(2), 255–280. https://www.jstor.org/stable/1881734, https://doi.org/10.2307/1881734

**Forero FP and Vega M** (2016) Asymmetric exchange rate pass-through: evidence from nonlinear SVARs. *Peruvian Economic Association* (63), 1–23.

**Genç E and Artar O** (2014) The effect of exchange rate on exports and imports of emerging countries. *European Scientific Journal* **10**(13), 128–141.

**Gherman A, Stefan G and Filip A** (2013) Exchange rate volatility effects on export competitiveness 'Romanian Case'. *Theoretical and Applied Economics Journal* **xx**, No **9**(586), 39–50.

**Gupta P and Eichengreen B** (2012) The real exchange rate and export growth: are services different. *Munich Personal RePEc Archive* **21**, No. 43338, 1–44.

**Hall S, Hondroyianns G, Swamy P, Tavas G and Ulan M** (2010) Exchange-rate volatility and export performance: Do emerging market economies resemble industrial countries or other developing countries. *Economic Modeling* **27**, 1521.

**IMF WP03/200, Kandil M and Mirzaie IA** (2003) The effects of ex rate fluctuations on output and price. IMF Working Papers.

**Kaldor N** (1934) A classificatory note on the determinateness of equilibrium. *Review of Economic Studies* **1**, 122–136.

**Ling N and Mun H** (2008) Real exchange rate and trade balance relationship an empirical study on Malaysia. *International Journal Business and Management* **3**(8), 130–137.

**Mahonye N and Zengeni T** (2019) Exchange rate impact on output and inflation: a historical perspective from Zimbabwe. *African Journal of Science, Technology, Innovation and Development* **11**, 347–58.

**Maka ED** (2013) Asymmetric pass-through of exchange rate changes to CPI inflation in Ghana. *International Journal of Economics, Finance and Management* **2**(5), 338–350.

**Nyeadi J, Atiga O and Atogenzoa CH** (2014) The impact of exchange rate movement on export: empirical evidence from Ghana. *International Journal of Academic Research in Accounting, Finance and Management Sciences* **4**(3), 48. doi: 10.6007/IJARAFMS/v4-i2/980

**OECD** (2021) Turkey overview. https://www.oecd.org/economy/surveys/TURKEY-2021-OECD-economic-survey-overview.pdf

**Ousmène Jacques Mandeng** (2019) *The SDR —A Blueprint for Libra?* London School of Economics and Political Science, Institute of Global Affairs. https://www.lse.ac.uk/iga/assets/documents/research-and-publications/OJM-Currency-baskets-The-SDR.pdf

**Ozturk S, Çetin M and Demir H** (2022) Income inequality and $CO_2$ emissions: nonlinear evidence from Turkey. *Environmental Development and Sustainability* **24**, 11911–11928 https://doi.org/10.1007/s10668-021-01922-y

**Reuters** (2023) Turkish 2022 trade deficit leaps 138% to $110.2 billion. https://www.reuters.com/markets/turkish-2022-trade-deficit-leaps-138-1102-billion-ministry-2023-01-02/

**Sana I and Saqib N** (2012) Exchange rate volatility and its effect on Pakistan's export volume. *Advances in Management and Applied Economics* **2**(4), 109–124.

**Sandu CG and Ghiba N** (2011) The relationship between exchange rate and exports in Romanian, using VECM model. *Annals Universities Apulens is Economical* **13**(2), 476–482.

**Srinivasan P and Kalaivani M** (2012) Exchange rate volatility and export growth in India: an empirical investigation. *Munich personal RePEc archive* **16**, No. 43828, 1–26.

**Taderera C, Runganga R, Mhaka S and Mishi S** (2021) Inflation, interest rate and economic growth nexuses in SACU countries. *Academy of Accounting and Financial Studies Journal* **25**, 1–14.

***The Economist*** (2022) *The Economist*, July 2021. https://www.economist.com/briefing/2022/07/21/how-has-turkeys-economy-kept-growing-despite-raging-inflation

**Thorbecke W** (2012) The effect of exchange rate changes on Germany's exports. *Research Institute of Economy, Trade and Industry* **12**(81), 1–30.

**Twarowska K** (2015) The impact of exchange rate on Poland's trade flows. *International Journal of Management and Learning* **4**(1), 41–57.

**World Bank indicator Turkey** https://databank.worldbank.org/reports.aspx?source=2&series=SL.UEM.TOTL.ZS&country=TUR

**Zakaria Z** (2013) The relationship between export and exchange rate volatility: empirical evidence based on the trade between Malaysia and its major trading partners. *Journal of Emerging Issues in Economics; Finance and Banking* **2**(2), 668–684.

## **Appendix A.** Variance Decomposition

VD of RGDP

| Period | SE | RGDP | DCPI | DNIR | DREER |
|---|---|---|---|---|---|
| 1 | 4.676914 | 100.0000 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 4.861080 | 92.56637 | 0.637577 | 6.722672 | 0.073382 |
| 3 | 5.032035 | 86.75465 | 1.897529 | 11.27473 | 0.073087 |
| 4 | 5.127029 | 86.97340 | 1.926939 | 11.02842 | 0.071240 |
| 5 | 5.146185 | 86.93624 | 2.023561 | 10.95831 | 0.081884 |
| 6 | 5.148899 | 86.86517 | 2.023695 | 11.02094 | 0.090191 |
| 7 | 5.149726 | 86.84174 | 2.030067 | 11.03269 | 0.095498 |
| 8 | 5.150037 | 86.84317 | 2.029904 | 11.03144 | 0.095490 |
| 9 | 5.150057 | 86.84250 | 2.030561 | 11.03145 | 0.095493 |
| 10 | 5.150064 | 86.84235 | 2.030556 | 11.03149 | 0.095605 |

VD of DCPI:

| Period | SE | RGDP | DCPI | DNIR | DREER |
|---|---|---|---|---|---|
| 1 | 11.21076 | 11.91672 | 88.08328 | 0.000000 | 0.000000 |
| 2 | 12.68381 | 21.07330 | 68.90575 | 0.251152 | 9.769804 |
| 3 | 13.01512 | 23.94694 | 65.44426 | 1.303893 | 9.304905 |
| 4 | 13.14111 | 24.63526 | 64.53047 | 1.570594 | 9.263682 |
| 5 | 13.20444 | 25.21040 | 63.92289 | 1.686082 | 9.180623 |
| 6 | 13.21138 | 25.18501 | 63.92429 | 1.718280 | 9.172418 |
| 7 | 13.21782 | 25.25268 | 63.86205 | 1.720173 | 9.165098 |

(*Continued*)

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(*Continued*)

| VD of RGDP | | | | | |
|---|---|---|---|---|---|
| Period | SE | RGDP | DCPI | DNIR | DREER |
| 8 | 13.21818 | 25.25131 | 63.86316 | 1.720107 | 9.165417 |
| 9 | 13.21840 | 25.25202 | 63.86125 | 1.721200 | 9.165528 |
| 10 | 13.21845 | 25.25241 | 63.86091 | 1.721216 | 9.165466 |
| VD of DNIR: | | | | | |
| Period | SE | RGDP | DCPI | DNIR | DREER |
| 1 | 8.856879 | 35.17625 | 23.36946 | 41.45429 | 0.000000 |
| 2 | 12.28688 | 44.81614 | 20.37875 | 29.87035 | 4.934767 |
| 3 | 12.70913 | 42.13041 | 19.20519 | 33.65891 | 5.005491 |
| 4 | 12.82647 | 41.62560 | 18.98847 | 34.37490 | 5.011034 |
| 5 | 12.93441 | 42.54849 | 18.69344 | 33.82973 | 4.928338 |
| 6 | 12.94003 | 42.54358 | 18.70855 | 33.82016 | 4.927712 |
| 7 | 12.94323 | 42.53745 | 18.69951 | 33.83227 | 4.930768 |
| 8 | 12.94383 | 42.53868 | 18.69913 | 33.83016 | 4.932034 |
| 9 | 12.94402 | 42.53948 | 18.69931 | 33.82930 | 4.931911 |
| 10 | 12.94406 | 42.53964 | 18.69935 | 33.82909 | 4.931919 |
| VD of DREER: | | | | | |
| Period | SE | RGDP | DCPI | DNIR | DREER |
| 1 | 6.81E+10 | 42.36922 | 0.038971 | 0.026498 | 57.56531 |
| 2 | 6.86E+10 | 41.84956 | 0.470720 | 0.026261 | 57.65346 |
| 3 | 6.93E+10 | 41.36516 | 0.644253 | 0.510274 | 57.48031 |
| 4 | 6.96E+10 | 41.31117 | 0.872151 | 0.583047 | 57.23363 |
| 5 | 6.97E+10 | 41.30949 | 0.877687 | 0.638142 | 57.17468 |
| 6 | 6.97E+10 | 41.29567 | 0.881616 | 0.659504 | 57.16321 |
| 7 | 6.97E+10 | 41.30422 | 0.881534 | 0.662339 | 57.15191 |
| 8 | 6.97E+10 | 41.30467 | 0.881534 | 0.662833 | 57.15097 |
| 9 | 6.97E+10 | 41.30450 | 0.881565 | 0.663208 | 57.15073 |
| 10 | 6.97E+10 | 41.30447 | 0.881575 | 0.663246 | 57.15071 |
| Cholesky Ordering: RGDP DCPI DNIR DREER | | | | | |

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## **Appendix B.** Impulse Response

IR of RGDP:

| Period | RGDP | DCPI | DNIR | DREER |
|---|---|---|---|---|
| 1 | 4.676914 | 0.000000 | 0.000000 | 0.000000 |
| 2 | 0.000312 | –0.388150 | 1.260387 | 0.131682 |
| 3 | –0.306507 | 0.574300 | 1.125320 | 0.034152 |
| 4 | –0.945899 | –0.161378 | 0.209902 | 0.014832 |
| 5 | 0.401642 | –0.171408 | 0.056003 | 0.054397 |
| 6 | 0.073844 | 0.024516 | 0.140236 | 0.047171 |
| 7 | 0.034364 | 0.043152 | 0.063677 | –0.037617 |
| 8 | –0.056232 | 0.004688 | 0.004532 | 0.000966 |
| 9 | –0.000950 | –0.013354 | –0.005172 | 0.000955 |
| 10 | 0.004227 | –0.000217 | 0.004289 | 0.005477 |

IR. of DCPI:

| Period | RGDP | DCPI | DNIR | DREER |
|---|---|---|---|---|
| 1 | –3.870022 | 10.52160 | 0.000000 | 0.000000 |
| 2 | 4.350339 | 0.388418 | 0.635650 | –3.964539 |
| 3 | 2.581088 | –0.057747 | 1.343376 | –0.210536 |
| 4 | –1.406336 | 0.760648 | 0.709599 | –0.485223 |
| 5 | –1.189040 | 0.131412 | 0.477037 | –0.098667 |
| 6 | 0.043845 | –0.346002 | 0.243500 | 0.050212 |
| 7 | 0.401353 | –0.000346 | 0.078936 | 0.053059 |
| 8 | –0.003204 | 0.089603 | 0.006877 | –0.037810 |
| 9 | –0.052022 | 0.019648 | –0.044851 | –0.027014 |
| 10 | –0.032278 | –0.017211 | 0.007166 | 0.004444 |

IR. of DNIR:

| Period | RGDP | DCPI | DNIR | DREER |
|---|---|---|---|---|
| 1 | –5.252977 | 4.281590 | 5.702502 | 0.000000 |
| 2 | 6.329609 | 3.526080 | –3.546255 | –2.729448 |
| 3 | –0.626208 | –0.505311 | 3.045008 | –0.796920 |
| 4 | 0.657208 | 0.467922 | –1.478685 | –0.398884 |
| 5 | –1.643605 | 0.185489 | 0.209223 | 0.031430 |
| 6 | 0.231642 | –0.229086 | –0.182104 | –0.078228 |
| 7 | 0.158000 | –0.018961 | 0.219814 | 0.095926 |
| 8 | 0.093086 | 0.047484 | –0.041142 | –0.053706 |
| 9 | –0.058297 | 0.034833 | –0.014717 | –0.005831 |
| 10 | –0.026983 | –0.016787 | –0.003602 | –0.008244 |

IR. of DREER:

| Period | RGDP | DCPI | DNIR | DREER |
|---|---|---|---|---|
| 1 | 4.43E+10 | –1.35E+09 | 1.11E+09 | 5.17E+10 |
| 2 | 1.68E+09 | –4.51E+09 | –77009474 | 6.42E+09 |
| 3 | 4.23E+09 | –2.97E+09 | –4.83E+09 | 6.96E+09 |
| 4 | –3.62E+09 | –3.36E+09 | 1.93E+09 | 3.15E+09 |
| 5 | 1.97E+09 | –5.94E+08 | –1.65E+09 | 1.63E+09 |
| 6 | –2.29E+08 | –4.54E+08 | 1.02E+09 | 6.67E+08 |
| 7 | 9.06E+08 | –68564774 | –3.80E+08 | 1.19E+08 |
| 8 | –2.58E+08 | 31197372 | 1.57E+08 | 1.28E+08 |
| 9 | 11794547 | –40825334 | –1.35E+08 | –7519690. |
| 10 | –40833620 | –23826198 | 43881571 | 52706166 |

Cholesky Ordering: RGDP DCPI DNIR DREER

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## **Appendix C.** BDS Test Results

| BDS test for RGDP | | | | |
|---|---|---|---|---|
| Dimension | BDS statistic | Std. error | z-statistic | Probability |
| 2 | –0.020270 | 0.012869 | –1.575132 | 0.1152 |
| 3 | –0.032655 | 0.020970 | –1.557211 | 0.1194 |
| 4 | –0.014592 | 0.025612 | –0.569721 | 0.5689 |
| 5 | –0.011960 | 0.027391 | –0.436635 | 0.6624 |
| 6 | –0.015748 | 0.027115 | –0.580793 | 0.5614 |
| BDS test for REER | | | | |
| Dimension | BDS statistic | Std. error | z-statistic | Probability |
| 2 | 0.168872 | 0.007859 | 21.48909 | 0.0000 |
| 3 | 0.287707 | 0.012632 | 22.77556 | 0.0000 |
| 4 | 0.359940 | 0.015213 | 23.66066 | 0.0000 |
| 5 | 0.400893 | 0.016038 | 24.99624 | 0.0000 |
| 6 | 0.422360 | 0.015650 | 26.98869 | 0.0000 |
| BDS test for NIR | | | | |
| Dimension | BDS statistic | Std. error | z-statistic | Probability |
| 2 | 0.115175 | 0.009825 | 11.72227 | 0.0000 |
| 3 | 0.206167 | 0.015983 | 12.89898 | 0.0000 |
| 4 | 0.252454 | 0.019482 | 12.95842 | 0.0000 |
| 5 | 0.265028 | 0.020790 | 12.74791 | 0.0000 |
| 6 | 0.257469 | 0.020535 | 12.53819 | 0.0000 |
| BDS test for CPI | | | | |
| Dimension | BDS statistic | Std. error | z-statistic | Probability |
| 2 | 0.141730 | 0.008594 | 16.49259 | 0.0000 |
| 3 | 0.237538 | 0.013790 | 17.22554 | 0.0000 |
| 4 | 0.289572 | 0.016579 | 17.46616 | 0.0000 |
| 5 | 0.334903 | 0.017450 | 19.19198 | 0.0000 |
| 6 | 0.353826 | 0.017000 | 20.81358 | 0.0000 |

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## **Appendix D.** NARDL Tables

| Nonlinear ARDL (NARDL) for CPI | | | | |
|---|---|---|---|---|
| Variable | Coefficient | Std. error | t–statistic | Probability |
| *RGDP*(–1) | 0.195062 | 0.201799 | 0.966616 | 0.3481 |
| *RGDP*(–2) | –0.398727 | 0.150572 | –2.648086 | 0.0175 |
| *CPI_POS* | 0.064617 | 0.102643 | 0.629538 | 0.5379 |
| *CPI_NEG* | –0.149144 | 0.133073 | –1.120771 | 0.2789 |
| Nonlinear ARDL (NARDL) for REER | | | | |
| *RGDP*(–1) | 0.425577 | 0.209469 | 2.031691 | 0.0564 |
| *RGDP*(–2) | –0.483353 | 0.189911 | –2.545157 | 0.0198 |
| *REER_POS* | 3.31E–11 | 1.93E–11 | 1.713925 | 0.1028 |
| *REER_POS*(–1) | –6.44E–11 | 2.93E–11 | –2.196747 | 0.0406 |
| *REER_POS*(–2) | 4.16E–11 | 2.20E–11 | 1.893619 | 0.0736 |
| *REER_NEG* | 5.87E–11 | 2.54E–11 | 2.308133 | 0.0324 |
| *REER_NEG*(–1) | –3.36E–11 | 2.56E–11 | –1.311482 | 0.2053 |
| Nonlinear ARDL (NARDL) for NIR | | | | |
| *RGDP*(–1) | 0.063931 | 0.143027 | 0.446983 | 0.6597 |
| *RGDP*(–2) | –0.282088 | 0.148025 | –1.905675 | 0.0712 |
| *NIR_POS* | –0.703718 | 0.169556 | –4.150364 | 0.0005 |
| *NIR_POS*(–1) | 0.402927 | 0.116163 | 3.468637 | 0.0024 |
| *NIR_NEG* | –0.247153 | 0.117035 | –2.111787 | 0.0475 |
| *NIR_NEG*(–1) | –0.270449 | 0.187316 | –1.443814 | 0.1643 |
| *NIR_NEG*(–2) | –0.057119 | 0.156878 | –0.364096 | 0.7196 |
| *NIR_NEG*(–3) | 0.370289 | 0.098070 | 3.775766 | 0.0012 |

### About the Author

**Ergin Akalpler** is an economics professor and consultant at the University of Cyprus. After studying in Turkey, he completed a Master's and PhD programme at the Vienna University of Economics and Business. He has taught at universities in Northern Cyprus and Vienna and has been active in several academic projects. His research areas include macroeconomics, international economics and sustainable growth. Since 2004, he has worked as a consultant for EU education programmes and since 2010 as an economic advisor to the President of the TRNC, in which role he is involved in the preparation of reports and the development of economic programmes.

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