İzmir İktisat Dergisi
İzmir Journal of Economics

E-ISSN: 1308-8505 **Year:** 2024 **Vol:** 39 **No:** 1 **Pages:** 219-236
Received: 13.07.2023 **Accepted:** 28.11.2023 **Published Online:** 09.02.2024 **Doi:** 10.24988/ije.1326586
RESEARCH ARTICLE

Investigating the Asymmetric Effects of Geopolitical Risks on Portfolio Investments in Turkish Economy

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Abstract

This study aims to analyze the impact of geopolitical risks faced by the Turkish economy on international portfolio investments. Since it is thought that these risks may have asymmetric effects, the study utilizes the NARDL methodology. Based on this situation, the BDS linearity test was employed to assess the variables, revealing the presence of a non-linear structure in the time series. As a result of the NARDL analysis, it is observed that the long-run and short-run effects of geopolitical risks differ, and the asymmetric relationship, which is moderate in the short-run, turns into a symmetric structure in the long-run. In this framework, it is concluded that international portfolio investors increase their investments to take advantage of return opportunities in the short run in the face of increased geopolitical risk, but prefer safe economies in the long run. The Turkish economy, in order to reassure investors, is of great importance to increase transparency in the fields of economy, justice, and governance, to ensure and strengthen the independence of institutions, and especially to put economic policies on a rational basis.

Keywords: *Capital flows, Portfolio Investments, Geopolitical risks, NARDL*

Jel Codes: *F21, F32, G32*

Türkiye Ekonomisinde Jeopolitik Risklerin Portföy Yatırımları Üzerindeki Asimetrik Etkilerinin İncelenmesi

Özet

Bu çalışma Türkiye ekonomisinin karşı karşıya kaldığı jeopolitik risklerin uluslararası portföy yatırımları üzerindeki etkisini incelemeyi amaçlamaktadır. Söz konusu risklerin asimetrik etkilerinin var olabileceği düşünüldüğünden çalışmada NARDL metodolojisine başvurulmuştur. Bu duruma istinaden değişkenlere BDS doğrusallık testi uygulanmış ve zaman serilerinin doğrusal olmayan bir yapı sergilediği görülmüştür. NARDL analizi sonucunda jeopolitik risklerin uzun ve kısa dönem etkilerinin farklılaştığı, kısa dönemde orta çıkan asimetrik ilişkinin uzun dönemde simetrik bir yapıya büründüğü görülmüştür. Bu çerçevede uluslararası portföy yatırımcılarının jeopolitik risk artışı karşısında kısa vadede getiri fırsatlarından yararlanmak için yatırımlarını artırdığı ancak uzun vadede güvenli ülke ekonomilerini tercih ettiği soncuna ulaşılmıştır. Türkiye ekonomisinin yatırımcılara güven verilebilmesi adına ekonomi, adalet ve yönetim alanlarında şeffaflığın artırılması, kurumların bağımsızlığının sağlanıp güçlendirilmesi ve özellikle iktisadi politikaların rasyonel zemine oturtulması büyük önem arz etmektedir.

Anahtar kelimeler: *Sermaye akımları, Portföy Yatırımları, Jeopolitik risk, NARDL.*

Jel Kodu: *F21, F32, G32*

CITE (APA): Ece, O., Çadırcı, B.D. (2024). Investigating the asymmetric effects of geopolitical risks on portfolio investments in Turkish economy. *İzmir İktisat Dergisi*. 39(1). 219-236. Doi: 10.24988/ije.1326586

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1. INTRODUCTION

In economics and finance terminology, risk characterizes a situation where there is no epistemic basis for establishing a calculable probability of potential outcomes. This situation creates a hesitation in the behavior of economic actors who are the addressees of the process, creating a stagnation in the ability to make rational decisions based on a lack of information. This phenomenon, which is mainly due to the complexity of the economic world, where not all the characteristics of the favorable environment are captured or known, has understandably negative effects on economic activity, impeding or diverting the flow of international investment. In this context, risk traditionally refers to domestic economic and political events, but it also emphasizes the ability to evolve in relation to international relations, with transnational challenges and cross-currents brought by new political and economic forces. This is because the expansion of the concept of investment in terms of its general perspective as a result of internationalization, globalization, and liberalization policies that found a basis for implementation in the 1980s is also observed in the framework of the risk phenomenon. However, the risk sensitivities of local economic fund flows and international fund flows are quite different from each other. International capital fund flows, which express the orientation of investors from the local country market to foreign country markets with the expectation of a higher return (Seyidoğlu, 2013: 718; Şener, 2008:7), are more unstable and have a fragile structure compared to uncertainty based on cyclical differences (Kirabaeva and Razin, 2013: 106). In its most general definition, foreign capital fund flows refer to fund orientations that are realized by targeting the acquisition of financial and real assets from across national borders (Keskin, 2020: 227). The main reasons for these orientations can be explained under the headings of economic conditions explained by investor expectations that foreign firms will perform better than domestic firms, exchange rate expectations explained by the acquisition of financial securities denominated in a foreign currency that is expected to appreciate against national currencies, and international diversification shaped by the high level of performance expected from the international diversification of the asset portfolio (Barjaktarovic, 2014: 115).

International fund flows, which have become the focus of attention especially for underdeveloped and developing countries with globalization, essentially constitute a source for meeting the financing needs they have put forward. In addition, they are of vital importance as they increase the liquidity of national capital markets, improve market efficiency and consequently demonstrate the ability to finance a wider range of investments, provide discipline and know-how to domestic capital, contribute to the development of securities markets, encourage savings, bring transparency to markets, promote corporate governance and enhance risk management opportunities (Barjaktarovic, 2014:116). However, international fund flows, in addition to all these benefits and the distribution of investment risks based on diversification (Baer and Hargis, 1997: 1813), have the structural feature of being more speculative and short-term as a result of the evolution in the investment mentality. The profound impact of all these features, scopes, and developments on investment strategies and investment results has introduced the concept of geopolitical risk into the finance literature.

In its most basic and simple sense, geopolitical risk refers to the uncertainties associated with tensions, terrorist acts, and wars between countries that affect the general course of normal and peaceful international relations (Caldara and Iacoviello, 2022: 6). In other words, it can be explained as the danger that the country's geographical location associated with its location characteristics and its policies regarding international relations may have negative effects on the profitability of the country's economic environment (Kamışlı, 2018: 294). Geopolitical risk, which is essentially the uncertainty in the political and economic logic of global governance, is the adverse effects of a problem arising within national borders on other countries to which it is related. The rationale for

the impact of these adversities on the investment decisions of national and international investors is explained in two different academic explanations. The first one, based on information asymmetry and pioneered by Brennan and Cao (1997) and Tille and Van Wincoop (2008), is explained by the experience of international contraction shaped by geopolitical risk increasing asymmetric information for domestic and international intermediaries. The other is considered in the alliance of Caballero et al.(2008), Fratzscher (2012), and Von Hagen and Zhang (2014), in the argument that the strength of national economic fundamentals is the result of regression due to differentiations in the capacity of national institutions.

It is evident that the concept of geopolitics is an important factor affecting investor preferences with the increasing globalization of financial markets. In the presentation of the study shaped by this argument, the theoretical arguments regarding the impact of geopolitical, interest rate, exchange rate, and pandemic risk factors on net portfolio investments will be presented first. This is followed by the literature review, analysis, and empirical findings. Finally, the presentation of the results and evaluations on the impact of geopolitical risk factors on net portfolio investments will be presented.

1.1 Motivation

Although the arguments regarding the reasons may differ, there is no doubt that geopolitical risk is a determining factor in international capital fund flow preferences related to investment preferences. In this respect, determining the level of impact of geopolitical risk on international capital fund flows or international investments has been an important research topic, especially for less developed and developing countries. Due to its location, political/policy preferences, and developing economic potential, it is very important to evaluate the issue at the scale of Türkiye. In the study shaped by this importance, international capital fund flows are analyzed through the representation of net portfolio investments.

1.2 Contribution

The literature on the relationship between international fund flows represented by net portfolio investments and risk factors has a wide range within the scope of this study. This is because the risk profile of the study includes macroeconomic risk elements in the representation of interest rate and exchange rate risk, the economic uncertainties of a general and active pandemic in the context of the COVID-19 pandemic, and political risk diversity centered on geographical location, administrative policies, conflicts of interests and ideals between countries and tensions in the context of geopolitical risk. This diversity expresses the originality of the study as well as the need to consider the increasing risk profile as a result of globalization and internationalization in trade. In this respect, the study aims to provide empirical evidence that can justify the decision-making processes of international firm managers and individual/institutional international investors at the micro level and managerial authorities at the macro level.

2. RELATED WORKS

The literature on the relationship between international capital fund flows and geopolitical risk factors has a wide range. In addition to the importance of the ability of geopolitical risk to manage investor preferences, the diversity of variables related to the representativeness of international capital fund flows is also an important factor. Further, the scope of the literature review has been expanded to include macroeconomic variables and the pandemic effect from the perspective of interest rate and exchange rate risk in addition to geopolitical risk factors.

The literature on the relationship between international capital fund flows and macroeconomic variables is mainly focused on the determinants of fund flows. Studies analysing many different countries and samples focus on inflation, real exchange rates, interest rates, and economic growth

variables. When the related literature is evaluated in general, it can be stated that the impact of portfolio investments on macroeconomic variables differs in the context of the structural conditions of countries and the period of analysis. In this framework, Bekaert and Harvey (1998), Jongwanich and Kohpaiboon (2013), Onuorah and Akujuobi (2013), Ahmad et al. (2015), Ouedraogo (2017), Çilingirtürk and Çetiner (2018), who analyze developing countries, mention a positive effect of portfolio investments on exchange rates and interest rates, while Lay and Wickramanayake (2007), who analyze developed countries, find opposite findings on the related variables. On the other hand, Agarwal (1997), in his study on developed countries, argues that portfolio flows have positive effects on exchange rates. Another general conclusion from the literature is that portfolio investments have a negative effect on the inflation rate in both developed and developing countries, as can be seen in the studies of Agarwal (1997) and Bekaert and Harvey (1998) and that this situation is accompanied by positive economic growth, as stated by Lay and Wickramanayake (2007).

Studies on Türkiye, which is classified as a developing country, generally focus on the relationship between real interest rates and international capital flows. In this framework, Berument and Dinçer (2004), Barışık and Açıkgöz (2007), Keskin (2008) and Korap (2010) find a negative relationship between the variables, while Balkan et al. (2002), İnsel and Sungur (2003), Pazarlıoğlu and Gülay (2007), Öztekin and Erataş (2009), Şenol and Koç (2018) and Arslan and Çiçek (2017) find positive findings in their analyses. Undoubtedly, it should not be ignored that these studies have different analysis periods.

Korap (2010) states in his study that the main driving force of portfolio flows is international developments. In recent years, the only development that has affected all countries of the world in many areas such as public health, economic, political, etc. is undoubtedly the pandemic process. For this reason, it is necessary to include the pandemic period in the analysis while examining the impact of risk factors on portfolio investments.

When the relevant literature is examined in terms of the pandemic, its negative effects on both developed and developing country economies can be clearly seen. However, in studies such as Nyiwul (2021), Vilutiene and Dumciuviene (2022), Davis and Zlate (2023), and Ashraf et al. (2022), which examine the effects of the pandemic on developed economies, it is stated that although there is a decrease in consumption, savings, and investments, an increase in exchange rate volatility and sectoral negativities, especially thanks to the measures taken, there is no decrease in portfolio flows and sudden stop problems. On the other hand, in the studies of Iyer and Dhole (2020), Alba et al. (2021), Güney and Hopoğlu (2021), Giofré (2021), Himanshu et al. (2021), Beirne et al. (2020), Syarifuddin and Setiawan (2021), ElFayoumi and Hengee (2021), Ustalar (2022) and Kartal et al. (2022), it was determined that in the countries in question, in addition to the economic problems experienced by the economies of developed countries, capital flight was also observed and this situation deepened the crisis.

The literature on the impact of geopolitical risks on international capital flows is diverse. While studies frequently focus on foreign direct investments, there are differences in terms of sample and country group in terms of their results. Lee and Mitchell (2012), Nguyen et al. (2022), Yu and Wang (2023), Ceyhan and Gülcan (2022), Mitsas et al. (2022), Feng et al. (2023), Afşar et al.(2022), Özşahin et al.(2022) find that increased geopolitical risks have a contractionary effect on capital flows. There is a consensus that geopolitical risks arising in developed countries cause problems such as productivity, a slowdown in sectoral development, and a decrease in security returns and that there is no uniform effect. The studies of Fania et al. (2020), Bilgin et al. (2020), Ceyhan and Gülcan (2022), Tang et al. (2023), and Yu and Wang (2023) can be given as examples. Additional findings from the existing body of literature pertaining to the relationship between geopolitical risk and capital flows

suggest that emerging economies exhibit a heightened susceptibility to geopolitical risks. Furthermore, it is found that a greater reliance on foreign commerce and capital inflows serves to mitigate the occurrence of military conflicts (Lee and Mitchel, 2012; Caldara and Iacoviello, 2018).

3. DATA SET AND METHODOLOGY

This study aims to examine the influence of geopolitical uncertainty on net capital flows within the context of Türkiye. The analysis utilizes a monthly dataset including 50 observations from April 2018 to May 2022. In addition to the geopolitical uncertainty index, the foreign-domestic interest rate spread and the real exchange rate are incorporated into the model as control variables. The data used in the analysis are obtained from the Central Bank of the Republic of Türkiye (CBRT), Economic Policy Uncertainty, and Federal Reserve Bank of New York (FED) databases. While obtaining the interest rate spread, the average value of the simple overnight realized rate is taken to represent the domestic interest rate, and the spread of the secured overnight financing rate (SOFR) is taken to represent the foreign interest rate. The study period covers the period from 2018-04, when the SOFR data started, to 2022-05 when the latest portfolio flows data for Türkiye were announced. Since monthly data are used in the analysis, seasonal adjustment is applied with the X-12 method, and logarithmic transformations are provided. The net capital flows variable takes negative values in some months. For this reason, the logarithmic transformation is included in the analysis using the $y = ln(x + \sqrt{(x^2 + 1)})$ transformation following the study of Busse and Hefeker (2007). Information on the data is given in Table 1 below.

Table 1: Data Set

Variables	Definitions	Source
lnakım	Logarithmic Net Portfolio Investments	CBRT
lgeo	Logarithmic Geopolitical Risk Index	Economic Policy Uncertainty website
lff	Logarithmic Domestic-International Interest Rate Spread	CBRT and FED
lrkur	Logarithmic Real Exchange Rate ($/TL)	CBRT
dummy	Pandemic Period	For Türkiye, 0 before March-2019, 1 after

The variables used in the analysis part of the study have been used by many researchers as previously mentioned in the literature. Among the studies to identify the determinants of net capital flows Feng et al. (2023) employ the geopolitical risk index as a measure of risk, while Liu and Zhao (2022) utilize the interest rate spread as an explanatory variable. Additionally, Jongwanich and Kohpaiboon (2013) incorporate real exchange rates as an explanatory factor in their analysis.

Net portfolio investments are calculated as the sum of portfolio investments net asset acquisition and net liability formation items of the balance of payments balance sheet. A positive (negative) balance in the net asset acquisition item of portfolio investments represents capital inflow (outflow) from residents, while a positive (negative) balance in the net liability formation item of portfolio investments represents short-term capital inflow (outflow) from foreigners (Seyidoğlu, 2013: 338). To summarise, positive values of net portfolio investments indicate capital inflows to the country, while negative values indicate capital outflows from the country.

Geopolitical risk, which means geographical risk arising from environmental problems (Alptürk et al., 2021: 108), is expressed as the relationship between the policy implemented in a region and the geographical situation of the relevant place. Therefore, risks such as terrorism incidents, internal or external conflicts, etc. arising in the geographical region may have an impact on economic activity as they will direct economic policies (Blomberg et al., 2004: 1009). Caldara and Iacoviello (2018) define geopolitical risk as war, terrorist acts, and tensions between states that affect the peaceful course of international relations.

Considering the importance of geopolitical risks on macroeconomic and financial cycles, there is a need to create a geopolitical risk indicator that can be measured in real-time so that economic agents such as global and national investors, policymakers, and the public sector can perceive the risks. In this framework, Caldara and Iacoviello (2018) developed an index that measures geopolitical risks. Adopting the strategy used by Baker et al. (2013) to measure economic-political uncertainty, the authors arrived at the index value through an algorithm that checks the articles analysing geopolitical events in the leading newspapers of the countries, considering measurement errors. They concluded that the index value obtained as a result of the study accurately determines the timing and intensity of geopolitical risks and that economic activity and financial markets are affected due to the change in investment decisions during periods when risks arise (Caldara and Iacoviello, 2022: 27).

In the analysis phase of the study examining the relationship between net portfolio investments and geopolitical risks, the domestic-foreign interest rate spread and real exchange rates are preferred as control variables. The monthly average value of the realized overnight simple interest rate is used for the domestic interest rate, while the secured overnight financing rate (SOFR), which is frequently used in the literature, is used to represent the foreign interest rate.

When the related literature is analysed, LIBOR (London Inter-Bank Offered Rate) is used as the reference interest rate in many studies representing the world (international) interest rate. However, there have been international studies on the use of alternative references. Especially, after the 2008 Financial Crisis, many central banks, especially the US and Japanese central banks, have been searching for alternative reference interest rates. For the US, the FED's low influence on LIBOR, the reluctance of banks to lend to each other at LIBOR rates, and the vulnerability of LIBOR to manipulation by banks in the London money market led the FED to set an alternative interest rate (Indriawan et al., 2021: 2). In this framework, SOFR, which is a broad measure of the cost of overnight cash borrowing collateralized by US Treasury securities in the repo market, started to be used instead of LIBOR as of the end of 2021 upon the recommendation of the Alternative Reference Rates Committee (ARRC) established under the leadership of the FED.

Another explanatory variable used in the analysis is the TL/$ real exchange rate. The reason for adding the real exchange rate to the model is that it can reveal the risks for portfolio investors as an indicator of financial stability. In addition, considering the study period, a dummy variable representing the Covid-19 pandemic, which has an impact all over the world, has been added to the model exogenously.

3.1. Methodology of the Study

The linear ARDL bounds test approach developed by Pesaran et al. (2001), rather than the classical Engle-Granger and Johansen cointegration tests, gives successful results in detecting long-run relationships even if the stationarity degrees of the series are different. The ability to test the existence of a cointegration relationship between variables unless they are integrated of the second order by this method is frequently preferred especially in analyses with small samples (Gatsi and Appiah, 2020: 287).

Shin et al. (2014) introduced a non-linear ARDL model that allows asymmetric relationships between variables in the long and short run. Similar to the linear ARDL model, the non-linear ARDL model, which is based on Granger and Yoon (2002)'s idea that even if the variables are not cointegrated, there may be a hidden cointegration relationship between the negative and positive separation of the relevant variables, can give successful results in small samples by taking into account the zero-second and first degrees of integration. On the other hand, the most important advantage of the

model is that it can test both linear and nonlinear cointegration relationships (Utkulu and Ekinci, 2015: 4).

Linear (Symmetric) ARDL:

$$\Delta lnakım_t = \beta_1 lnakım_{t-1} + \beta_2 lgeo_{t-1} + \beta_3 lff_{t-1} + \beta_4 lrkur_{t-1} + \sum_{i=1}^{k} \beta_{5i} \Delta lnakım_{t-i} + \sum_{i=0}^{l} \beta_{6i} \Delta lgeo_{t-i} + \sum_{i=0}^{m} \beta_{7i} \Delta lff_{t-i} + \sum_{i=0}^{p} \beta_{8i} \Delta lrkur_{t-i} + \beta_9 Dummy_{t-i} + u_t \quad (1)$$

Equation 1 is the mathematical representation of the linear ARDL model. In the equation, β_1,..., β_4 are the long run coefficients, β_5,..., β_8 are the short run coefficients, β_9 is the coefficient of the dummy variable added to the model as an exogenous variable, Δ is the difference operator and u_t is the error term. The cointegration relationship between the series is decided according to the F_{ist} values obtained as a result of the Wald test applied to the variable coefficients in the model.

The equation in question claims the existence of a symmetric relationship between the dependent and independent variables. However, it should not be neglected that there may be asymmetric transitions between variables. The source of asymmetric relationships is seen as the market structure leading to imperfect competition, political interventions, the existence of asymmetric information, and transaction costs (Meyer and Cramon-Taubadel, 2004: 586). Since the existence of these factors is a common situation, especially in developing countries such as Türkiye, it is considered that it would be more appropriate to handle the study with the non-linear ARDL (NARDL) method.

$$\begin{aligned} lgeo_{POS} &= lgeo_t^+ = \sum_{j=1}^{t} \Delta\, lgeo_j^+ = \sum_{j=1}^{t} \max(\Delta lgeo_j, 0) \\ lgeo_{NEG} &= lgeo_t^- = \sum_{j=1}^{t} \Delta\, lgeo_j^- = \sum_{j=1}^{t} \min(\Delta lgeo_j, 0) \\ lff_{POS} &= lff_t^+ = \sum_{j=1}^{t} \Delta\, lff_j^+ = \sum_{j=1}^{t} \max(\Delta lff_j, 0) \\ lff_{NEG} &= lff_t^- = \sum_{j=1}^{t} \Delta\, lff_j^- = \sum_{j=1}^{t} \min(\Delta lff_j, 0) \\ lrkur_{POS} &= lrkur_t^+ = \sum_{j=1}^{t} \Delta\, lrkur_j^+ = \sum_{j=1}^{t} \max(\Delta lrkur_j, 0) \\ lrkur_{NEG} &= lrkur_t^- = \sum_{j=1}^{t} \Delta\, lrkur_j^- = \sum_{j=1}^{t} \min(\Delta lrkur_j, 0) \end{aligned} \quad (2)$$

Since the NARDL model allows the asymmetric effects of explanatory variables to be analysed, numbered 2 positive and negative components of these variables should be added to equation 1. In the equations, $\Delta lgeo_j^+$ represents partial increases in the logarithmic geopolitical risk index, $\Delta lgeo_j^-$ represents partial decreases, Δlff_j^+represents partial increases in the logarithmic domestic-foreign interest rate spread, Δlff_j^- represents partial decreases, $\Delta lrkur_j^+$ represents partial increases in the logarithmic real exchange rate level and finally $\Delta lrkur_j^-$ represents partial decreases.

Equation (3) shows the NARDL model equation formed by adding equation 2 to the linear ARDL equation. The "+" and "-" signs in the equation represent the positive and negative partial sums of the relevant variable, respectively. On the other hand, the symbols *k, l, m, ...s* indicate the lags of the variables.

Nonlinear (Asymmetric) ARDL:

$$\Delta lnakım_t = \gamma_1 lnakım_{t-1} + \gamma_2^+ lgeo_{t-1}^+ + \gamma_3^- lgeo_{t-1}^{\mp\gamma_4^+ lff_{t-1}^+} + \gamma_5^- lff_{t-1}^{\mp\gamma_6^+ lrkur_{t-1}^+} + \gamma_7^- lrkur_{t-1}^{\mp\sum_{i=1}^{k}\gamma_{8i}\Delta lnakım_{t-i}} + \sum_{i=0}^{l} \gamma_9^+ \Delta lgeo_{t-1}^+ + \sum_{i=0}^{m} \gamma_{10}^- \Delta lgeo_{t-1}^- + \sum_{i=0}^{n} \gamma_{11}^+ \Delta lff_{t-1}^+ + \sum_{i=0}^{p} \gamma_{12}^- \Delta lff_{t-1}^- + \sum_{i=0}^{r} \gamma_{13}^+ \Delta lrkur_{t-1}^+ + \sum_{i=0}^{s} \gamma_{14}^- \Delta lrkur_{t-1}^- + \gamma_{15} Dummy_t + u_t \quad (3)$$

Equation 3 investigates the cointegration relationship between net portfolio investments and the positive and negative components of the geopolitical risk index, domestic-foreign interest rate spread, and real exchange rate level. Accordingly, if the F statistic value of the hypothesis H_0: $\gamma_2 =$

$\gamma_3^+ = \gamma_4^- = \gamma_5^+ = \gamma_6^- = \gamma_7^+ = \gamma_8^- = 0$ is outside the lower and upper limits of the Pesaran et al. (2001) table critical values, the existence of a cointegration relationship can be mentioned. On the other hand, asymmetric relationships of variables are analysed with the help of the Wald test. Long-run asymmetric relationships are investigated by testing the H_0: $^{-\gamma_i^+}/_{\gamma_2} = {}^{-\gamma_i^-}/_{\gamma_2}$hypothesis for each variable, while short-run asymmetric relationships are investigated by testing the $H_0: \sum_i^j \gamma_i^+ = \sum_i^j \gamma_i^-$ null hypothesis (Hoang et al., 2016: 57).

If the null hypothesis cannot be rejected as a result of Wald tests, the model turns into the linear ARDL model shown in Equation 1. In this respect, depending on the acceptance or rejection of the null hypothesis H_0, asymmetric relationships may emerge in both the long and short run, only in the long run or only in the short run (Utkulu and Ekinci, 2015: 8).

This study, it is aimed to reveal the asymmetric relationship between net portfolio investments and geopolitical risks, domestic-foreign interest rate spread, and real exchange rate. In addition, it also investigated how geopolitical risks, domestic-foreign interest rate spread, and real exchange rate variables will affect net portfolio investments. The theoretical expectation is that geopolitical risks will decrease net portfolio investments, while the domestic-foreign interest rate spread will increase them. In the literature, there is an uncertain effect of the real exchange rate on net portfolio flows depending on investor perception (Aydoğan and Vardar, 2020:613).

4. Empirical Results and Discussions

This section of the study analyses the relationship between net portfolio investments and geopolitical risks and presents the empirical findings obtained from econometric analyses. Firstly, stationarity analyses of the series were performed with Philips-Perron (PP) and Augmented Dickey-Fullar (ADF) tests, and then cointegration relationships were examined. In the final stage, NARDL model findings revealing long and short-run asymmetric effects were evaluated.

Table 2: PP and ADF Unit Root Test Results

	Philips-Perron (PP)		**Augmented Dickey-Fuller (ADF)**	
Variables	Constant	Constant and Trend	Constant	Constant and Trend
Lnakım	-4,9161*	-4,8988*	-5,0460*	-5,0345*
lgeo	-3,6865*	-3,5660*	-3,6761*	-3,5511**
lff	-2,8856	-2,9088	-3,1226**	-3,0175
lrkur	0,1696	-1,2520	0,5469	-1,5066
Δlff	-6,1909*	-6,4697*	-5,9905*	-6,2118*
Δlrkur	-3,8370*	-3,7161*	-4,1147*	-4,1738*

Note: "*", and "**", show 1% and 5% confidence intervals, respectively. Schwartz Information Criterion (SIC) is used for the appropriate number of lags.

Table 2 shows whether the data used in the analysis have unit roots according to both Philips-Perron (PP) and Augmented Dickey-Fuller (ADF) tests. According to the test results, the lnakım and lgeo series is found stationary in both methods in the level case. The lff series, which represents the difference between domestic and foreign interest rates, does not contain a unit root only in the ADF test with constant. Finally, lrkur data are stationary at first difference in both methods. To sum up, it is concluded that lnakım and lgeo series are stationary at I(0), lff and lrkur series are stationary at I(1) level. This result supports the use of the ARDL method, which allows different degrees of stationarity when examining the cointegration relationship between variables. However, it is necessary to examine the linearity of the series in order to ensure the integrity of the study. The BDS test, which is commonly used in methodology, is employed to achieve this objective (Torun, 2023:6). In our study, the BDS test was also used to identify nonlinearity in the time series. According to Çinko

(2006:25), the test statistic derived from the computation of the correlation integral exhibits robustness against various forms of linearity. The null hypothesis of the BDS test, which is a nonparametric test, shows the data are independent and identical. If the null hypothesis is rejected as a result of the BDS test, it is decided that the series are not linear (Kočenda, 2001:338). The BDS test results of the series are given in Table 3.

Table 3: BDS Test Results

Var.	m=2	m=4	m=6
lnakım	0,017371*	0,047842*	0,040363*
lngeo	0,007364*	-0,000641**	-0,000145*
lnff	0,169564*	0,353553*	0,403904*
lnrkur	0,166990*	0,309424	0,335068*

Note: "*", and "**", show 1% and 5% confidence intervals, respectively.

Based on the findings presented in Table 3, the results of the BDS test indicate that the null hypothesis is rejected across all dimensions. Put differently, the series do not demonstrate linearity. At this point, conventional unit root tests such as the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests exhibit little efficacy when used to nonlinear time series analyses. The lack of consideration for nonlinearity in deterministic components results in a loss of validity for the tests (Liu and He, 2010: 1753). Kapetanios et al. (2003) introduced the KSS unit root test, commonly known as the Exponential Smooth Transition Autoregressive (ESTAR) model, as a means of assessing the presence of a nonlinear trend in a time series.

The Exponential STAR (ESTAR) model is characterized by the following equation (Kapetanios et al.,2003: 362).

$$\Delta y_t = \emptyset y_{t-1} + \gamma y_{t-1}\{1 - exp(-\theta y_{t-1}^2)\} + \varepsilon_t \quad (4)$$

In equation (4), y_t is the time series without trend, γ is the unknown parameter, $\{1 - exp(-\theta y_{t-1}^2)\}$ is the exponential transition function, and ε_t is the error term with zero mean and constant variance. The null hypothesis of the model is based on the existence of a unit root ($\emptyset$=0), while the alternative hypothesis ($\emptyset$>0) is expressed as nonlinear stationarity. Table 4 shows the KSS unit root test results for nonlinear series.

Table 4: KSS Unit Root Test Results

	Constant				Constant and Trend			
Variables	**KSS-stat**	**%1 cv**	**%5 cv**	**%10 cv**	**KSS-stat**	**%1 cv**	**%5 cv**	**%10 cv**
lnakım	-4,2610	-3,3700	-2,7100	-2,4040	-4,1520	-3,8050	-3,0820	-2,7400
lngeo	-3,0880	-3,3700	-2,7100	-2,4040	-2,9830	-3,8050	-3,0820	-2,7400
lnff	-2,5350	-3,3700	-2,7100	-2,4040	-2,5400	-3,8050	-3,0820	-2,7400
lnrkur	1,3530	-3,3700	-2,7100	-2,4040	-0,2710	-3,8050	-3,0820	-2,7400
Δlnff	-3,2190	-3,3700	-2,7060	-2,3990	-3,0810	-3,8060	-3,0770	-2,7340
Δlnrkur	-2,9600	-3,3700	-2,7060	-2,3990	-3,3560	-3,8060	-3,0770	-2,7340

Upon evaluating the outcomes of the KSS unit root test presented in Table 4, it is observed that, within the fixed model, the variables *lnakım* and *lngeo* exhibit stationarity at the 1% and 5% levels of statistical significance, respectively. Conversely, the variables *lnff* and *lnkur* demonstrate stationarity in their first differences. In the fixed and trended model, it is observed that the variables *lnakım* and *lngeo* exhibit stationarity at the level, whilst the variables *lnff* and *lnrkur* follow a process of integrated order 1 (I(1)).

Following the unit root test stage of the study, the existence of a cointegration relationship between the variables should be investigated. In this framework, if the F-statistic value obtained from the

analysis is not between the lower and upper critical values given by Pesaran et al. (2001), the null hypothesis stating that there is no cointegration relationship between the series is rejected.

Table 5: ARDL Bound Test

k	F-Statistic Value	Lower Limit I(0)	Upper Limit I(1)	Significance Levels
6	10,4614	1,75	2,87	10%
		2,04	3,24	5%
		2,32	3,59	2,5%
		2,66	4,05	1%

According to Table 5, the $F_{PSS} = 10{,}4614$ value obtained for *k=6* is outside the lower and upper limits at all significance levels. At this point, the null hypothesis stating that there is no cointegration relationship between the variables is rejected. At this point, based on the outcomes of the BDS tests conducted on the error terms derived from the series, it is evident that the null hypothesis is rejected across many dimensions, indicating that the error terms do not exhibit linearity. The obtained outcome indicates that investigation should be conducted using the nonlinear autoregressive distributed lag (NARDL) model.

Table 6: NARDL Optimal Model Choice (Top 10 Models)

	AIC		AIC
ARDL(2,3,4,4,3,2,4)	6,028	ARDL(2,3,4,4,3,4,4)	6,058
ARDL(2,3,4,4,3,3,4)	6,033	ARDL(3,3,4,4,3,2,4)	6,065
ARDL(2,0,4,4,3,4,4)	6,036	ARDL(2,4,4,4,3,3,4)	6,069
ARDL(2,0,4,4,4,4,4)	6,042	ARDL(2,4,4,4,3,2,4)	6,071
ARDL(3,3,4,4,3,3,4)	6,056	ARDL(2,3,4,4,4,3,4)	6,072

Before analyzing the long and short-run relationships between variables, it is important to determine the appropriate lags so that it will be better to interpret the findings obtained through the optimal model. Since the study is carried out with monthly data, a maximum lag level of 12 is allowed and the ARDL (2,3,4,4,4,3,2,4) model with the smallest AIC (Akaike Information Criterion) value is found to be the optimal model. In other words, it was found in equation 3 that *k=2, l=3, m=4, n=4, p=3, r=2*, and *s=4*.

Table 7: NARDL(2,3,4,4,3,2,4) Model Results

Variables	Coefficient	t-stat.
lnakım_{t-1}	-1,482017	-7,505483*
lgeo^{+}_{t-1}	12,83168	2,801081**
lgeo^{-}_{t-1}	9,809027	1,885348***
lff^{+}_{t-1}	47,26307	5,216121*
lff^{-}_{t-1}	-19,73206	-1,852611***
lrkur^{+}_{t-1}	-38,80125	-2,195460**
lrkur^{-}_{t-1}	332,6421	3,010639*
dummy^{LR}	-21,77246	-3,258323*
Δlnakım(-1)	0,260072	2,812321**
$\Delta\text{lgeo}^{+}_{t}$	9,432820	2,444775**
$\Delta\text{lgeo}^{+}_{t-1}$	7,620884	2,156552**
$\Delta\text{lgeo}^{+}_{t-2}$	12,96290	3,340246*
$\Delta\text{lgeo}^{-}_{t}$	-7,391267	-2,165206**
$\Delta\text{lgeo}^{-}_{t-1}$	-23,44822	-5,980233*
$\Delta\text{lgeo}^{-}_{t-2}$	-17,89915	-3,749835*
$\Delta\text{lgeo}^{-}_{t-3}$	-8,761829	-2,602646**
Δlff^{+}_{t}	20,54710	1,462945
$\Delta\text{lff}^{+}_{t-1}$	-68,30473	-4,787874*
$\Delta\text{lff}^{+}_{t-2}$	-83,61070	-6,131667*
$\Delta\text{lff}^{+}_{t-3}$	-31,93444	-5,062967*
Δlff^{-}_{t}	120,0938	4,315451*

Δlff^{-}_{t-1}	-17,74702	-0,508805
Δlff^{-}_{t-2}	122,5992	4,693214*
$\Delta lrkur^{+}_{t}$	-92,79689	-3,630618*
$\Delta lrkur^{+}_{t-1}$	-110,0174	-3,393134*
$\Delta lrkur^{-}_{t}$	334,4626	5,300661*
$\Delta lrkur^{-}_{t-1}$	-102,4588	-1,996872***
$\Delta lrkur^{-}_{t-2}$	233,1742	4,174767*
$\Delta lrkur^{-}_{t-3}$	115,3560	1,733077
$dummy^{SR}_{t}$	-21,77246	-8,389030*

Table 7: NARDL(2,3,4,4,3,2,4) Model Results (continued)

$L_{lgeo^{+}_{t-1}}$	-8,6582	-3,1193*
$L_{lgeo^{-}_{t-1}}$	-6,6187	-2,0368***
$L_{lff^{+}_{t-1}}$	-31,8910	-4,8180*
$L_{lff^{-}_{t-1}}$	13,3143	1,8197***
$L_{lrkur^{+}_{t-1}}$	26,1813	2,1740**
$L_{lrkur^{-}_{t-1}}$	-224,4523	-2,7310**

Note: "*", "**" and "***" show 1%, 5%, and %10 significance levels, respectively.

Table 7 shows the long and short-run results, asymmetric relationships, and diagnostic test values for the NARDL (2,3,4,4,4,3,2,4) model. The error correction coefficient obtained in the NARDL model is negative, statistically significant (at the 1% level), and takes a value between -1 and -2. This indicates that short-term shocks (imbalances) converge to the long-term equilibrium value with a gradually decreasing fluctuation instead of a monotonous convergence (Narayan and Smyth, 2006:339).

When the long-run coefficients ($L_{lgeo^{+}_{t-1}}, L_{lgeo^{-}_{t-1}}, L_{lff^{+}_{t-1}}, L_{lff^{-}_{t-1}}, L_{lrkur^{+}_{t-1}}, L_{lrkur^{-}_{t-1}}$) between the geopolitical risk index, domestic-foreign interest rate spread and real exchange rate level, and net portfolio flows are analysed, it is found that positive shocks in geopolitical risk have a decreasing effect on net portfolio investments, whereas the coefficient of negative shocks is not statistically significant. This can be interpreted as a negative shock in geopolitical risks that has an uncertain impact on net portfolio flows. On the other hand, positive shocks to the domestic-foreign interest rate spread and the real exchange rate have negative and positive effects on net portfolio investments, respectively. However, similar to geopolitical risks, the effect of negative shocks on the interest rate spread is statistically insignificant and therefore uncertain. Finally, the long-run relationship between the negative shocks observed in the real exchange rate and net portfolio investments is found to be negative.

When the short-term asymmetric effects of the NARDL model are analysed, it is observed that the positive shock in the geopolitical risk index has a significant effect on the dependent variable and an increase in the dependent variable. The negative shock, on the other hand, is significant in all lagged and unlagged values and has a decreasing effect on the dependent variable. This shows that net portfolio investments move in the same direction as the level of geopolitical risk. This effect can be interpreted as arising due to the opportunistic nature of the risk. Moreover, there are many other factors such as the nature of the geopolitical risk factor, information on the origin of portfolio investments, the level of economic and financial relations between investors and investment countries, and the volume of gains or losses of net portfolio investors. The structure of international portfolio investments depends on investors' risk aversion motives. However, the result obtained is in parallel with the study results of Nguyen et al. (2022), Tang, et al. (2023), Golitsis and Khudoykulov (2022), Feng et al. (2023), Afşar et al., (2022) and Özşahin et al.,(2022). Regarding the short-term

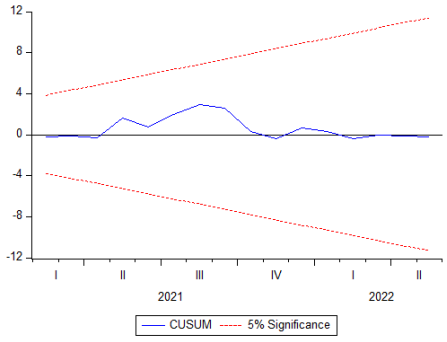
asymmetric effects of the domestic-foreign interest rate spread on net portfolio investments, it is concluded that the lagged values of positive shocks are statistically significant and have a dampening effect on net portfolio flows. On the other hand, negative shocks to the interest rate spread increase net portfolio investments. Finally, when the asymmetric effects of the real exchange rate on net portfolio investments are analysed, it is observed that positive shocks lead to a decrease in the dependent variable at all lagged and unlagged levels. In addition, it is concluded that negative shocks have a positive effect in the non-lagged and two-lagged cases. This result coincides with the results of Jongwanich and Kohpaiboon (2013), Onuorah and Akujuobi (2013), Ahmad et al. (2015), Çilingirtürk and Çetiner (2018) and Ouedraogo (2017).

In the analysis, the relationship between net portfolio investments and the pandemic period is established through a dummy variable. In this framework, when the statistical significance and coefficient value of the dummy variable included in the model as an exogenous variable is examined, it is observed that the pandemic period decreases net portfolio investments. This result supports studies with a sample of developing countries.

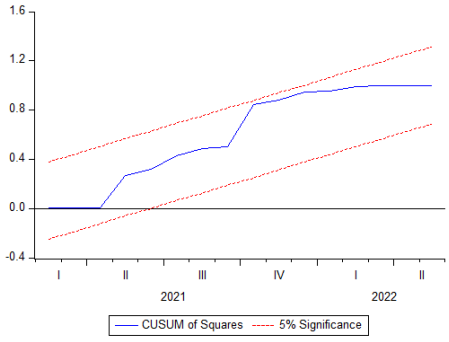
Table 8: Control Tests

R^2: 0,91	JB(Prob):1,4197(0,4917)	White(Prob):1,1997(0,3639)
Adj. R^2: 0,83	RR(Prob): 0,2479(0,8076)	LM(Prob):0,0267(0,8722)
F_{stat} (Prob):17,7970(0,000)	$W_{LR,lgeo}$ (Prob):0,9761(0,3435)	$W_{SR,lgeo}$ (Prob):2,2411(0,0395)
	$W_{LR,lff}$ (Prob):4,6952(0,0002)	$W_{SR,lff}$ (Prob):-4,4820(0,0004)
	$W_{LR,lrkur}$(Prob):-3,2198(0,0053)	$W_{SR,lrkur}$ (Prob):-4,6673(0,0003)

Figure 1: The plot of CUSUM and CUSUM of squares



Cusum



Cusum-SQ

Table 8 presents the control tests of the NARDL model. It is seen that the preferred model is successful in terms of autocorrelation, heteroscedasticity, normal distribution, and model fit tests. In addition, according to CUSUM and CUSUM SQ results in Figure 1, it is concluded that the model coefficients are stable. W_{LR} and W_{SR} show the Wald test values for testing long and short-run asymmetry relationships, respectively. Accordingly, the rejection of the null hypothesis stating that the positive and negative effects of the relevant variable are not different indicates the existence of the asymmetric relationship. When Table 8 is analysed, in the long run, all variables except the geopolitical risk index show an asymmetric effect. In the short run, all variables in the analysis have an asymmetric relationship with net portfolio investments. In other words, a positive or negative shock in the geopolitical risk index has a symmetric effect on net portfolio flows in the long run and an asymmetric effect in the short run, while the asymmetric pass-through of the domestic-foreign interest rate spread and the real exchange rate level on the dependent variable is observed both in the long and short run.

In sum, increases in geopolitical risks decrease net portfolio flows in the long run, as expected, but increase them in the short run. Decreases in geopolitical risks, on the other hand, do not yield a

significant result in the long run, but decrease net portfolio flows in the short run. The effect of changes in the domestic-foreign interest rate spread is opposite to expectations. As the difference between domestic interest rates and foreign interest rates increases, a negative effect on net portfolio flows is observed both in the long and short term. On the other hand, while the fall in the interest rate spread is not effective in the long run, it increases portfolio flows in the short run. This result can be explained by the fact that during the research period, portfolio investors perceived the interest rate hikes in the country as risky and wanted to invest in economies they trust at the expense of making less profit. The impact of the real exchange rate on net portfolio flows differs in the long and short run. Positive divergences in the real exchange rate increase portfolio flows in the long run and decrease them in the short run, while negative divergences have the opposite effect, decreasing portfolio investments in the long run and increasing them in the short run.

5. Conclusion

Based on the results of this study, it is shown that both positive and negative shocks in geopolitical risk exhibit a symmetrical impact on net portfolio flows over an extended period of time while demonstrating an asymmetrical influence in the short term. Further, an escalation in risk leads to a rise in capital flight, but a reduction in risk does not have any discernible impact. In the immediate term, a rise in risk levels leads to a corresponding increase in capital inflows, and conversely, a decrease in risk levels leads to a decrease in capital inflows. The obtained outcome aligns with the theoretical prediction, indicating that over an extended period, investors make decisions driven by a feeling of uncertainty over the economic prospects of a nation. Conversely, in the short term, their actions are motivated by the desire to capitalize on the potential returns resulting from risk.

Geopolitical risks refer to the complex interplay between military, political, and economic concerns within a nation, which are influenced by its geographical context. This particular form of risk, sometimes referred to as spatial risk, possesses the ability to directly impact investor decision-making processes and thus alter the direction of capital flows. This transformation has the potential to provide both positive and negative outcomes, since it may present possibilities for investors to procure assets. The responsibility for accurately identifying and comprehending risks lies with individual investors, while countries aiming to attract portfolio investments must prioritize the creation of a secure environment that minimizes risks.

In order to enhance the appeal of developing nations such as Türkiye to foreign investors, policymakers must undertake crucial measures aimed at enhancing specific macroeconomic indicators, augmenting legal and administrative transparency, fortifying institutions, and implementing rational policies to cultivate investor trust.

This study has certain limitations with respect to its sample size, wherein some variables, such as foreign direct investments, have been excluded from the model to streamline the analysis. Enhancing the study could be achieved by including variables such as political stability and/or a measure of democracy in the model, in addition to geopolitical concerns. This would allow for the examination of potential non-linear impacts. It is hoped that the findings of this study will provide valuable insights for future research endeavors.

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