

# THE ROLE OF CAPITAL FLOWS IN THE INTERNATIONAL TRANSMISSION OF US MONETARY POLICY: THE CASE OF TURKEY\*

ABD Para Politikasının Uluslararası Aktarımında Sermaye Akımlarının Rolü: Türkiye Örneđi

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## Abstract

This article aims to examine the impacts of US monetary policy (MP) changes on the Turkish economy. A Structural Vector Autoregressive (SVAR) model is estimated for the period 2002:01–2017:12, during which a flexible exchange rate regime was adopted in the Turkish economy. According to the impulse-response analysis, the Turkish interest rate responds positively and significantly to the US Effective Federal Funds Rate (EFFR). This result shows that the Central Bank of the Republic of Turkey's (CBRT) MP follows the FED's MP, consistent with the dilemma hypothesis of Rey (2015). The analysis also demonstrates that both the EFFR and the VIX have a negative impact on net total capital inflows to the Turkish economy. The impulse-responses for the three components of net capital inflows indicate important conclusions. Firstly, neither EFFR nor VIX has a significant impact on Net Foreign Direct Investment (NFDI) inflows. Secondly, Net Portfolio Investments (NPI) respond significantly to the VIX but not to the EFFR. Thirdly, Net Other Investments (NOI) respond significantly to the EFFR but not to the VIX. These findings indicate that the NOI component plays a direct and major role in the emergence of the US MP's spillover effects on the Turkish MP.

## Öz

Bu makale, ABD para politikasındaki deđişikliklerin Türkiye ekonomisi üzerindeki etkilerini incelemeyi amaçlamaktadır. Türkiye ekonomisinde esnek döviz kuru rejiminin benimsendiđi 2002:01–2017:12 dönemi için bir Yapısal Vektör Otoregresif (SVAR) model tahmin edilmektedir. Etki-tepki analizine göre, Türkiye faiz oranı, ABD Efektif Federal Fon Oranı'na (EFFR) pozitif ve anlamlı şekilde tepki vermektedir. Bu sonuç, Rey'in (2015) ikili açmaz hipoteziyle tutarlı biçimde, Türkiye Cumhuriyet Merkez Bankası'nın (TCMB) para politikasının FED'in para politikasını takip ettiđini göstermektedir. Analiz aynı zamanda hem EFFR'nin hem de VIX'in Türkiye ekonomisine yönelik net toplam sermaye giriřleri üzerinde negatif etkiye sahip olduđunu kanıtlamaktadır. Net sermaye giriřlerinin üç bileřeni için elde edilen etki-tepkiler, önemli sonuçlara işaret etmektedir. İlk olarak ne EFFR'nin ne de VIX'in Net Yabancı Doğrudan Yatırım (NFDI) giriřleri üzerinde anlamlı bir etkisi bulunmamaktadır. İkinci olarak, Net Portföy Yatırımlarının (NPI) VIX'e tepkisi anlamlı iken, EFFR'ye tepkisi anlamlı deđildir. Üçüncüsü, Net Diđer Yatırımların (NOI) EFFR'ye tepkisi anlamlı iken, VIX'e tepkisi anlamlı deđildir. Bu bulgular, ABD para politikasının Türkiye para politikası üzerindeki yayılma etkilerinin ortaya çıkmasında, NOI bileřeninin doğrudan ve önemli bir rol oynadıđını göstermektedir.

## Keywords:

US Monetary Policy Spillovers, Capital Flows, Global Risk, International Risk-taking

## JEL Codes:

E52, E58, F32, F42.

## Anahtar

## Kelimeler:

ABD Para Politikası Yayılımları, Sermaye Akımları, Küresel Risk, Uluslararası Risk-alma

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## 1. Introduction

After the 2008 Global Financial Crisis, discussions on the effects of center countries' MP practices on the economic variables and MPs of peripheral countries have gained momentum. In this context, Rey (2015) argued that in an environment where international capital moves freely, MP in Emerging Market Economies (EMEs) is dependent on US MP even under a flexible exchange rate regime and claimed that the traditional open economy policy trilemma has turned into a dilemma. Accordingly, a change in US MP leads to a change in international risk perception, shaping a Global Financial Cycle (GFCy) in asset prices, credits, and capital flows. According to Rey (2015), the VIX index, which is an indicator of global risk and uncertainty, exhibits a high correlation with the GFCy. Therefore, US MP is accepted as one of the determinants of the GFCy (Kalemli-Özcan, 2019; Miranda-Agrippino and Rey, 2020). An expansionary MP that leads to a decrease in the Federal Funds Rate (FFR) in the US economy causes a decrease in global risk perception (i.e., a decrease in the VIX). As a result, there is a rise in capital inflows to EMEs. These capital inflows cause credit expansion and local currency appreciation in EMEs (Gourinchas and Obstfeld, 2012), while they feed domestic asset price bubbles and create risks that threaten financial stability (Ferrero et al., 2022). In order to avoid the negative impact of excessive real appreciation of the local currency on the export sector, foreign exchange market interventions are seen in EMEs. In addition, the potential for increased capital inflows to lead to excessive debt and overheating in the economy is also among the reasons for foreign exchange market interventions (Kalemli-Özcan, 2019). Therefore, monetary expansion (and a decrease in interest rates) occurs as a result of foreign exchange interventions made for the reasons mentioned above in EMEs. A contractionary MP that leads to a rise in the FFR in the US economy causes capital outflows from EMEs and pressures for local currency depreciation. In EMEs where domestic liability dollarization is high, monetary authorities may intervene in the foreign exchange market (with fear of floating) to avoid the potential damage that local currency depreciation would inflict on the balance sheets of indebted economic units (Calvo and Reinhart, 2002). As a result, the domestic economy experiences monetary contraction (and an increase in interest rates). The processes described above reveal that MP in EMEs tends to follow US MP.

This study addresses the hypothesis that the international risk-taking channel plays an important role in the transmission of the effects of US MP on the MP of the Turkish economy. Borio and Zhu (2012) state that risk perception has a role in the transmission of MP in a closed economy. Accordingly, local MP affects financial conditions and the real economy by changing investors' willingness to take risks. This mechanism is defined by the authors as the risk-taking channel of MP. On the other hand, the transmission of US MP between countries by affecting the risk appetite of international investors is called the international risk-taking channel (Yıldırım, 2022). Bruno and Shin (2015a) explain the international risk-taking channel with a model in which regional banks, that borrow in USD from global banks, lend to local borrowers. The spread between the local loan rate and the USD financing rate rises in this context as the US interest rate declines. As a result, recipient economies experience a loosening of credit standards and an acceleration of bank capital flows. This lowers the dollar funding cost. According to this model, a loosening of US MP will lead to increased cross-border liabilities and, via the bank leverage channel, will have a spillover effect on global financial conditions. Bruno and Shin (2015b) provide evidence supporting the international risk-taking channel by demonstrating that an increase in FFR causes a decrease in banking flows and international bank leverage. Jordà et

al. (2019) show that the co-movement in global stock markets has increased sharply over the last three decades and that fluctuations in risk premiums explain a large part of this synchronization in stocks. They state that this situation can be explained by the prominent role played by leveraged financial intermediaries and international banks in the global economy. The authors also prove that the US MP has been a significant source of risk perception fluctuations in global stock markets in recent years. They argue that these fluctuations are transmitted to economies regardless of exchange rate regimes and that this finding is suggestive proof that MP in the center economy triggers fluctuations in risk appetite that appear independent of local monetary conditions. Kalemli-Özcan (2019) argues that the international risk spillover channel of MP is generally effective in EMEs where local banks intermediate capital flows. Accordingly, when US interest rates and global risks are low, domestic banks in EMEs borrow more cheaply from global markets, and then provide loans to domestic firms and households more cheaply. In this environment where capital inflows to the country increase, banks' low funding costs transform into low borrowing costs for domestic economic units. When US interest rates and global risk perception increase, banks are forced to provide less credit due to capital outflows from the country, which means an increase in the borrowing costs of domestic economic units. This process results in policy spillovers between the US and EMEs. Miranda-Agrippino and Rey (2020) prove how US monetary contractions cause global credit flows to sharply reduce, international financial intermediaries' leverage to decrease, domestic credit levels globally to shrink, and external financial conditions to tighten. The authors note that countries with flexible exchange rates are also disposed to the same spillovers. Morais et al. (2019) demonstrate that lower interest rates and quantitative easing in high-income countries (US, UK, and Eurozone) lead international banks to enhance the supply of credit in EMEs to get more returns.

This study aims to investigate the effects of US MP changes on Turkey's MP practices and the transmission channels of these effects. For this purpose, a Structural Vector Autoregressive (SVAR) model is estimated for the period 2002:01-2017:12, in which the flexible exchange rate regime was implemented in the Turkish economy. The data set after 2017 was not included in order to avoid deviations in the analysis due to the foreign exchange rate shock experienced in the country in 2018 and, accordingly, the resulting changing monetary policies. The following topics will be examined using the model. First, it is investigated whether changes in the FFR, which is an indicator of FED MP, have an effect on the MP of the Turkish economy. According to the estimation results in this article, the Turkish interest rate responds positively to an increase in the FFR. This result indicates a finding supporting the dilemma hypothesis and shows that there is a transmission mechanism that allows changes in US MP to spread to the Turkish economy. Second, it is questioned whether capital flows play a role in the transmission of changes in US MP and VIX to the Turkish economy. Eller et al. (2020) demonstrate how changes in the GFCy have a significant impact on changes in capital flows that are country-specific. In contrast, Cerutti et al. (2019a) state that although the common movement in capital flows focuses on bank, portfolio debt, and portfolio equity flows, global conditions do not affect all EMEs in a similar way. Cerutti et al. (2019b) find that changes in the GFCy have little explanatory power on the changes in capital flows. The estimation results of the model in this article prove that both the FFR and the VIX significantly affect total capital inflows to the Turkish economy. Therefore, it is understood that capital inflows play a role in the spillover mechanism created by the US MP on the Turkish economy. Third, it investigates

which components of capital inflows play an important role in the transmission of the effects of the FED MP on the Turkish economy. Avdjiev et al. (2018) emphasize that when investigating the relationship between international capital flows and global factors, it is necessary to distinguish between the different components of these flows. Habib and Venditti (2019) examine the transmission of changes in global risk to different components of capital flows. They prove that the effects of global risk on the domestic economy are mainly transmitted through the other investment component. There are few studies in the literature on the relative importance of the components of capital flows in the international transmission of US MP. It is expected that this article will contribute to this relatively less studied aspect of the literature. The empirical findings reached in this article highlight the role of the other investments component in the transmission of the spillover effects created by changes in the FFR on the Turkish economy.

The structure of the article is as follows. Section 2 presents a literature review, which includes Pull/Push Drives of Capital Flows, Discussions on Dilemma/Trilemma, and Spillover Effects of US Monetary Policy. Section 3 describes the empirical model of the analysis, which is SVAR, explanations of the data, and ordering of the variables. Section 4 has interpretations of Impulse-Response and Variance Decomposition Analyses’ findings. Finally, the last section concludes the article.

## **2. Literature Review**

This study is related to three branches of literature: pull/push drivers of capital flows, discussions on dilemma versus trilemma, and spillovers of center countries’ monetary policies.

### **2.1. Pull/Push Drivers of Capital Flows**

The first strand of literature related to this article investigates the push and pull factors that lead capital flows, pioneered by Calvo et al. (1993, 1996) and Fernandez-Arias (1996). While push factors reflect global conditions, pull factors refer to recipient country-specific conditions. Push factors in the literature include risk perception indicators such as VIX, indicators reflecting monetary conditions in core countries such as policy interest rate and global liquidity, and real activity indicators such as growth rate in center economies and commodity prices. Pull factors include domestic growth rate, asset return indicators, sovereign risk indicators, financial market depth, and institutional quality measures. The literature provides clear empirical proof on the role of push factors on international capital flows. Koepke (2019) conducted a qualitative meta-analysis with 34 empirical studies on the subject. As a result of the analysis, it is determined that the two push (global) factors that have the strongest effect on portfolio flows and banking flows are global risk perception and center country interest rates. Milesi-Ferretti and Tille (2011), Fratzscher (2012), Broner et al. (2013), Rey (2015), Ahmed and Zlate (2014), Ananchotikul and Zhang (2014) and Koepke (2018) discover a negative and significant effect of global risk perception on portfolio flows; while Fernandez-Arias (1996), Taylor and Sarno (1997), World Bank (1997), Chuhan et al. (1998), Montiel and Reinhart (1999), Baek (2006), Dahlhaus and Vasishtha (2014), Feroli et al. (2014), Koepke (2018) and Fratzscher et al. (2016) reach strong findings about a negative and significant effect of the center countries’ interest rates on portfolio flows. Studies that identify

strong evidence of a negative impact of global risk perception on banking flows include Jeanneau and Micu (2002), Ferrucci et al. (2004), Takats (2010), Milesi-Ferretti and Tille (2011), Rey (2015), Bruno and Shin (2015b), Herrmann and Mihaljek (2013) and Bruno and Shin (2015a). A few studies identify relatively weak evidence of a negative impact of center country interest rates on banking flows (Cerutti et al., 2014; Ghosh et al., 2014; Bruno and Shin, 2015b). Forbes and Warnock (2012) identify extreme movements in gross capital inflows and outflows and find that sudden stops (sharp decreases in gross capital inflows) and retrenchments (sharp decreases in gross capital outflows) accompany global factors, especially global risk changes. Scheubel et al. (2019) find that the GFCy has a significant effect on the probability of surges (sharp increases in gross capital inflows), sudden stops, and capital flight (sharp increases in gross capital outflows). CGFS (2021) states that the composition of capital flows shifted from banking flows to portfolio flows after the Global Crisis, and argues that this situation weakens the role of VIX in determining aggregate capital flows. In contrast, Buono et al. (2020) found that the VIX became more important for portfolio debt flows after the expectation of a decrease in quantitative easing in 2013. This article investigates the impact of two push factors (the US FFR and the VIX) on net capital inflows to the Turkish economy for the period under consideration.

## **2.2. Discussions on Dilemma/Trilemma**

The second strand of literature related to this article addresses the debates on open economy policy impasses. The Mundellian trilemma hypothesis argues that it is impossible to have a fixed exchange rate, perfect capital mobility, and MP independence simultaneously; just two of these three can coexist (Obstfeld and Taylor, 1998). In contrast, Rey (2015) argues that in an environment where international capital moves freely, the Mundellian trilemma turns into a dilemma. Accordingly, in a globalized financial world with different capital flows and financial market imperfections, the MPs of the center countries can affect the monetary conditions and financial stability of other countries. A flexible exchange rate regime might not be enough in such a world to protect the local economy from outside influences and to provide the independence of MP (Rey, 2016). If the domestic policy rate does not closely follow it, it is often regarded as evidence of MP autonomy with respect to the center country. Additionally, the fact that the effect of the center country interest rate on domestic interest rates, especially in EMEs, depends on the applied exchange rate regime, is interpreted as the validity of the trilemma. When a fixed exchange rate regime is applied by an open economy, the country's MP is expected to be more affected by the US interest policies, while it is expected to be less affected in a flexible exchange rate regime. Accordingly, the autonomy of MP is higher in a flexible exchange rate. In a fixed exchange rate, MP becomes more dependent on the center country's MPs. On the other hand, the fact that center country interest policies, independent of the exchange rate regime, lead to effects that weaken the MP autonomy of EMEs is interpreted as the validity of the dilemma.

Obstfeld et al. (2019) show that global financial shocks are transmitted more to economies with fixed exchange rates than to those with relatively flexible rates, using panel data from 40 EMEs. Similarly, Habib and Venditti (2019) find that countries adopting a tight fixed exchange rate regime in an environment of financial openness are more sensitive to global risk with panel data from 50 countries. Georgiadis and Mehl (2015) find that under unrestricted

capital mobility, the preference of exchange rate regime is a determinant of monetary autonomy with a GVAR model using data from 61 developed and developing countries. Aizenman et al. (2016) prove that the implemented exchange rate regime affects the susceptibility degree to changes in financial circumstances or policies in core economies by using panel data from 100 countries. Herwartz and Roestel (2017) show that monetary autonomy decreases as exchange rate flexibility decreases in an environment of open capital accounts with panel data from 20 countries; Conversely, as exchange rate stability increases, the need to follow world interest rates and hence monetary dependence increases. Ligonniere (2018) shows that MP autonomy is lost in economies that are financially open and have a fixed exchange rate regime with a panel data set of 161 countries. Bekaert and Mehli (2019) find that the pass-through from the center country interest rate to local interest rates depends on the extent of global financial integration and the exchange rate regime applied, and that in a financially integrated environment, countries with flexible exchange rate regimes are exposed to much less pass-through than countries with fixed exchange rate regimes. Obstfeld et al. (2005), Goldberg (2013), Klein and Shambaugh (2015), and Obstfeld (2015) find that short-term interest rates are less correlated with the center country interest rate for countries with flexible exchange rates than for countries with fixed exchange rates. This situation is interpreted as the validity of the trilemma view.

On the other hand, Rey (2016) argues that the fact that policy rates or short-term interest rates are less correlated under flexible exchange rates is not sufficient to show that economies can have an independent MP by implementing flexible exchange rates. Rey (2015) uses VAR analysis to show that the MP of the center country affects the leverage ratios of global institutions in the international financial system, capital flows and credit growth, leading to GFCy; and that the GFCy affects the national MPs of the peripheral countries under capital mobility, independently of the exchange rate regime. Therefore, national MP remains dependent on global monetary conditions even under flexible exchange rates. Hofmann and Takats (2015) use panel data analysis to show that there is a spillover effect from the FFR to interest rates in EMEs and small developed economies under both fixed and flexible exchange rate regimes. Similarly, Edwards (2015) finds that in countries with flexible exchange rates and open capital accounts, FED policies affect domestic interest rates, and therefore these countries tend to import FED policies. Anaya et al. (2017) state that US monetary changes after the Global Crisis affected the MP stances of 19 EMEs, and that this finding is independent of the characteristics of the countries such as financial openness, institutional quality and exchange rate regime. Gülşen and Özmen (2020) show that local interest rates in both EMEs and advanced economies respond importantly to the center country interest rate and global financial conditions; however, the effect of foreign interest rates is greater in EMEs than in advanced economies. The findings of the study prove that exchange rate flexibility is ineffective in isolating countries' central bank policy actions against US MP, consistent with the dilemma view. Moreover, the findings prove that under flexible exchange rate regimes, the impact of FED interest rates has increased significantly in both EMEs and advanced economies after the Global Financial Crisis. Using a dynamic factor model and a global Bayesian VAR, Miranda-Agrippino and Rey (2020) demonstrate the significance of FED MP as one of the drivers of the GFCy. The results demonstrate that significant global financial intermediary deleveraging, a rise in overall risk aversion, a contraction of the global component of asset values and a decline in international credit, an expansion of corporate bond spreads, and a decline in gross capital flows occurred after the US experienced monetary contractions. They emphasized that these results also hold

for the economies with floating exchange rates. Estimating dynamic panel regressions for 26 small open economies with floating exchange rate regimes, Georgiadis and Zhu (2021) discover that even after adjusting for macroeconomic fundamentals, MP in these economies reacts to MP in base country. The authors discover that tighter base-country MP and foreign currency exposures resulting from debt instruments exacerbate the evidence for ‘fear of floating’ caused by concerns about financial stability. In short, the findings in all these studies may be interpreted as the validity of the dilemma.

There are also studies in the literature that conclude that the dilemma is partially valid. Han and Wei (2018) show with panel data of 28 countries that when the center country tightens its MP, flexible exchange rates provide monetary autonomy in peripheral countries, but when the center country loosens its MP, loose MPs are also implemented in peripheral countries due to fear of exchange rate appreciation. A similar result is found by Eterovic et al. (2022) using panel data of 21 countries implementing flexible exchange rate regimes. The authors prove that the spillover effects of the FED MP on other countries are larger in periods of FED interest rate cuts than in periods of interest rate increases. These results mean that the partial dilemma is valid. Another study that concludes that the dilemma is partially valid is Cheng and Rajan (2020), who conducted panel data analysis with data from 88 countries. However, unlike the previous two studies, this study shows that flexible exchange rates provide a degree of monetary autonomy for peripheral countries that do not implement capital controls when the center economy loosens its MP. It is also proven that when the center country implements a tight MP, peripheral countries also follow a tight MP due to fear of capital outflow or reserve loss. This study examines the effects of changes in the FFR on Turkey's monetary policy by focusing on the period during which a flexible exchange rate regime was implemented. The study reaches conclusions in favor of the dilemma that Turkey's MP was affected by the US MP under the floating exchange rate regime.

### **2.3. Spillover Effects of US Monetary Policy**

The third strand of literature related to this article is related to the spillover effects of US MP on EMEs. There is a large body of literature on international MP shock transmission to EMEs. The literature shows that center country monetary shocks have spillovers on emerging countries' variables such as interest rates, equity prices, exchange rates, domestic credits, and capital flows. Akıncı and Queralto's (2018) two-country quantitative macroeconomic model shows how US MP shocks can have a significant effect on a number of variables in EMEs.

According to Dağlaroğlu et al. (2018), after 2010, the US MP and other global financial factor(s) have become remarkable influences on Turkey's MP. Their findings demonstrate how important global financial indicators like the VIX and EMBI have become when determining the short-term policy rate. Using SVAR methodology, Epstein et al. (2019) demonstrate that even though EME interest rates showed a strong on-impact rise in response to increased global financial risk, they followed the same trajectory as US interest rates as the increase in global financial risk subsided, persistently declining and remaining below the mean over the medium term. Degasperi et al. (2023) contend that following a US tightening, fragile five countries (Turkey, Brazil, South Africa, Chile, and Mexico) experience steep devaluations of the domestic currency, while interest rates spike up due to the response of the interest rate and the rise in risk premia.

Gilchrist et al. (2019) show that the US MP shock has a spillover effect on foreign bond yields. Hofmann et al. (2020) conclude that one key factor influencing investor risk-taking and, hence, EME domestic currency bond spreads is exchange rates. Their results show that when EME currencies appreciate relative to the dollar, the global investors' optimum portfolio choice under standard mean-variance preferences results in higher portfolio flows into EME local currency bond markets. Using the SVAR model, Bernoth and Herwartz (2021) find that sovereign risk rises when the local currency depreciates in relation to the US dollar and that the non-public sector's currency mismatch has an important role in the transmission of exchange rate shocks to country risk. Estimating the SVAR model with 4 inflation targeting EMEs (Turkey, Indonesia, Brazil and South Africa) data, Yıldırım (2022) finds that EME central banks tend to react in a procyclical manner to global financial risk shocks at first, as changes in sovereign risk and exchange rates pose a threat to financial stability by encouraging risk-taking behavior. The initial procyclical policy response can also be justified by examining the inflation patterns and the extent of liability dollarization. Gilchrist et al. (2022) discovered that there is a consistent and noteworthy influence of global financial risk on sovereign bond spreads through panel regressions and local projection analysis for 50 countries.

Gajewski et al. (2019) find that MP shocks in center countries are transmitted to the financial markets of small and open emerging countries (Chile, Korea, and Poland) through international banks. According to Schmidt et al. (2018), shifts in MP in center countries (US and UK) cause changes in the interest rate differential and credit availability in peripheral nations like France and Italy, which in turn cause changes in financial conditions and credit rationing in these peripheral countries. Using bank-level data from twelve Asian countries, Lee and Bowdler (2022) show that banks cut loan growth rates, and the interest rates charged on bank loans increase in response to an increase in the FFR. Di Giovanni et al. (2022) demonstrate that increased exposure of domestic banks to international capital markets allows them to transmit the GFCy locally. They also demonstrate that an improvement in international financial circumstances results in lower borrowing costs and a rise in domestic lending in Turkey.

Estimating a GVAR model, Tumala et al. (2021) demonstrate that the MP decisions of the US and China have a significant effect on the interest rates and exchange rates in Nigeria and South Africa. Dedola et al. (2017), using Bayesian VAR with 36 developed and EMEs, find that the majority of the sample countries experienced a depreciation against the dollar and a recession as a result of an unexpected tightening of US MP. According to Jordà et al. (2019), the US MP has been a significant factor in the fluctuations in risk appetite that have been observed in international equity markets. Dées and Galesi (2021), using the GVAR model for 33 countries' data, show that the US monetary easing triggers increases in international equity prices and surges of gross capital inflows in other countries.

Fratzscher et al. (2018) argued that the pro-cyclicality of capital flows to EMEs has been greatly aggravated by Fed policy measures, which magnify portfolio inflows during times when capital is already large and raise outflows even further during times when capital flees EMEs. According to Tian et al. (2022), a rise in the US interest rate results in a decrease in capital inflow to China, which has a negative spillover effect on the country's economy and lowers real output. Regarding the components of capital flows, Georgiadis and Jarociński (2023) find that US MP spillovers mostly affect global investors' risk perception and decrease portfolio inflows to EMEs through financial channels. Converse et al. (2020) find that in countries where exchange-traded funds hold a larger share of the equity market relative to mutual funds, global

financial conditions are more significantly sensitive to the total cross-border equity flows and returns. Their results mean that the rising role of exchange-traded funds as a channel for international capital flows has amplified the GFCy in EMEs.

In summary, the literature finds that capital movements have an important role in the transmission of US MP to other economies. However, the issue of which components of capital flows play a more important role in the transmission mechanism has been addressed less. This article investigates the role of different components of capital flows in the transmission of US monetary changes to the Turkish economy. Thus, it is expected that the article will contribute to a relatively less studied aspect of the literature.

### 3. Data and Methodology

#### 3.1. Structural VAR Model

A reduced form VAR process is presented as:

$$y_t = A_1 y_{t-1} + \dots + A_p y_{t-p} + u_t \quad (1)$$

where,  $y_t$  is a  $(K \times 1)$  vector of endogenous variables, the  $A_i$ 's ( $i=1, \dots, p$ ) are  $(K \times K)$  coefficient matrices and  $u_t$  is  $K$ -dimensional white noise with  $u_t \sim (0, \Sigma u)$  (Lütkepohl, 2005). Errors ( $u_t$ ) are assumed to be serially uncorrelated. The basic VAR model explains the endogenous variables solely by their history. In order to model possible contemporaneous relations between the variables, a structural form of the VAR is needed:

$$A y_t = A_1^* y_{t-1} + \dots + A_p^* y_{t-p} + B e_t \quad (2)$$

The structural errors,  $e_t$ , are assumed to be serially and cross-sectionally uncorrelated. The  $A_i^*$  ( $i=1, \dots, p$ ) are  $K \times K$  coefficient matrices. The relationship between error terms in the reduced and structural forms is the following:

$$u_t = A^{-1} B e_t \quad (3)$$

Also, the relationship between the variance-covariance matrix of  $u_t$  (observed) and the variance-covariance matrix of  $e_t$  (unobserved) will be:

$$\Sigma_u = A^{-1} B B' (A^{-1})' \quad (4)$$

The model for shocks is can be written as:

$$A u_t = B e_t \quad (5)$$

The main purpose is to decompose the structural errors ( $e_t$ ) into components caused by the unexplained contemporary reduced-form shocks ( $u_t$ ). In order to highlight contemporaneous relations, it is necessary to impose  $2K^2 - K(K+1)/2$  restrictions on the  $A$  and  $B$  matrices to be able to exactly identify the system. In this article, structural shocks are determined by imposing a zero restriction on the contemporaneous structural parameters in matrix  $A$ .

#### 3.2. Data

The dataset includes five variables, with two US variables and three local variables. The US interbank market overnight interest rate (effective FFR) is used as a proxy for US MP.

EFFR is the weighted average of the interest rate subject to overnight swap transactions of US depository institutions' funds held at the FED. Although the effective FFR is primarily determined by the market, it is affected by the open market operations carried out by the FED to achieve the FFR target.

The second variable considered regarding the US economy is the VIX index, which is widely used as an indicator of global risk and uncertainty. VIX measures the market expectation regarding the short-term volatility exhibited by stock index option prices on the Chicago Stock Exchange.

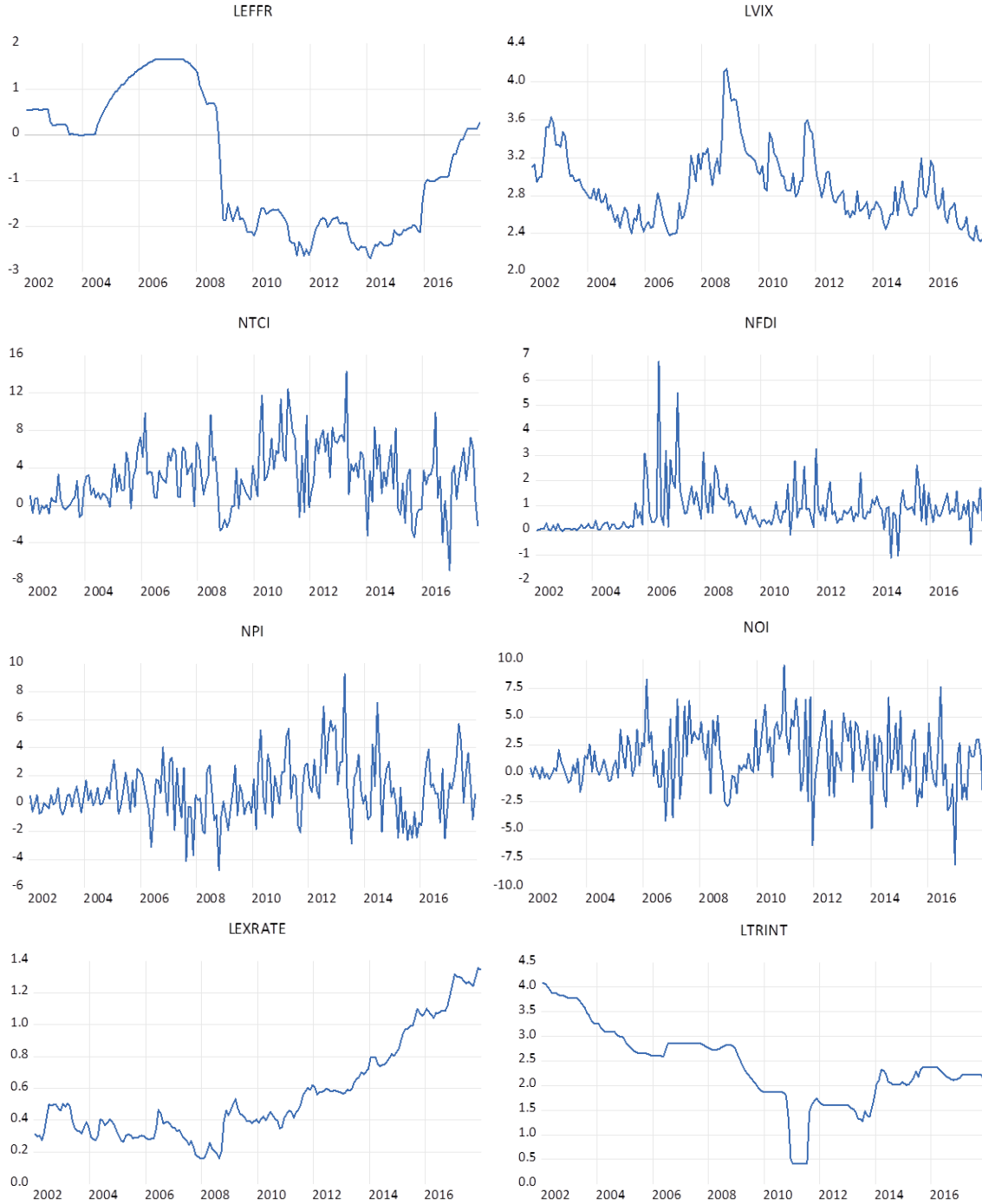
To determine the role of international capital movements in the transmission of changes in US interest rate and global risk perception to the Turkish economy, NTCI was used in the model. To determine which component of net capital inflows played a more important role in this transmission, NFDI, NPI, and NOI components were included in the model separately. Net capital inflows were found by subtracting the net asset acquisition item from the net liability formation item in the balance of payments presentation. Therefore, net capital inflows for each component were calculated as the difference between gross capital inflows and gross capital outflows.

Another variable in the model regarding the Turkish economy is related to the exchange rate. Considering that exchange rate changes may have an important role in the emergence of the possible effects of the US MP transmitted through net capital inflows, the Dollar/TL exchange rate was included.

Finally, the Turkish interbank market overnight interest rate was added to the model to represent the Central Bank of the Republic of Turkey's (CBRT's) MP. EFFR and VIX data regarding the US economy were obtained from the St. Louis FED database. Net capital inflows, exchange rate, and interest rate data for the Turkish economy were obtained from the Electronic Data Distribution System of CBRT. EFFR, VIX, exchange rate, and Turkish overnight interest rate data were used in the estimations by taking the logarithmic difference, and the series regarding net capital inflows were used by taking the first differences. A dummy representing the Global Financial Crisis is also included as an exogenous variable. This takes the value 1 for the period October 2008-December 2008, and takes 0 otherwise. Explanations regarding the data in the model are provided in Table 1. Figure 1 shows the time series of the variables in the model for the analysis period.

**Table 1. Explanations of Data**

<b>Variable</b>	<b>Explanation</b>
DLEFFR	Change in the logarithm of the effective federal funds rate compared to the previous period
DLVIX	Change in the logarithm of the VIX compared to the previous period
DNTCI	Change in net total capital inflows compared to the previous period (billion USD)
DNFDI	Change in net foreign direct investment inflows compared to the previous period (billion USD)
DNPI	Change in net portfolio inflows compared to the previous period (billion USD)
DNOI	Change in net other investment inflows compared to the previous period (billion USD)
DLEXRATE	Change in the logarithm of the nominal Dollar/TL exchange rate compared to the previous period
DLTRINT	Change in the logarithm of the interbank market overnight interest rate compared to the previous period



**Figure 1. Time Series Plots of the Variables in Levels**

**Notes:** The figure plots the levels of the logarithm of the effective federal funds rate (LEFFR), the logarithm of the VIX (LVIX), net total capital inflows (NTCI), net foreign direct investment inflows (NFDI), net portfolio inflows (NPI), net other investment inflows (NOI), the logarithm of the nominal Dollar/TL exchange rate (LEXRATE) and the logarithm of the Turkish interbank market overnight interest rate for the period 2002:01-2017:12.

### 3.3. Ordering of the Variables

It is important to correctly order the variables when constructing the SVAR model matrix. The ordering of the variables is made from the most exogenous variable to the most endogenous one. The ordering of the variables included in the SVAR model of the Turkish economy was made by taking into account theoretical predictions. Since the Turkish economy is a small and open economy, it should be assumed that it cannot affect global variables (Obsfeld and Rogoff, 1996). Therefore, global variables are included before domestic variables in the model. After making a distinction between global and domestic variables, a classification is also made between real variables and financial variables. The basic condition behind dynamic adjustment in small open economy models is that financial markets are cleared faster than real markets (Obsfeld and Rogoff, 1996). Therefore, financial variables are listed after real variables in the model. Thus, the ordering is made as follows; {EFFR, VIX, NTCI, EXRATE, TRINT}. The most exogenous variable of the model is the EFFR. It is assumed that this variable is affected by only its own shocks and affects all variables following it, contemporaneously. And it is assumed that VIX is affected by EFFR shocks and its own shocks, and affects all other variables, contemporaneously. The assumption that VIX is contemporaneously affected by EFFR is based on the risk-taking channel of MP (Bekaert et al., 2013). According to this channel, an increase in the EFFR is followed by a rise in the VIX index. Rising EFFR also leads to decreasing leverage ratios of international institutions as a result of the increase in risk perception in international markets. This results in decreasing international capital flows (Bruno and Shin, 2015b; Rey, 2015). Thus, immediately after the global variables, the sequence continues with domestic variables. It is assumed that NTCI is affected by global variables and that it affects the nominal exchange rate (EXRATE) and the Interbank Market Overnight Interest Rate of Turkey (TRINT), contemporaneously. It is also assumed that the EXRATE affects the TRINT, contemporaneously. The TRINT, which is assumed to be contemporaneously affected by all the variables in the model, is ordered last. This setup creates a lower triangular matrix A, where the first variable is not contemporaneously affected by the other variables in the system. The next variable is affected by the first variable and is not affected by the variables below it, contemporaneously. The process continues until the last variable is affected by all the variables, contemporaneously. Therefore, the following restrictions are imposed on the contemporaneous structural parameters in matrices A and B:

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ a_{21} & 1 & 0 & 0 & 0 \\ a_{31} & a_{32} & 1 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & 1 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & 1 \end{bmatrix} \begin{bmatrix} u^{dleffr} \\ u^{dlvix} \\ u^{dntci} \\ u^{dlexrate} \\ u^{dltrint} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 \\ 0 & b_{22} & 0 & 0 & 0 \\ 0 & 0 & b_{33} & 0 & 0 \\ 0 & 0 & 0 & b_{44} & 0 \\ 0 & 0 & 0 & 0 & b_{55} \end{bmatrix} \begin{bmatrix} e^{dleffr} \\ e^{dlvix} \\ e^{dntci} \\ e^{dlexrate} \\ e^{dltrint} \end{bmatrix} \quad (6)$$

In Equation 6,  $e^{dleffr}$  is the US FFR shock,  $e^{dlvix}$  is the global risk shock,  $e^{dntci}$  is the capital inflow shock,  $e^{dlexrate}$  is the exchange rate shock and  $e^{dltrint}$  is the Turkish interest rate shock. Additionally,  $u^{dleffr}$ ,  $u^{dlvix}$ ,  $u^{dntci}$ ,  $u^{dlexrate}$  and  $u^{dltrint}$  are the equation residuals of the reduced form VAR model.

### 4. Findings

The model constructed above is estimated for the period 2002:01-2017:12. To obtain reliable findings from an SVAR model, the series considered must be stationary. Augmented

Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root test results show that all series used are stationary for the relevant period (Table 2). The optimal lag of 4 was chosen based on the LR, FPE, and AIC criteria (Table 3).

**Table 2. Unit Root Tests**

Variable	ADF Test Stat. (Prob.)	PP Test Stat. (Prob.)	Variable	ADF Test Stat. (Prob.)	PP Test Stat. (Prob.)
DLEFFR	-8.523** (0.000)	-8.639** (0.000)	DNPI	-10.822** (0.000)	-63.350** (0.000)
DLVIX	-13.632** (0.000)	-14.724** (0.000)	DNOI	-10.375** (0.000)	-83.439** (0.000)
DNTCI	-14.427** (0.000)	-43.888** (0.000)	DLEXRATE	-9.882** (0.000)	-9.365** (0.000)
DNFDI	-15.120** (0.000)	-61.547** (0.000)	DLTRINT	-9.603** (0.000)	-9.581** (0.000)

**Note:** In unit root tests, a constant term is added to the estimates. \*\* indicates significance at the 1% level.

**Table 3. Lag Length Selection**

Lag	LogL	LR	FPE	AIC	SC	HQ
0	240.7843	NA	6.22e-08	-2.404003	-2.234342	-2.335289
1	329.7614	171.4662	3.19e-08	-3.070431	-2.476617*	-2.829932*
2	367.6956	71.12674	2.79e-08	-3.205163	-2.187196	-2.792879
3	394.3574	48.60215	2.75e-08	-3.222473	-1.780353	-2.638404
4	425.5752	55.28152*	2.58e-08*	-3.287242*	-1.420968	-2.531387
5	441.1166	26.71176	2.86e-08	-3.188714	-0.898288	-2.261075
6	451.1665	16.74990	3.37e-08	-3.032985	-0.318405	-1.933560

The unit circle test shows that all the inverse roots of the autoregressive polynomial are within the unit circle, and the model satisfies the stability condition (Figure A1 in the Appendix). According to the Lagrange Multiplier (LM) test results, the null hypothesis that there is no autocorrelation between the error terms of the reduced form of the model could not be rejected (Table A1 in the Appendix). According to the White heteroscedasticity test results, the null hypothesis that there is no heteroscedasticity problem between the residuals of the model could not be rejected (Table A2 in the Appendix). In short, it is understood from the diagnostic tests on the error terms that there is no structural problem in the model.

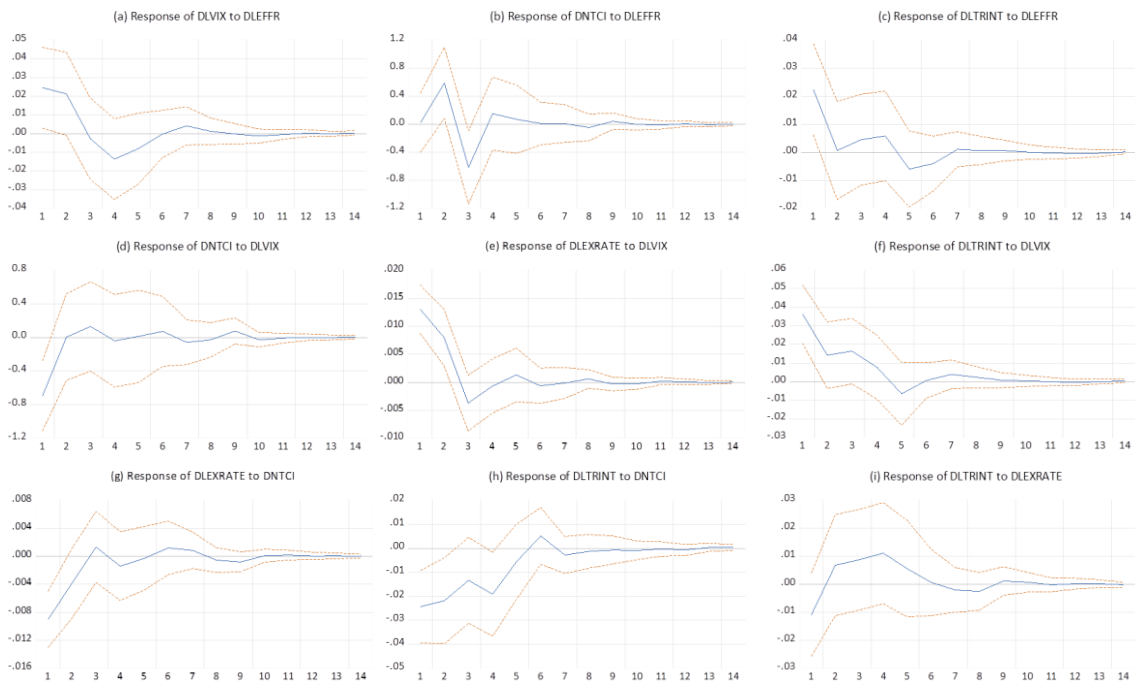
#### 4.1. Impulse-Response and Variance Decomposition Analyses

In order to evaluate the responses of the variables in the model to structural shocks, impulse-response functions were obtained. Figure 2 shows the responses of other variables to a one-standard-deviation shock on the variables included in the model. In the impulse response graphs in Figure 1, the dotted lines are 95% confidence bounds. If the confidence interval does not contain zero, it means that the p-value is less than 0,05, indicating a statistically significant response. The impulse-response results are as follows;

The findings of the impulse-response analysis show that the increment in the EFFR has a positive and significant effect on the VIX index, which is considered to be an indicator of global risk. The graph (a) in Figure 2 shows that a positive shock to the VIX creates a positive impact

on the EFR in the first period, and then the effect of the shock dies out in the second period, where the lower bound confidence interval reaches zero. This result confirms the view that the FED MP is the main determinant of global financial conditions (Rey, 2015; Miranda-Agrippino and Rey, 2020). Accordingly, the increase in the US EFR leads to a contraction in the GFCy as a result of the decreasing global risk appetite.

According to the findings of the analysis, NTCI to the Turkish economy respond negatively and significantly to the increase in the US interest rate. The graph (b) in Figure 2 indicates that a positive EFR shock leads to a decrease in the NTCI in the third period after increasing it in the second period. In the literature on the pull and push determinants of capital flows (Calvo, 1996; Koepke, 2019), it is predicted that international capital moves from developing countries such as Turkey to center countries with the expectation of higher returns in the face of the increase in the US interest rate. The result reached here shows that the US interest rate is a significant external factor that affects net capital flows in the Turkish economy. This result also proves that net capital inflows play a role in transmitting US MP shocks to the Turkish economy.



**Figure 2. Impulse-Response Functions**

The domestic interest rate in the Turkish economy responds positively and significantly to the increase in the FFR in the first period (Figure 2c). This finding seems to be parallel to the view that EMEs' central banks will tend to imitate the MPs of center countries due to reasons such as excessive borrowing, overheating and fear of floating in the face of center country MP shocks (Georgidas and Zhu, 2021).

The analysis findings also prove that net capital inflows respond negatively and significantly to the increase in the VIX index in the first period (Figure 2d). This finding shows

that the increment in the VIX index leads to a decline in net total capital flows in the Turkish economy. This result confirms the view that global uncertainty is another global variable affecting international capital flows (Koepke, 2019). Accordingly, in the face of increasing global risk and uncertainty, international capital flows to center countries are seen as safe havens. Therefore, it can be said that the mechanism that emerges through capital flows in the transmission of US monetary shocks works not only via the search for yield but also through the risk-taking channel.

According to the impulse-response analysis, the increase in the VIX index has a positive and significant effect on the Dollar/TL exchange rate in the Turkish economy in the first and the second periods (Figure 2e). It should be noted that the rise in the exchange rate indicates a depreciation of the TL. Therefore, it is understood that the increase in global risk, which leads to a strengthening of the currencies of the center countries, which are seen as safe havens, causes a depreciation of the Turkish Lira.

Similarly, the increment in the VIX index also has a positive and significant effect on the domestic interest rate in the Turkish economy in the first period (Figure 2f). Accordingly, when the currencies of the center countries appreciate as a result of the increase in global risk, an upward movement is observed in the domestic interest rate.

The impulse-response analysis proves that the exchange rate responds negatively and significantly to a shock in capital flows in Turkey in the first period (Figure 2g). Therefore, an increase in net capital inflows causes the Turkish Lira to appreciate. Therefore, the effect that occurs on the exchange rate in the Turkish economy through the VIX as a result of the FED MP shock is also strengthened through the capital flows channel.

In addition, the results of the impulse-response analysis prove that a shock on net capital flows in the Turkish economy creates an opposite and significant effect on the domestic interest rate in the first and the second periods (Figure 2h). Accordingly, an increase in net capital inflows causes a decrease in the interest rate.

Finally, the local interest rate responds positively to a shock in the exchange rate, although its statistical significance is low (Figure 2i). This result shows that the depreciation of the Turkish Lira creates increasing pressure on the domestic interest rate.

The impulse-response analysis shows that capital inflows, exchange rates, and interest rates in the Turkish economy respond quickly to US monetary policy and VIX shocks. These results are in line with the findings in the previous empirical literature that US monetary policy shocks have immediate effects on financial variables in small open economies (Bowman et al., 2015; Rey, 2016; Ganelli and Tawk, 2019). These results are also in line with the theoretical prediction that financial markets adjust quickly in the face of economic shocks (Obstfeld and Rogoff, 1996).

In order to see to what extent the changes in the variables in the model are explained by other variables, variance decomposition analysis was used. Table 4 shows that the forecast error variance of each variable is explained by other variables. The findings of the variance decomposition analysis provide support for the results obtained from the impulse response analysis. Accordingly, the variable that affects the changes in the global risk variable the most, other than its own shocks, is the FFR. While the proportion of DLVIX's variability explained by DLEFFR is 2.63 percent in the first period, it is 4.43 percent and 5.04 percent in the second and

fifteenth periods, respectively. The variables that affect the changes in total capital inflows the most, other than their own shocks, are the domestic interest rate, the FFR, and global risk, respectively. The part of DNTCI's variability explained by DLEFFR is 2.79 percent in the second period, 5.58 percent in the third period, and remains at 5.26 percent in the fifteenth period. The part of DNTCI's variability explained by DLVIX is 5.67 percent in the first period, and decreases in the following periods, reaching 3.59 percent in the fifteenth period. The changes in the USD/TL exchange rate, other than its own shocks, are explained mostly by global risk and total capital inflows, respectively. The part of DLEXRATE's variability explained by DLVIX is 17.35 percent and 19.94 percent in the first and second periods, respectively, and remains high in the following periods, reaching 20.17 percent in the fifteenth period. In addition, while DTCI's rate of explaining DLEXRATE's variability is 8.23 percent in the first period, it does not show any significant change in the following periods, reaching 8.24 percent in the fifteenth period. The changes in the domestic interest rate, other than its own shocks, are explained mostly by global risk, total capital inflows, and the US FFR, respectively. DNTCI's explanation ratio of DLTRINT's variability is 4.56 percent in the first period, 7.34 percent in the second period, and 10.48 percent in the fifteenth period. DLVIX's explanation ratio of DLTRINT's variability is 10.21 percent in the first period and reaches 11.98 percent in the fifteenth period. DLEFFR explains 3.88 percent of DLTRINT's variability in the first period, while this ratio remains largely unchanged in the following periods and reaches 3.82 percent in the fifteenth period.

As a robustness check, generalized impulse responses were also obtained to assess whether the findings of the SVAR model are robust to the order of the variables. Orthogonalized impulse responses may differ based on the order of the variables in the VAR, whereas generalized impulse responses proposed by Koop et al. (1996) and Pesaran and Shin (1998) are invariant to the variable order. In other words, with generalized impulses, the ordering of the variables does not matter. Therefore, the recourse to generalized impulses helps avoid uncertainties associated with the ordering of the variables. Figure A2 in the Appendix shows the generalized impulse response functions obtained for net capital inflows. The generalized impulse response functions give very similar results to the orthogonalized Cholesky impulse response functions in Figure 1. These findings confirm the reliability of the results based on the ordering of the variables according to theoretical predictions.

The impulse-response and variance decomposition analyses show that the effects of changes in the US FFR are transmitted to the interest rate in the Turkish economy through total capital inflows. The results also show that the effects on capital inflows emerge through changes in both the FFR and the VIX.

In order to see which components of capital inflows have a greater effect on the transmission of US monetary shocks, the model is re-estimated using the variables DNFDI, DNPI, and DNOI, respectively, instead of DNTCI. The impulse-response functions obtained for foreign direct investment flows show that neither the FFR nor the VIX has a significant effect on DNFDI (Figure 3). In the empirical literature, the impact of global factors such as foreign interest rates and global risk on FDI flows is often found to be ambiguous and inconclusive. Most studies in the literature conclude that FDI flows are affected not by global push factors but by factors such as domestic tax regime, trade protection, and the strength of bilateral trade

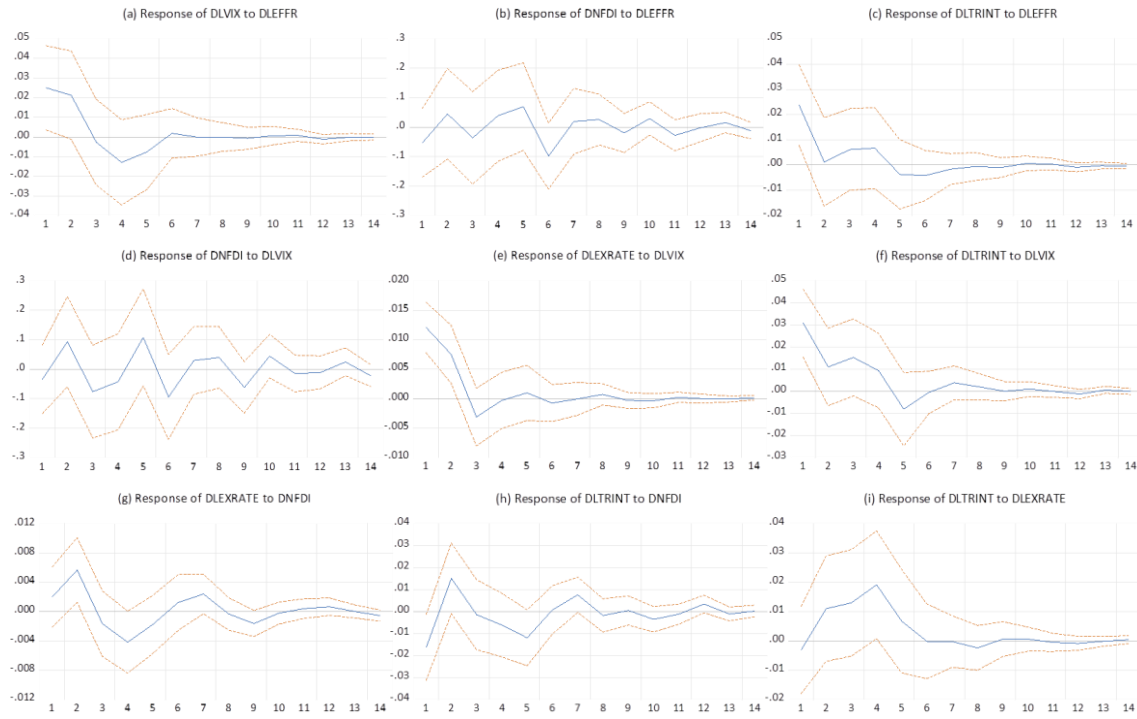
relations (Koepke, 2019). Therefore, as expected, it is understood that FDI flows do not have a notable role in the emergence of the spillover effects of FED MP on the Turkish economy.

**Table 4. Variance Decompositions**

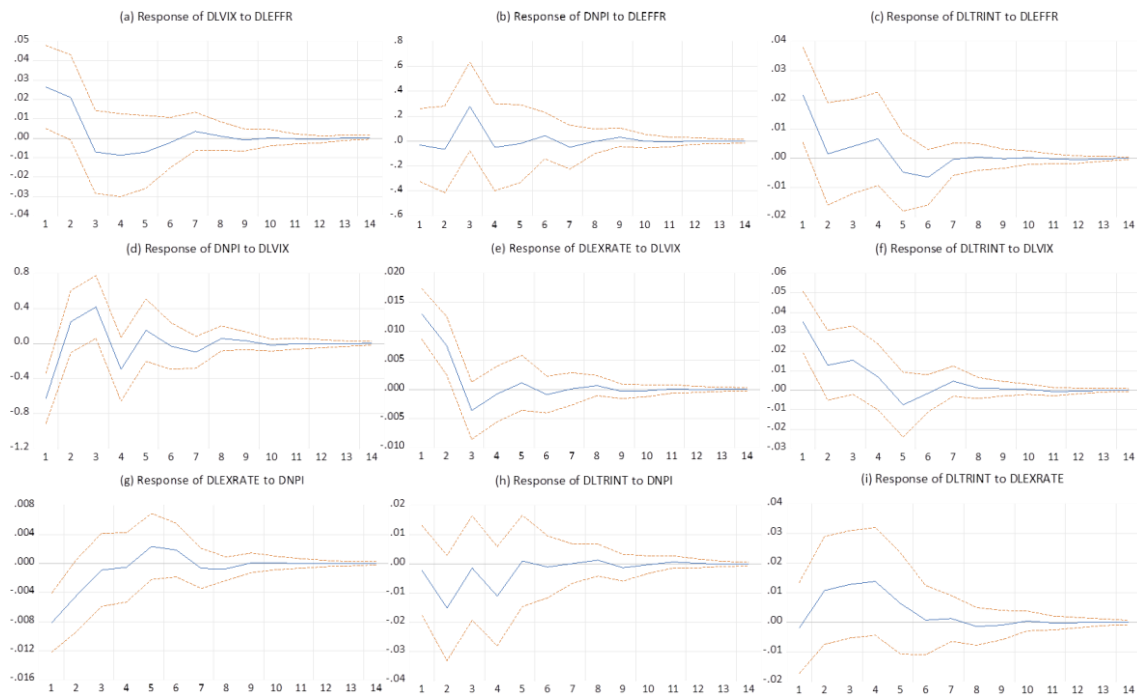
<b>Variance Decomposition of DLVIX:</b>						
<b>Period</b>	<b>S.E.</b>	<b>DLEFFR</b>	<b>DLVIX</b>	<b>DNTCI</b>	<b>DLEXRATE</b>	<b>DLTRINT</b>
1	0.151395	2.631391	97.36861	0.000000	0.000000	0.000000
2	0.154515	4.430409	94.16261	0.053120	0.208057	1.145799
3	0.159320	4.195789	93.09670	0.264645	1.048797	1.394073
5	0.161821	5.032130	90.34059	0.636037	2.040898	1.950345
15	0.162907	5.045106	89.31984	1.215537	2.228200	2.191319
<b>Variance Decomposition of DNTCI:</b>						
<b>Period</b>	<b>S.E.</b>	<b>DLEFFR</b>	<b>DLVIX</b>	<b>DNTCI</b>	<b>DLEXRATE</b>	<b>DLTRINT</b>
1	2.922954	0.005039	5.667166	94.32779	0.000000	0.000000
2	3.538268	2.795697	3.867655	92.94569	0.345122	0.045839
3	3.611827	5.584232	3.845137	89.24902	0.375500	0.946111
5	3.778840	5.296646	3.525412	81.61296	1.618631	7.946351
15	3.801569	5.264457	3.595102	81.23099	1.705521	8.203929
<b>Variance Decomposition of DLEXRATE:</b>						
<b>Period</b>	<b>S.E.</b>	<b>DLEFFR</b>	<b>DLVIX</b>	<b>DNTCI</b>	<b>DLEXRATE</b>	<b>DLTRINT</b>
1	0.031413	0.351107	17.35739	8.233608	74.05789	0.000000
2	0.034341	1.211468	19.94806	8.146959	69.78594	0.907573
3	0.034705	1.377509	20.67231	8.124175	68.86661	0.959395
5	0.035083	1.979724	20.40904	8.119167	68.16338	1.328693
15	0.035353	2.012984	20.17768	8.248475	67.76244	1.798420
<b>Variance Decomposition of DLTRINT:</b>						
<b>Period</b>	<b>S.E.</b>	<b>DLEFFR</b>	<b>DLVIX</b>	<b>DNTCI</b>	<b>DLEXRATE</b>	<b>DLTRINT</b>
1	0.114026	3.879843	10.21701	4.566997	0.913545	80.42260
2	0.120689	3.466452	10.51193	7.346116	1.134604	77.54089
3	0.123206	3.461017	11.85302	8.224337	1.595094	74.86654
5	0.126149	3.738949	11.95747	10.33984	2.490988	71.47275
15	0.126731	3.821479	11.98703	10.48235	2.550335	71.15881

**Note:** Cholesky Ordering: DLEFFR DLVIX DNTCI DLEXRATE DLTRINT

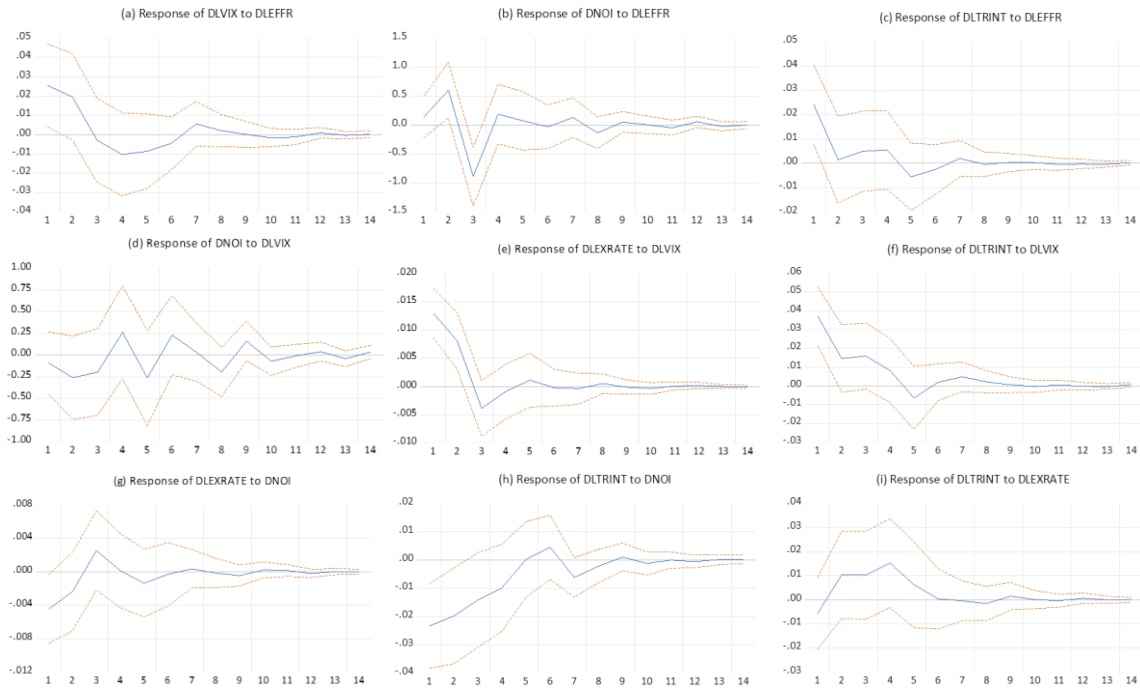
The impulse response functions obtained for net portfolio investments indicate similar findings to the functions obtained for total capital inflows (Figure 4). As in the DNTCI estimates, the negative effect of DLVIX on DNPI and the negative response of DLEXRATE to DNPI are statistically significant. However, the response of DNPI to DLEFFR and the effect of DNPI on DLTRINT are not significant. Accordingly, it can be said that portfolio investments have an indirect role, operating through VIX, in the emergence of the spillover effects of FED MP on the Turkish MP.



**Figure 3. Impulse-Response Functions Containing Net Foreign Direct Investments**



**Figure 4. Impulse-Response Functions Containing Net Portfolio Investments**



**Figure 5. Impulse-Response Functions Containing Net Other Investments**

The impulse response functions obtained for net other investments also give very similar results to the functions obtained for total capital inflows (Figure 5). As in the DNTCI estimates, the negative effect of DLEFFR on DNOI and the negative responses of DLTRINT and DLEXRATE to DNOI are statistically significant. However, the response of DNOI to DLVIX is not significant. Accordingly, it can be said that the role of other investments in the emergence of the spillover effects of US MP on the Turkish economy works directly through the FFR channel. When the impulse-responses related to different components of capital flows are evaluated together, it is seen that the spillover effects of the FED's FFR policy on the MP of the Turkish economy are mainly transmitted through the other investments component of capital flows.

## 5. Conclusion

This study addresses the hypothesis that the international risk-taking channel plays an important role in the transmission of the effects of US MP on the MP of the Turkish economy. According to the international risk-taking channel, monetary contractions in the US lead to an increase in global risk perception, and a decline in the leverage of the global financial intermediaries. This causes a strong decrease in international credit flows and domestic credits, and an increase in the borrowing costs of domestic economic units in EMEs. In addition, in EMEs where domestic liability dollarization is high, pressures for domestic currency depreciation may force central banks to intervene in the foreign exchange market with financial stability concerns. This process results in policy spillovers between the US and EMEs.

In this study, the effects of US MP changes on Turkey's MP practices and the transmission channels of these effects are empirically investigated. For these purposes, a structural VAR model is estimated for Turkey, a small open country with a flexible exchange

rate regime, using the data covering the period 2002:01-2017:12. In this section, the impulse-response and variance decomposition analyses results obtained from the structural VAR estimation will be summarized. Firstly, it is determined that an increase in the FFR increases the Turkish interest rate. Therefore, it can be said that the CBRT's monetary (interest rate) policy follows the FED's MP. This result is consistent with the findings of Rey (2015), Hofmann and Takats (2015), Edwards (2015), Anaya et al. (2017), Akıncı and Queralto (2018), Dağlaroğlu et al. (2018), Gülşen and Özmen (2020), Miranda-Agrippino and Rey (2020), Georgiadis and Zhu (2021), proving the dilemma hypothesis is valid. This result also shows that there is a transmission mechanism that allows changes in the FED's MP to spread to the Turkish economy. Secondly, it is empirically proven that two global (push) factors, the FFR and the VIX, negatively affect capital inflows to Turkey. This result is consistent with the findings of many studies in the literature, e.g. Calvo (1993, 1996) and Koepke (2019), among others. Additionally, it is shown that global risk also affects exchange rate and Turkish interest rates, positively and significantly. These findings mean that the mechanism arising from capital flows in transmitting US MP shocks to the Turkish economy works not only through yield search but also through the risk-taking channel.

The impulse-responses for the three components of NTCI (FDI, NPI, and NOI) indicate important conclusions. Firstly, net foreign direct investment (NFDI) inflows are not affected by either FFR or VIX. Therefore, it can be said that FDI inflows do not have a notable role in the emergence of the spillover effects of US MP on the Turkish economy. Secondly, net portfolio investments (NPI) respond significantly to the VIX but not to the EFR. Therefore, it can be concluded that portfolio investments indirectly (through VIX) transmit the spillover effect of the FED MP on the Turkish MP. The result regarding the relationship between VIX and portfolio investments is consistent with the findings of Milesi-Ferretti and Tille (2011), Fratzscher (2012), Broner et al. (2013), Rey (2015), Ahmed and Zlate (2014), Ananchotikul and Zhang (2014) and Koepke (2018), among others. Finally, net other investments (NOI) respond significantly to the EFR but not to the VIX. The result regarding the relationship between the center country's interest rate and other investments is parallel to the findings of Ghosh et al. (2014), Cerutti et al. (2014), and Bruno and Shin (2015b), among others. Therefore, it can be said that the spillover effect of the US MP on the Turkish economy is directly and mainly transmitted through NOI. In summary, while the US MP affects capital inflows through both the FFR and the VIX, the spillover effects of the US MP are strengthened and transmitted to the exchange rate and domestic interest rate through the capital inflows channel.

All these results show the dependence of the CBRT's MP on the US MP. The results reveal that the mechanism works as follows. An increase in US interest rates increases the global risk indicator VIX. Both reduce capital inflows to Turkey. This results in upward pressure on the exchange rate and depreciates the domestic currency. In the face of a depreciating Turkish Lira, the CBRT applies a monetary contraction, possibly with financial stability concerns. This policy causes a rise in the domestic interest rate. The mechanism explained above means that the CBRT loses monetary autonomy. The loss of monetary autonomy prevents the use of MP for domestic macroeconomic purposes, such as avoiding economic contraction. To regain monetary autonomy, it can be recommended the countercyclical use of macroprudential policies and/or capital controls to cope with financial fragilities arising from US MP spillovers. It may be proper policy to tighten macroprudential policies or capital controls when US interest rates and global risk perception are low, and gross

capital inflows are high; conversely, to loosen these policies when US interest rates and global risk perception are high, and gross capital inflows are low.

This article has contributed to the relevant global literature as an empirical study specific to Turkey. Since there are not many studies in this field specific to Turkey, it aims to fill this gap. It provides empirical findings to researchers in new studies to be conducted on this subject. However, the structural VAR model used in the current study has some limitations. Although this study finds that the effects of economic shocks are robust to the ordering, the recursive framework has a risk of misidentifying some economic shocks due to Cholesky ordering. Future studies may estimate non-recursive models that include different structural restrictions within the predictions of economic theory. Although the recursive VAR model assumes that domestic variables do not have simultaneous effects on foreign variables, their lagged effects are estimated. Future studies can use the block exogeneity assumption, which does not allow domestic variables to affect foreign variables simultaneously or with a lag. The standard structural VAR model neglects the effect of temporary structural breaks on the model. Actually, macroeconomic time series may be structurally unstable over time, and the parameters of the underlying time series may not be time-invariant. Future studies may take this issue into account using models such as time-varying parameter VAR. The linear structural VAR model ignores the fact that domestic economic variables may respond differently to foreign shocks under different financial conditions. For example, the effects of foreign shocks may be more pronounced in periods of financial stress than in normal periods. Future studies can use a nonlinear threshold VAR model that divides the sample period into various regimes based on a selected threshold variable.

#### **Declaration of Research and Publication Ethics**

This study which does not require ethics committee approval and/or legal/specific permission complies with the research and publication ethics.

#### **Researcher's Contribution Rate Statement**

The authors declare they have contributed equally to the article.

#### **Declaration of Researcher's Contribution of Interest**

There is no potential conflicts of interest in this study.

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## APPENDIX

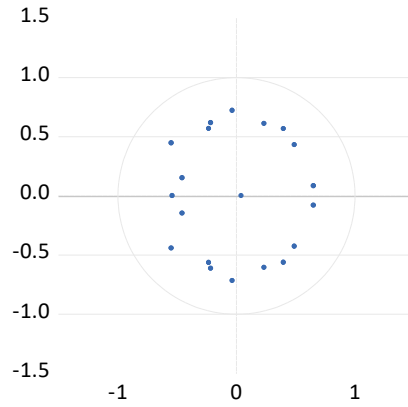


Figure A1. Inverse Roots of AR Characteristic Polynomial.

Table A1. LM test

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	29.29882	25	0.2516	1.177910	(25, 599.6)	0.2518
2	18.34403	25	0.8274	0.730868	(25, 599.6)	0.8275
3	28.81609	25	0.2717	1.158041	(25, 599.6)	0.2719
4	30.48656	25	0.2066	1.226862	(25, 599.6)	0.2067
5	22.50062	25	0.6067	0.899547	(25, 599.6)	0.6069
6	26.63274	25	0.3745	1.068374	(25, 599.6)	0.3747

Table A2. White Test

Chi-sq	df	Prob.
616.6761	615	0.4734

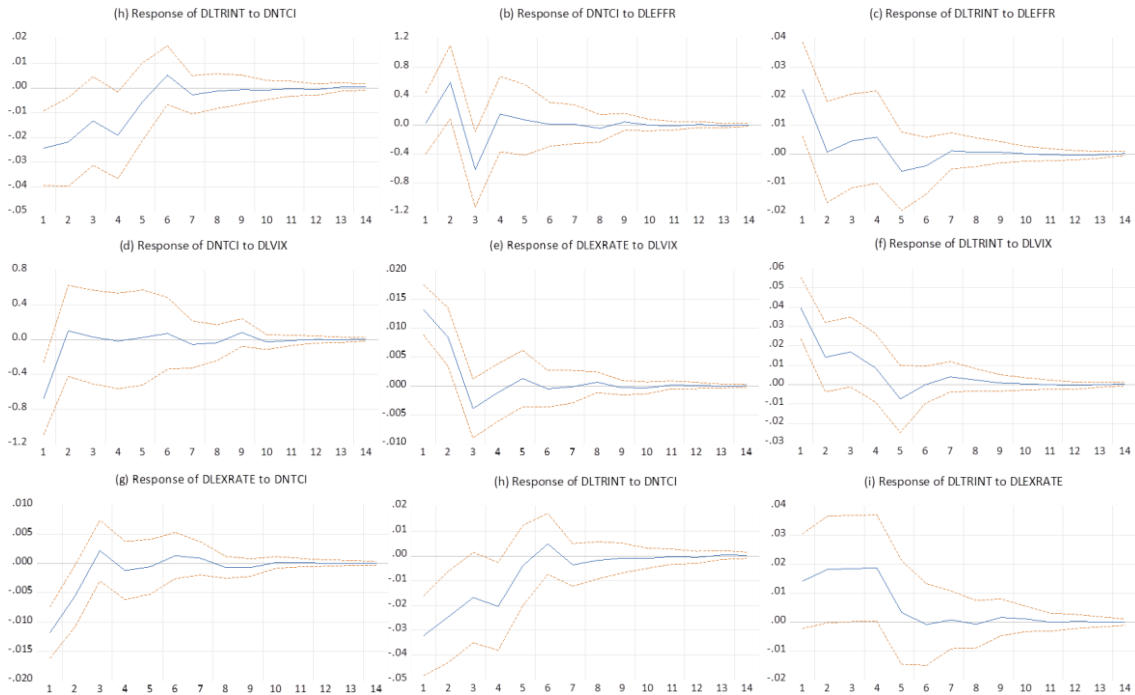


Figure A2. Generalized Impulse-Response Functions