3 THE EVOLUTION OF THE "CAPITAL FLOWS-CURRENT ACCOUNT NEXUS" IN A LOW-SAVING EMERGING MARKET: EVIDENCE FROM TÜRKIYE

Dincer DEDEOGLU[1*]

Kaan OGUT[2]

Abstract

This study investigates the evolving relationship between capital inflows, credit expansion, and the current account deficit in Türkiye, a low-saving emerging market. Unlike prior studies that aggregates capital inflows, this paper disaggregates portfolio-type inflows and external borrowing by financial and non-financial sectors, further distinguishing household and corporate loans. Utilizing 21 time-varying parameter VAR models with stochastic volatility over 1996Q4-2025Q2, we identify four distinct transmission regimes reflecting shifts in macroeconomic conditions and policy frameworks. Results show that during boom periods, capital flow shocks worsened the current account by 0.67 percentage points of GDP, declining to 0.39 percentage points post-2018 following macroprudential tightening. Forecast error variance decomposition of the current account indicates a marked decline in capital flows' contribution from 83% to 31%, alongside a rise in credit shocks from 5% to 26%, suggesting a structural shift from capital flow dominance to a balanced influence of credit and capital flows. Firm credit generates substantially larger current account responses than household credit. Findings highlight that sustained macroprudential policies can fundamentally reshape external vulnerability and transmission channels in emerging markets.

Keywords: *Capital flows, Credit expansion, Current account, External imbalances, TVP-VAR model, Türkiye*

JEL Classification: *C32, E44, E51, F14, F32, F41, G15*

1. Introduction

Relationships between the current and the financial accounts have been the subject of extensive research, particularly in developing economies. Capital flows are often seen as a mixed blessing; while they provide crucial financing for current account deficits, they can also exacerbate these

[1*] *Corresponding author, Department of Economics, Istanbul Medeniyet University, Türkiye; dincer.dedeoglu@medeniyet.edu.tr*

[2] *Department of Economics, Bahcesehir University, Türkiye; kaan.ogut@bahcesehir.edu.tr*

deficits, contributing to economic instability. The volatility of large capital flows can distort economic structures, posing challenges for policymakers in maintaining macroeconomic stability (Ahmed and Zlate, 2014). Therefore, a stable financial account is crucial for sustaining a balanced payment structure and mitigating the risks associated with global imbalances (Wong and Carranza, 1999). Given these challenges, understanding the dynamics between capital flows and the current account, and their interplay, becomes essential for both economic theory and policy formulation.

According to the balance of payments identity, a country operating under a floating exchange rate regime must ensure that its current and financial accounts are balanced. This suggests that any current account deficit must be offset by an equivalent net capital flow and vice versa. In theory, two primary perspectives explain the relationship between current account deficits and capital flows: the savings-investment view, which posits that capital flows finance the current account deficit (Feldstein and Horioka, 1980; Bayoumi, 1990; Obstfeld and Rogoff, 1995; Mann, 2002), and the portfolio view, which suggests that capital flows are the primary driver of the current account deficit (Ventura, 2001; Guo and Jin, 2009; Tille and van Wincoop, 2010). These perspectives provide valuable insights into the mechanisms linking these two accounts.

However, while these frameworks illuminate the broader macroeconomic picture, they often overlook the critical factors of total credit expansion. Total credit growth can significantly impact the current account balance, particularly in economies in which capital flows stimulate domestic credit markets. This raises three core questions: (i) How do capital flows affect domestic credit? (ii) How does credit expansion influence the current account? (iii) How do these linkages vary over time? While existing work addresses each question separately, it rarely combines them within a unified framework. This study addresses this gap by investigating how credit expansion mediates the relationship between capital flows and current account deficits, with explicit attention to the heterogeneity and temporal evolution of these channels.

Persistent external imbalances in emerging market economies, particularly in those with low domestic savings, have garnered significant macroeconomic research attention. Current account deficits, combined with substantial capital flows, pose challenges for policymakers who aim to ensure financial stability. The volatility of these capital flows affects exchange rates and domestic credit market dynamics, often resulting in unsustainable credit expansion. For Türkiye, this issue is acute because of its chronic dependence on foreign capital to finance current account deficits, making it susceptible to global liquidity shifts. Türkiye's situation offers a valuable case for examining the relationship between capital flows, credit growth, and current account dynamics. Despite the extensive literature on the role of capital flows in shaping external balances, the impact of credit expansion within this context is underexplored. Given the critical role of macroprudential policies in managing credit booms and mitigating external vulnerabilities, understanding how credit growth influences the effects of capital flows on the current account is crucial. This study addresses this gap and provides new insights into the temporal dynamics of these relationships in Türkiye's open economy, which has repeatedly faced financial fragility.

In light of this discussion, the present paper makes a focused contribution to the literature on the capital flows-current account nexus in low-saving emerging economies. First, rather than relying on a single aggregate measure, we disaggregate both capital flows (portfolio, foreign borrowing through banks and firms) and credit (total private, household and firm credit), which allows us to trace heterogeneous transmission channels from external finance to domestic balance sheet dynamics. Second, we estimate a set of Time Varying Parameter VAR models with stochastic volatility over a long sample for Türkiye, so that the strength and sign of these channels are allowed to change across major policy and financial episodes instead of being constrained to a single average effect. Third, by comparing several alternative specifications within the same framework, we document a robust pattern whereby capital-inflow-induced credit expansion is systematically associated with a worsening of the current account. These features together

differentiate the paper from earlier studies that use constant-parameter VARs with aggregate variables or that ignore the time variation in the underlying mechanism. The findings from this study are expected to offer policymakers valuable insights to help develop strategies that mitigate the adverse effects of credit expansion on the current account.

The remainder of the paper is organized as follows. Section 2 reviews the theoretical and empirical literature. Section 3 provides historical context on Türkiye's external imbalances and credit dynamics. Section 4 describes the data and methodology. Section 5 presents the results, and Section 6 concludes with policy implications.

2. Literature Review

A stable financial account is therefore essential for sustaining the balance of payments and mitigating the risks associated with such imbalances (Wong and Carranza, 1999). In line with the balance of payments identity, a country with a floating exchange rate regime must achieve an equilibrium between its current and financial accounts, so that any current account deficit is matched by an equivalent capital inflow.

Capital flows play a crucial role in financing current account deficits in developing economies, but large and volatile inflows often create macroeconomic challenges by fuelling credit expansion and deepening external imbalances (Ahmed and Zlate, 2014). According to mainstream view, when a current account is in deficit, net foreign wealth decreases, and/or foreign debt increases. This explanation implies that the causality relationship moves from the current account deficit to capital flow mainly in the type of foreign borrowing. According to the textbook view, as stated by Krugman et all (2018, p. 356), the current account measures the size and direction of international borrowing. From the perspective of this widely accepted approach, current accounts are considered as both a gauge of how much financing an economy obtains from abroad and of the direction of that financing, with surplus countries lending to deficit ones (Borio & Disyatat, 2015). This savings-investment view posits that capital flows finance a pre-existing current account deficit and therefore act as a passive balancing item (Feldstein and Horioka, 1980; Bayoumi, 1990; Obstfeld and Rogoff, 1995; Mann, 2002). On the other hand, the excess global liquidity view considers a causal relationship that runs from capital inflows to the current account. According to this view, capital inflows cause widening current account deficits through the appreciation of the domestic currency (Orhangazi & Özgür, 2015). This second approach, supported by studies on emerging or developing economies, has considered effects of capital flow on current accounts. Moreover, this alternative view reverses the direction of causality and argues that changes in investors' portfolio preferences drive capital flows, which in turn shape current account outcomes (Guo and Jin, 2009; Tille and van Wincoop, 2010). Both approaches offer valuable insights into the co-determination of current and financial accounts, but they largely abstract from the role of domestic credit as an explicit transmission channel. As Akyüz (2017, p. 136) noticed, when surge on capital inflows, flexible exchange rate regime could lead to nominal as well as real appreciations even as current account deficits are widened. It indicates capital inflows can lead to unsustainable current account deficits and appreciated exchange rates (Orhangazi, 2014).

Empirical studies provide strong evidence that capital inflows tend to operate through the credit channel, increasing domestic borrowing and contributing to current account imbalances. Early work by Calvo et al. (1993) shows that capital inflows raise domestic consumption and lead to larger current account deficits, while Ghosh and Ostry (1995) emphasize that consumption-smoothing mechanisms financed by capital inflows often amplify external deficits. Fry et al. (1995) find for many developing countries that capital inflows distort the economy by boosting domestic consumption and thereby worsening the current account. Subsequent contributions confirm these patterns across broader samples and time horizons. Lane and Milesi-Ferretti (2001) conclude that

capital flows tend to deteriorate current account balances in both advanced and developing economies, and Yan and Yang (2008) document a direct negative effect of capital inflows on the current account in emerging markets. Extending the analysis to OECD countries, Oeking and Zwick (2015) show that capital flows help finance the current account in downturns but tend to precede current account deficits during expansions, especially through portfolio and banking flows.

A related strand of the literature highlights the amplification role of credit booms and their contribution to financial fragility. Jordà et al. (2010) show that credit booms frequently precede financial crises, while Elekdag and Wu (2011) find that rapid credit growth tends to widen current account deficits by stimulating consumption and investment. Lane and McQuade (2014) and Carvalho (2019) demonstrate that capital inflows, particularly in the form of debt, are strongly associated with domestic credit booms, suggesting that external finance and domestic credit cycles are tightly linked. More granular evidence indicates that the impact of credit on external balances depends on its composition. Büyükkarabacak and Krause (2009) report that household credit tends to reduce net exports and worsen the current account, whereas business credit has the opposite effect. Igan and Tan (2017) further show that capital flows disproportionately fuel household and corporate credit, exacerbating external imbalances through a surge in domestic borrowing.

Türkiye provides a particularly instructive case for studying the interaction between capital flows, credit expansion and the current account. A number of country-specific studies document that capital inflows are a key driver of Türkiye's persistent current account deficits via their impact on domestic credit. Erden and Çağatay (2011) find that short-term capital inflows put significant pressure on the current account by amplifying credit expansion. Varlık and Berument (2016) provide additional evidence linking capital inflows to rising credit and imports, which in turn deteriorate the current account. Kirikkaleli et al. (2015) argue that the entry of foreign banks intensified credit growth and contributed to the worsening of Türkiye's current account deficit. More recent work by Çelgin et al. (2023) shows that both consumer and corporate loans have a significantly negative effect on the current account, with consumer loans having a larger impact, consistent with the idea that credit-fuelled consumption and import demand heighten external imbalances. Over a longer sample, Köroğlu (2018) documents a one-way causal relationship running from credit expansion to the current account deficit for the period 1982-2016, without evidence of reverse causality. Çayır (2021) adds further nuance by showing that foreign direct investment and portfolio flows have differentiated short and long run effects on household credit, underscoring the complex ways in which different types of capital flows feed into domestic credit markets and external balances.

Taken together, the international and Türkiye -specific evidence points to a strong and complex link between capital flows, credit dynamics and current account outcomes. However, the literature remains fragmented across several dimensions. Early work focuses on consumption smoothing, later studies emphasize domestic credit as a transmission mechanism, and more recent contributions highlight heterogeneity across flow types and loan categories. What is largely missing are frameworks that jointly incorporate disaggregated capital flows, sector-specific credit aggregates and explicitly time-varying dynamics in order to trace how these channels evolve over financial cycles. This gap is particularly important for emerging markets such as Türkiye, where the relationships between capital inflows, credit and external balances are unlikely to be stable across regimes. Existing results also carry clear policy implications: managing capital flow driven credit booms requires macroprudential tools targeted at the composition and pace of credit growth (Fendoğlu, 2017; Küçükbıçakçı et al., 2020), and in episodes of large and volatile inflows may need to be complemented by capital flow management measures or targeted fiscal interventions. Against this background, the present paper seeks to integrate these strands of the literature within a unified time-varying VAR framework for Türkiye that combines disaggregated capital flows and

sectoral credit and examines how the associated current account responses change across macro-financial regimes.

3. Background: Türkiye's External Imbalances

3.1 The Savings-Investment Gap and Current Account Dynamics

Since 2003, Türkiye's current account deficit has grown due to investment spending outpacing domestic savings, as per the investment-savings identity. A current account deficit generally occurs when domestic savings are insufficient for investment, suggesting that Türkiye relies on foreign savings for investment. Figure 1 (a) shows the relationship between savings and investment gap and Türkiye's current account from 1980 to 2020.

Between 1995-1997 and 2003-2011, except during the 2008-2009 global recession GDP and investment in Turkiye's economy grew satisfactorily. This supports the hypothesis that insufficient national savings relative to investment causes a current account deficit. During this period, real credit growth paralleled real investment and real GDP growth rates. Following the decline in GDP growth rates in 2014, investment also decreased (Figure 1 panel b).

Krugman et al. (2018) emphasize the current account's role in signaling international borrowing, especially in developing nations such as Türkiye. According to the balance of payment accounting rules, the current account deficit is eventually compensated by direct or portfolio-type financial investments and foreign borrowing, possibly with central bank intervention. Although relevant to Türkiye, this elucidation does not suggest causation between the current account and capital flows. Investigating this link can guide policies to address the current account deficit.

3.2. Global Liquidity and Capital Inflows

Central banks in the U.S., EU, and Japan have jointly implemented expansionary monetary policies, especially since 2002, leading to global liquidity surpluses and rising financial asset values (Addison, 2006; Becker, 2007). The post-2008 recession, QE policies with zero or negative interest rates intensified the liquidity surplus. Since 2000, high yields and excess global liquidity have driven capital flows to emerging markets, stabilizing their currencies. Additionally, the relatively high interest rates in these markets attract further capital flow.

Large fluctuations in capital flows to emerging economies are mainly driven by global factors such as risk appetite. There is a global financial cycle in capital flows, asset prices and credit growth. This cycle is shaped by the VIX[3] index, a measure of market uncertainty and risk aversion (Rey, 2015). This global financial cycle may not always be consistent with the specific macroeconomic conditions of developing countries. The analysis reveals that one of the most important determinants of the global financial cycle is the monetary policy implemented by central countries, which affects capital flows and credit growth in the international financial system. Kalemli-Özcan (219) argues that the effects of US monetary policy are transmitted to the rest of the world through capital flows, regardless of the exchange rate regimes of countries.

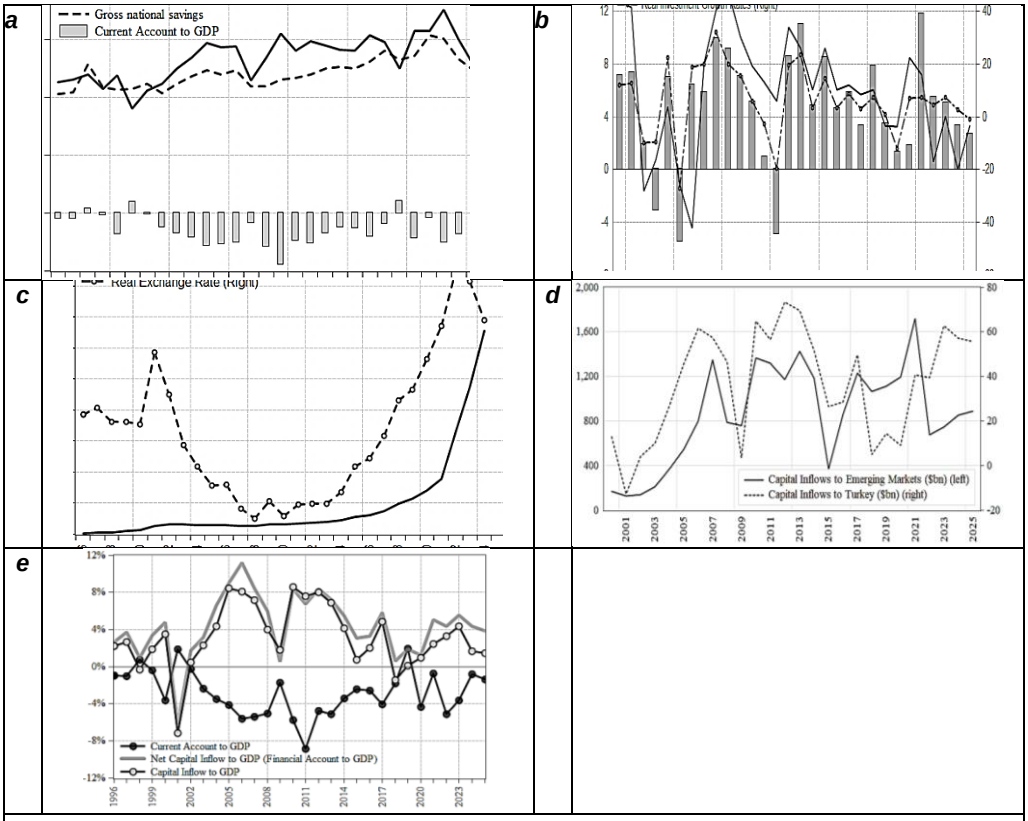
Capital flows to Türkiye generally mirrored those of other emerging markets, primarily driven by the global liquidity landscape shaped by developed country central banks' monetary policies (Figure 1 panel d). Türkiye's current account deficit was financed mainly by capital flows (Figure 1 (e)). The strong correlation between current account deficits and capital flows may imply that capital flows trigger credit expansion, as prior research suggests.

[3] *VIX is the Market Volatility Index. It is a measure of uncertainty and market risk aversion*

3.3. Exchange Rate Dynamics and Import Dependence

The excess global liquidity perspective suggests that capital flows cause current account deficits by appreciating the currency in Türkiye (Orhangazi and Özgür, 2015). Following the 2001 crisis, Türkiye's relatively high interest rates attracted substantial capital flows, leading to real currency appreciation (Figure 1 panel c). The overvalued currency managed inflation but made the manufacturing sector dependent on imported inputs (Akcay and Güngen, 2019). A similar experience in Türkiye was the real appreciation of the Turkish lira because of capital flows following financial liberalization in 1989, which led to an increase in demand for imported goods and a widening foreign trade deficit and current account deficit. The widening current account deficit was no longer sustainable in late 1993 and the Turkish economy entered a serious economic crisis in April 1994 (Orhangazi and Yeldan, 2021).

Figure 1 Selected macroeconomic indicators



Source: Authors' calculations and construction based on data from CBRT EVDS, IMF World Economic Outlook Database, and IIF.

3.4. Credit Expansion and External Financing

Credit expansion supported by capital flows distorted the current account deficit by increasing imports of various goods, thus escalating domestic production's import dependence (Orhangazi and Yeldan, 2021). Moreover, a stable nominal exchange rate and Turkiye's relatively high

inflation rate strengthened Turkish currency's purchasing power, encouraging domestic producers to use more imported inputs.

Foreign borrowing by the banking sector is pivotal for explaining how capital flows lead to credit expansion and asset price bubbles, especially post-QE policies (Orhangazi and Özgür, 2015). Domestic banks borrowed internationally to finance domestic lending (Akyüz, 2012), and these loans were partly used by private individuals to fund import spending on consumption and investment, worsening the current account.

4. Data and Methodology

4.1 Data

This section describes the dataset used in this study. The analysis covers the period from 1996Q4 to 2025Q2, using quarterly data to capture the temporal evolution of capital flows, credit expansion, and current account dynamics in Türkiye.

Rather than estimating a single model specification, we adopt a systematic robustness approach by estimating 21 alternative TVP-VAR-SV models. 4 baseline models are presented in the main text while 17 additional specifications are reported in the Appendix to demonstrate robustness across alternative measures of capital flows and credit aggregates.

All variables are obtained from the Central Bank of the Republic of Türkiye (CBRT) Electronic Data Delivery System (EDDS) [4]. Capital flow and current account variables are expressed as percentages of GDP, while credit variables are measured as net usage (quarterly change divided by the sum of GDP over the previous four quarters). Detailed variable definitions are provided in Table A1 (Appendix).

4.2. Model Specifications

4.2.1. Baseline Models

Table 1: Baseline Model Specifications

Model	Variables	Capital Flow	Credit Type	Description
M1	$Y'_t = [cf_t, ct_t, ca_t]$	Total Flows	Total Credit	Aggregate transmission
M2	$Y'_t = [cf_t, cp_t, ca_t]$	Total Flows	Private	Excludes public credit
M3	$Y'_t = [fb_t, ct_t, ca_t]$	Foreign Borrowing	Total Credit	Foreign Borrowing
M4	$Y'_t = [fb_t, cp_t, ca_t]$	Foreign Borrowing	Private	Excludes public credit

Note: All baseline models are estimated as 3-variable TVP-VAR-SV systems with recursive identification.

[4] *The information regarding the study's variables is presented in Table A1 and Table A2 of the appendix section. If necessary, variables are seasonally adjusted using the Census X-13 method. Before estimation, we analyze the time series properties of the variables using the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979), the Phillips-Perron (PP) test (Phillips and Perron, 1988), and Lee-Strazicich minimum lagrange multiplier unit root test with two structural breaks (LS) (Lee and Strazicich, 2003). The test results show that all series are stationary at conventional significance levels. The findings of the unit root tests are recorded in Table A3 and Table A4 in the appendix section. A BDS test was carried out to assess non-linearity in the time series, using a distance (Σ) of 0.7 and a dimension (ω) between 2 and 6. The test results reject the null hypothesis of independence, indicating non-linear dependence and supporting the use of the TVP-VAR methodology. This suggests that traditional linear models may not adequately capture the data dynamics, while the TVP-VAR model, with time-varying coefficients, provides a more accurate representation. The full BDS test output is omitted for brevity. Results are available upon request.*

Table 1 summarizes the four baseline models presented in the main text. These models focus on the most policy-relevant capital flow and credit measures: total capital flows (cf) and foreign borrowing (fb), combined with total credit (ct) and private credit (cp).

4.2.2. Robustness Models

To ensure that our main findings are not driven by specific variable definitions, we estimate 17 additional models reported in Appendix A. These models explore: (i) Alternative capital flow measures, (ii) Disaggregated credit categories, (iii) 4 variable systems that simultaneously include multiple credit types. Tables A6 and A7 (Appendix) provide complete specifications for all robustness models.

4.2 Methodology

This section introduces the TVP-VAR methodology, which is a widely used approach for examining macroeconomic time-series dynamics. Unlike conventional VAR models, which have fixed coefficients, TVP-VAR models allow coefficients to change over time in a linear framework following a specified pattern. Additionally, TVP-VAR models often incorporate stochastic volatility (SV), which permits variations in the error terms' variances over time.

Many macroeconomic time series exhibit nonlinear behavior, such as a variable that increases more sharply during economic downturns than decreases during recovery periods. Some variables experience periods of increased volatility, measured by the variance in their movements. Structural changes in the behavior of some variables are also observed. These instances of nonlinearity in macroeconomic time series may arise from various underlying structural factors that can be effectively captured by the flexible TVP-VAR-SV framework.

TVP-VAR models treat the coefficients of the VAR model as stochastic processes, with coefficients, including intercepts, lag coefficients, variances, and covariances of the error terms, following a random-walk process. This random walk behavior provides a flexible functional form for capturing different types of nonlinearities.

The TVP-VAR model employs Bayesian estimation for its state-space equations, which include a measurement equation and state equations for the time-varying coefficients. Specifically, the measurement equation is formulated in the following manner, as per (Primiceri, 2005; Nakajima, 2011; Nakajima and Watanabe, 2011).

$$y_t = c_t + B_{1t}y_{t-1} + \cdots + B_{st}y_{t-s} + e_t, \quad u_t \sim N(0, \Omega_t)$$

Where: y_t: $k \times 1$ dimensional vector of endogenous variables, c_t: $k \times 1$ dimensional vector of intercepts, B_{it} : $k \times k$ dimensional matrix of time-varying coefficients, Ω_t : $k \times k$ dimensional time-varying variance-covariance matrix of residuals.

A normal distribution with a mean of zero is assumed for the error terms (u_t) and A variable covariance matrix that changes over time is represented by the symbol Ω_t. To effectively analyze time-varying shocks and perform an impulse response analysis, it is essential to decompose the variable Ω_t. Cholesky decomposition can be utilized to achieve this goal, by employing a recursive ordering of the variables (Nakajima and Watanabe, 2011). Ω_t can be decomposed as follows:

$$\Omega_t = A_t^{-1}\Sigma_t(A_t^{-1})'$$

Here, the matrix A_t is a lower-triangular matrix that acknowledges the contemporaneous connections between variables and Σ_t is a diagonal matrix that holds the time-varying idiosyncratic shocks.

$$A_t = \begin{bmatrix} 1 & 0 & \cdots & 0 \\ \alpha_{21,t} & \ddots & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ \alpha_{k1,t} & \cdots & \alpha_{k,k-1,t} & 1 \end{bmatrix}, \quad \Sigma_t = \begin{bmatrix} \sigma_{1,t} & 0 & \cdots & 0 \\ 0 & \ddots & \ddots & \vdots \\ \vdots & \ddots & \ddots & 0 \\ 0 & \cdots & 0 & \sigma_{k,t} \end{bmatrix}$$

Following the identification of time-varying shocks, the model presented in Equation (1) can be reorganized according to the methods outlined by Nakajima and Watanabe (2011):

$$y_t = X_t\beta_t + A_t^{-1}\Sigma_t\epsilon_t, \quad \epsilon_t \sim N(0, I)$$

Where: X_t : $k \times k(k+1)$ dimensional matrix, $X_t = I_k \otimes (1, {y_{t-1}}', \cdots, {y_{t-s}}')$, β_t : $k(k+1)s \times 1$ dimensional vector that is formed by stacking the set of c_t and B_{it} by rows and by order $j = 1, \cdots, s$.

In the measurement equation, it is assumed that β and A follow a random walk, while stochastic volatilities adhere to a geometric random walk, The transition equations for the time-varying parameters β_t, α_t, and σ_t are as follows (Primiceri, 2005; Nakajima, 2011)

$$\begin{cases} \beta_{t+1} = \beta_t + u_{\beta t} \\ a_{t+1} = a_t + u_{at} \\ h_{t+1} = h_t + u_{ht} \end{cases}, \quad \begin{pmatrix} \epsilon_t \\ u_{\beta t} \\ u_{at} \\ u_{ht} \end{pmatrix} \sim N\left(0, \begin{pmatrix} I & 0 & 0 & 0 \\ 0 & V_\beta & 0 & 0 \\ I & 0 & V_a & 0 \\ I & 0 & 0 & V_h \end{pmatrix}\right)$$

Where: a_t: $q \times 1$ dimensional vector with $q = k(k-1)/2$ containing the strictly lower-triangular elements of A_t , - h_t: $(h_{1t}, \cdots, h_{kt})'$ with $h_{it} = \log(\sigma_{it}^2)$ for $i = 1, \cdots, k$, - $V_a, V_h, V_{\beta_0}, V_{a_0}, V_{h_0}$ are diagonal matrices, $\beta_{s+1} \sim N(\mu_{\beta_0}, V_{\beta_0})$, $a_{s+1} \sim N(\mu_{a_0}, V_{a_0})$, $h_{s+1} \sim N(h_{h_0}, V_{h_0})$.

The Bayesian method, particularly the Markov Chain Monte Carlo (MCMC) approach, can be used to estimate the proposed model. With Bayesian estimation, the distribution of model parameters and unobserved latent variables is contingent on the observed data. The MCMC method facilitates sampling from the complex posterior distribution of the time-varying latent variables (Carlin and Chib, 1995; Chib, 2001).

5. Empirical results

This section presents the main empirical findings from our TVP-VAR-SV analysis[5,6,7], tracing how the capital flows-credit-current account transmission mechanism has evolved across Türkiye's major macroeconomic episodes since 1996. We focus on four baseline models (M1-M4) and validate robustness through 17 additional specifications (Appendix).

5.1 TV-IRFs Across Regimes

Figure 2 presents the time-varying impulse response functions (TV-IRFs) for the four baseline models[8]. The time-varying nature of transmission is evident in Figure 2's three-dimensional surfaces. To characterize this evolution systematically, we classify the sample into four distinct regimes based on economic conditions and policy frameworks.[9]

Pre-boom Stabilization (1998-2002): Following the 2001 financial crisis, Türkiye implemented an IMF-supported stabilization program featuring floating exchange rates, central bank independence, and banking sector restructuring. During this period, capital flow transmission averaged 0.60 percentage points, establishing a baseline for subsequent comparison.

Boom Periods (2003-2007, 2010-2013): We combine two boom episodes pre-GFC (2003-2007) and post-GFC QE-driven recovery (2010-2013), characterized by abundant global liquidity, rapid credit growth (20-30% annually), and minimal macroprudential constraints. Transmission strength

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[5] *The orderings of the variables in the TVP-VAR models are consistent with the economic logic and causal relationships between these variables. In all TVP-VAR-SV specifications, variables are ordered as a capital flow measure, a credit aggregate, and the current account balance. This recursive identification treats capital flows (cf, fa, fb, fbb, ffm, pi) as* ***the*** *most exogenous block, reflecting Türkiye's status as a low saving emerging economy where external financing is largely driven by global liquidity. Credit aggregates (ct, cp, ch, cfm) are placed second as the main policy instrument and transmission channel from external finance to domestic demand and imports, while the current account (ca) is ordered last as the outcome variable. This ordering is consistent with standard macro finance models and is supported by auxiliary constant parameter Granger causality tests that point from capital flows to credit and the current account rather than in the opposite direction.*

[6] *For the TVP-VAR model, a lag length of 2 is chosen. In their study, chose a lag length of two, as recommended by (Primiceri, 2005). They note that this lag length is commonly used in the TVP-VAR literature. Furthermore, they observe that using a higher number of lags is generally possible in VARs with constant coefficients. However, they point out that the increased complexity and dimensionality usually impose significant computational challenges. Therefore, the authors suggest that using two lag lengths strikes a suitable balance, enabling comparisons of their results with those in other significant studies in the literature. In addition, the Schwarz Criterion (SC) indicates that a lag length of 2 is optimal for the model.*

[7] *We calculated the joint posterior distributions for the TVP-VAR model's parameters through the use of 10000 iterations. Specifically, we employed 1000 of these iterations to ensure the convergence of the time-varying parameters. The joint posterior distributions of the parameters were calculated using prior distributions of* $V_{\beta} \sim G(25,0.01)$, $(V_a)_i^{-2} \sim G(5,0.02)$, $(V_h)_i^{-2} \sim G(5,0.02)$ *and flat priors were used for the parameter values(*$\mu_{\beta_0} = \mu_{\alpha_0} = \mu_{\sigma_0} = 0$ *and* $V_{\beta_0}, V_{a_0}, V_{h_0}$*) following Çatik and Akdeniz (2019), Helmi et al. (2023), Ilhan et al. (2023).*

[8] *Following the estimation of the model, time-varying impulse-response functions (TV-IRFs) were computed for the time horizons* $\boldsymbol{t} = \mathbf{1},..,\mathbf{8}$ *using the variance-covariance matrix(*$\boldsymbol{\Omega_t}$*) derived from the TVP-VAR. The graphical representation of the functions in Figure 2 depicts three-dimensional plots, with the horizontal axis representing the time horizon (h), and the vertical axis representing the time after the shock.*

[9] *To verify this classification is not masking important within-regime variation, we examine 8 finer sub-periods in Appendix Table A8. The analysis confirms that: (i) pre-boom (1998-2002) transmission remained stable at 0.60 pp, (ii) two boom episodes (2003-07, 2010-13) were highly similar (0.61 and 0.59 pp), and (iii) post-2018 decline was progressive and persistent (0.46 → 0.42 → 0.39 pp). The four-regime classification captures key structural changes without sacrificing meaningful variation.*

averaged 0.67 pp, approximately 12% higher than the pre-boom baseline. The similarity between boom episodes (0.61 pp pre-GFC, 0.59 pp post-GFC) justifies treating them as a single regime: the GFC proved a temporary shock, not structural break.

Transition (2008-2009, 2014-2017): This regime encompasses two distinct shocks that weakened transmission to 0.55, an 18% reduction from boom levels. First, the Global Financial Crisis (2008-09) caused sudden stops and credit contraction. Second, the 2013 Fed taper tantrum combined with domestic political tensions (Gezi protests 2013, coup attempt 2016) generated persistent uncertainty. While neither episode involved comprehensive macroprudential policy, both demonstrated that transmission strength can change substantially with economic conditions.

Post-Macroprudential Era (2018-2025): From 2018 currency crisis onwards, authorities implemented comprehensive macroprudential measures: loan-to-value limits, consumer loan maturity caps, and binding credit growth ceilings. Transmission declined progressively to 0.39 pp from boom periods and 35% reduction from pre-boom baseline. This regime shift persists over seven years (28 quarters), surviving COVID-19 policy easing and global financial volatility, indicating structural rather than cyclical change.

Figure 2 TV-IRFS

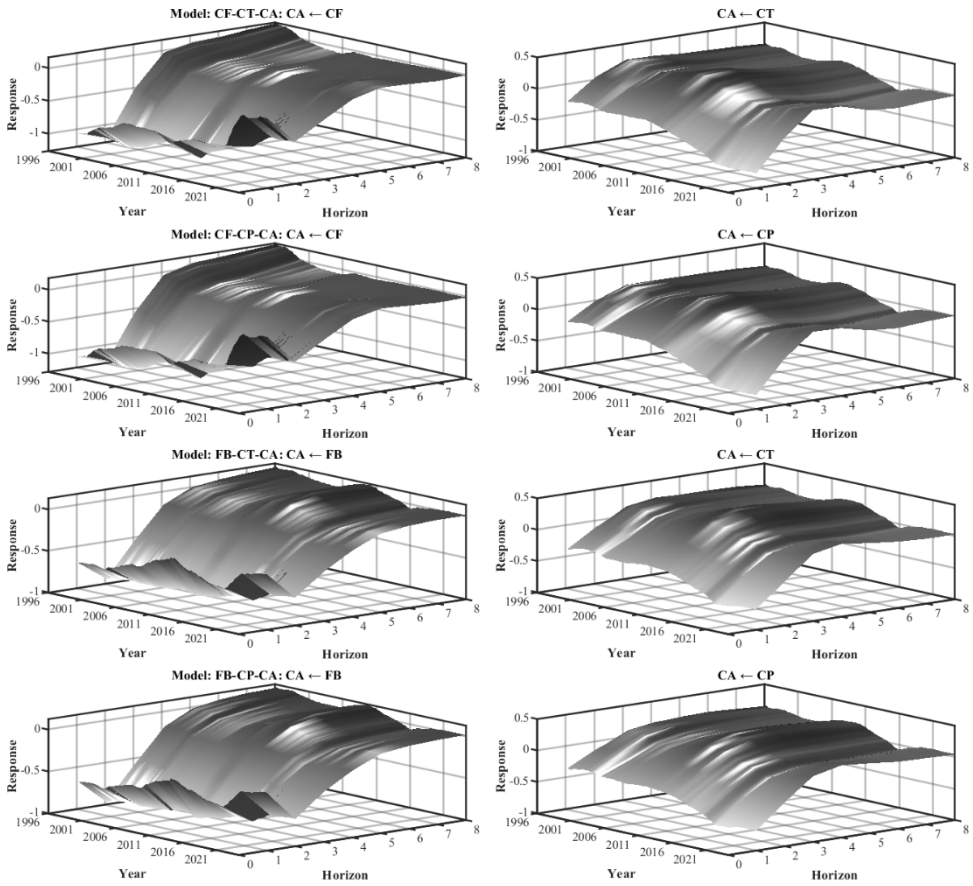


Table 2: Transmission Strength Across Four Regimes

Regime	Years	Avg.	Range	N of Qs
Pre-Boom	1998-2002	0.60	0.52-0.69	20
Boom	2003-13*	0.67	0.59-0.70	36
Transition	2008-09, 2014-17	0.55	0.50-0.62	24
Post-Policy	2018-2025	0.39	0.35-0.46	30

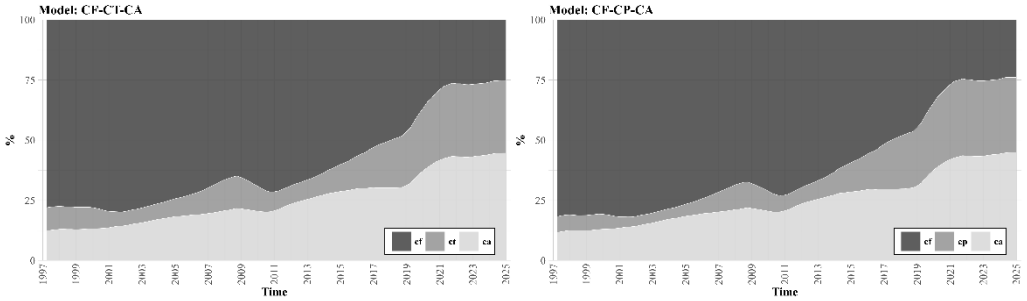
*Note: *Excludes GFC period (2008-09). Values averaged across models M1-M4. All values in percentage points of GDP at horizons 2-4.*

The four-regime evolution reveals a clear pattern: high transmission persisted for 15 years (1998-2013, excluding GFC), weakened during transition periods (2008-09, 2014-17), then declined sharply and persistently following comprehensive macroprudential tightening. This substantial transmission decline from 0.67 to 0.39 pp demonstrates that appropriately designed and consistently enforced macroprudential frameworks can fundamentally reshape external vulnerability.

5.2 TV-FEVDs Across Regimes

While impulse responses measure transmission magnitude, forecast error variance decomposition (FEVD) reveals the relative importance of different shocks in explaining current account fluctuations. We examine how this importance evolved across our four regimes using the main models (M1-M4).[10]

Figure 3 TV-FEVD: Evolution of forecast error variance decomposition across four regimes



[10] *Robustness across all 21 specifications confirms these patterns (Appendix Table A9). All capital flow measures (CF, FA, PI, FB, FBB, FFM) decline in importance post-2018, with portfolio investment showing most dramatic collapse (42% to 5%, -37pp). All credit measures (CT, CP, CFM, CH) gain importance, with firm credit rising from 10% to 32% (+22pp) to become the dominant driver post-2018. Firm borrowing (FFM) shows minimal change (21% to 17%), confirming policy deliberately maintained productive investment financing. Patterns are remarkably consistent across diverse model structures.*

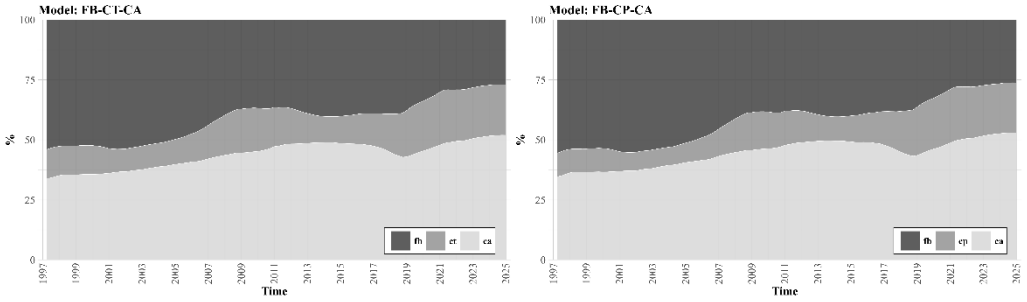


Table 2: Forecast Error Variance Decomposition (Main Models)

Shock Type	Pre-Boom (1998-2002)	Boom (2003-13)	Transition (2008-17)	Post-Policy (2018-25)	Change
Capital Flows (CF)	83%	73%	62%	31%	-52
Total Credit (CT)	5%	7%	11%	25%	+20
Private Credit (CP)	4%	6%	11%	26%	+22
Foreign Borrowing (FB)	55%	45%	39%	29%	-26

Notes: Percentage of current account forecast error variance explained by each shock at horizons 2-4. CF averaged across M1-M2, CT across M1-M3, CP across M2-M4, FB across M3-M4. Change column shows percentage point difference from pre-boom to post-policy.

Capital flow shocks: Declining dominance. CF shocks explained 83% of current account variance during pre-boom, declining progressively to 73% in boom periods, 62% in transition, and merely 31% post-2018. This 52 percentage point reduction demonstrates that macroprudential policy not only weakened transmission strength (as shown by IRFs) but fundamentally altered which shocks drive external balance dynamics. Foreign borrowing (FB) shows more gradual decline from 55% to 29% (-26pp), suggesting global financial conditions retain influence through multiple channels beyond direct capital flows.

Credit shocks: Credit shocks explanatory power increased substantially. Total credit explained only 5% of CA variance pre-boom, rising to 25% post-2018. Private credit showed similar evolution (4% to 26%). This shift reflects macroprudential policy making credit shocks more autonomous.

FEVD validates IRF findings. IRFs showed transmission decline from 0.67 to 0.39 percentage points, FEVD shows 52pp capital flow importance decline (83% to 31%). Both exhibit progressive evolution across regimes, reinforcing that transformation was policy-driven rather than crisis-driven.

5.3 Policy Implications

Our findings provide important lessons for macroprudential policy design in emerging markets. The substantial transmission decline and fundamental FEVD shift (capital flows 83% to 31%, credit 5% to 26%) demonstrate that comprehensive macroprudential frameworks can fundamentally reshape external balance dynamics.

Policy weakened transmission magnitude (from 0.67 to 0.39 pp via IRF) and reduced capital flow dependence (52pp via FEVD). This dual impact, weaker passthrough plus reduced external dependence, provides more robust resilience than either alone.

Portfolio investment's variance share collapsed from 42% to 5% (negative 37 percentage points) while firm borrowing remained stable (21% to 17%, negative 4pp), validating granular policy design. Non-selective capital controls would either fail to cool volatile flows or strangle productive investment.

With credit shocks rising from 10% to 35% of current account variance, external balance management requires credit regulation alongside capital flow policies. Interest rates alone cannot address imbalances when credit autonomously finances imports. Firm credit (32% variance share) particularly matters in manufacturing-intensive economies.

Progressive decline (0.67 to 0.55 to 0.39 pp) indicates cumulative effects over seven years. Episodic interventions likely prove ineffective; sustained enforcement, even during crises, appears essential for embedding structural change.

Global financial conditions retain 24% to 29% variance share post-2018 (down from 45% to 55%). Macroprudential frameworks substantially reduce vulnerabilities but cannot achieve full decoupling. These results suggest the appropriate policy goal is managing, rather than eliminating, external dependence.

Conclusions

This study examines capital flow transmission evolution in Türkiye over 1996Q4 to 2025Q2 using 21 time-varying parameter VAR specifications. We document fundamental structural transformation in external balance dynamics driven by post-2018 macroprudential tightening.

Impulse response analysis reveals transmission declined from 0.67 percentage points (boom periods) to 0.39 post-2018, robust across all specifications. The progressive decline across four regimes (0.67 to 0.55 to 0.39 pp) indicates cumulative policy effects over seven years rather than abrupt structural breaks.

Forecast error variance decomposition reveals deeper transformation. Capital flows' explanatory power fell from 83% to 31%, while credit shocks rose from 5% to 26%. Current account dynamics shifted from capital flow dominance, where external balance tracked volatile international financing, to credit-capital flow balance where domestic credit conditions matter equally. Firm credit now explains 32% of variance (exceeding capital flows at 26%), reflecting manufacturing structure where corporate borrowing finances imported intermediates.

Three contributions emerge. Methodologically, time-varying estimation proves essential; constant-coefficient models would miss the entire decline from 0.67 to 0.39 pp. Empirically, comprehensive macroprudential frameworks can fundamentally reshape external vulnerabilities, offering policy-relevant optimism. Conceptually, the shift to credit shock dominance implies external balance management increasingly requires credit regulation alongside traditional capital flow policies.

Several important caveats warrant discussion. First, while our TVP-VAR-SV framework captures the time-varying nature of macroeconomic relationships, attributing the observed structural break

solely to macroprudential policies requires caution. The post-2018 period witnessed a complex policy mix including unconventional monetary policy, negative real interest rates, foreign exchange interventions, and various administrative controls. Isolating the pure effect of macroprudential measures from this broader policy package remains methodologically challenging. The structural break we document likely reflects the combined impact of multiple policy instruments rather than a single regulatory change. Second, our analysis focuses on the stability dimension of macroprudential policy without addressing potential costs. While the substantial decline in external vulnerability represents an important achievement, several questions remain unanswered. Did loan growth caps and sectoral credit limits constrain financing access for small and medium enterprises? Did regulatory measures create distortions in credit allocation across sectors? What were the implications for consumption smoothing and long-term investment? A comprehensive welfare analysis would require quantifying both the stability benefits documented here and these potential growth and efficiency costs.

Despite these limitations, findings carry clear policy implications. Comprehensive macroprudential frameworks, combining loan to value limits, maturity restrictions, credit growth ceilings, and differentiated treatment across flow types, substantially reduce external vulnerabilities when enforced consistently. Türkiye achieved transmission decline from 0.67 to 0.39 pp and 52 percentage point FEVD shift. However, complete insulation remains elusive; global conditions retain meaningful influence (24% to 29% variance share). Realistic policy objectives should target managed rather than eliminated external dependence.

References

Addison, T., 2006. International Finance and the Developing World: The Next Twenty Years. Research Paper. Helsinki.

Ahmed, S. and Zlate, A., 2014. Capital flows to emerging market economies: A brave new world? *Journal of International Money and Finance*, 48, pp.221-248.

Akcay, Ü. and Güngen, A.R., 2019. The making of Turkey's 2018-2019 economic crisis. *IPE Working Papers*. [online] Available at: <https://www.econstor.eu/bitstream/10419/200182/1/1667890263.pdf>.

Akyüz, Y., 2012. The boom in capital flows to developing countries: Will it go bust again? *Ekonomitek*, 1(1), pp.63-96.

Akyüz, Y., 2017. *Playing with Fire: Deepened Financial Integration and Changing Vulnerabilities of the Global South*. Oxford: Oxford University Press.

Bayoumi, T., 1990. Saving-investment correlations: Immobile capital, government policy, or endogenous behavior? *IMF Staff Papers*, 37(2), pp.360-387.

Becker, S., 2007. Global liquidity "glut" and asset price inflation. Deutsche Bank Research.

Borio, C. and Disyatat, P., 2015. Capital flows and the current account: Taking financing (more) seriously. *BIS Working Papers* No: 525.

Büyükkarabacak, B. and Krause, S., 2009. Studying the effects of household and firm credit on the trade balance: The composition of funds matters. *Economic Inquiry*, 47(4), pp.653-666.

Calvo, G.A., Leiderman, L. and Reinhart, C.M., 1993. Capital inflows and real exchange rate appreciation in Latin America: The role of external factors. *IMF Staff Papers*, 40(1), pp.108-151.

Carlin, B.P. and Chib, S., 1995. Bayesian model choice via Markov chain Monte Carlo methods. *Journal of the Royal Statistical Society Series B: Statistical Methodology*, 57(3), pp.473-484.

Carvalho, D., 2019. Financial integration and the great leveraging. *International Journal of Finance & Economics*, 24(1), pp.54-79.

Çatik, A.N. and Akdeniz, C., 2019. The evolution of the monetary transmission channels in Turkey: Evidence from a TVP-VAR model. *Applied Economics Letters*, 26(13), pp.1072-1079.

Çayr, B., 2021. The impacts of international capital flows on household credits. *Central Bank Review*, 21(4), pp.131–140. https://doi.org/10.1016/j.cbrev.2021.12.000.

Çelgin, A., Eren, O. and Özlü, P., 2023. Credit growth and current account balance. *Central Bank Review*, 23(3), p.100131.

CBRT, 2013. Inflation Report 2013-II. *Ankara: Central Bank of the Republic of Turkey*.

Chib, S., 2001. Markov chain Monte Carlo methods: computation and inference. In: J.J. Heckman and E. Leamer, eds., 2001. *Handbook of Econometrics*, Vol. 5, pp.3569–3649.. Amsterdam: Elsevier.

Dickey, D.A. and Fuller, W.A., 1979. Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74(366), pp.427-431.

Elekdag, S. and Wu, M.Y., 2011. Rapid credit growth: boon or boom-bust*? IMF Working Papers*.

Erden, L. and Çağatay, O., 2011. TÜRKİYE'DE CARİ İŞLEMLER VE SERMAYE HESAPLARI ARASINDAKİ İLİŞKİ. *Hacettepe Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi,* 29(2), pp.49-67.

Feldstein, M. and Horioka, C., 1980. Domestic saving and international capital flows. *The economic journal*, 90(358), pp.314-329.

Fendoğlu, S., 2017. Credit cycles and capital flows: Effectiveness of the macroprudential policy framework in emerging market economies. *Journal of Banking & Finance*, 79, pp.110-128.

Fry, M.J., Claessens, S., Burridge, P. and Blanchet, M.-C., 1995. Foreign direct investment, other capital flows and current account deficits: What causes what? Other Capital Flows and Current Account Deficits: What Causes What.

Geweke, J., 1992. Evaluating the accuracy of sampling-based approaches to the calculations of posterior moments. *Bayesian statistics*, 4, pp.641-649.

Ghosh, A.R. and Ostry, J.D., 1995. The current account in developing countries: A perspective from the consumption-smoothing approach. *The World Bank Economic Review*, 9(2), pp.305-333.

Guo, K. and Jin, K., 2009. Composition and growth effects of the current account: A synthesized portfolio view. *Journal of International Economics*, 79, pp.31-41. https://doi.org/10.1016/j.jinteco.2009.03.003.

Hamilton, J.D., 1994. Time Series Analysis. [online] Princeton: Princeton University Press. Available at: <http://www.jstor.org/stable/j.ctv14jx6sm>.

Helmi, M.H., Çatk, A.N. and Akdeniz, C., 2023. The impact of central bank digital currency news on the stock and cryptocurrency markets: Evidence from the TVP-VAR model*. Research in International Business and Finance*, 65, p.101968.

Igan, D. and Tan, Z., 2017. Capital inflows, credit growth, and financial systems. *Emerging Markets Finance and Trade*, 53(12), pp.2649-2671.

Ilhan, A., Akdeniz, C. and Özdemir, M., 2023. Time-Varying Exchange Rate Pass-Through to Domestic Prices: Evidence from Turkey. *Romanian Journal of Economic Forecasting*, 26(3), pp.162-182.

Jordà, Ò., Schularick, M. and Taylor, A.M., 2010. Financial crises, credit booms, and external imbalances: 140 years of lessons. NBER Working Papers.

Kalemli-Ozcan, Ş., 2019. US monetary policy and international risk spillovers. *Jackson Hole Symposium Proceedings*.

Kirikkaleli, D., Bora, I. and Vehbi, A., 2015. Capital flows to Turkey: Multivariate VAR approach. *International Journal of Economic Perspectives*, 9(3).

Köroğlu, E., 2018. Kredi genişlemesinin cari açığa etkisi: Türkiye örneği. *Bulletin of Economic Theory and Analysis*, [online] 3(3), pp.175-193.

Krugman, P.R., Obstfeld, M. and Melitz, M.J., 2018. *International Economics: Theory & Policy.* 11th ed. New York: Pearson.

Küçükbıçakçı, F.P.E., Özen, E. and Ünalmış, İ., 2020. Are macroprudential policies effective tools to reduce credit growth in emerging markets? *World Journal of Applied Economics*, 6(1), pp.73-89.

Lane, P.R. and McQuade, P., 2014. Domestic credit growth and international capital flows. *The Scandinavian Journal of Economics*, 116(1), pp.218-252.

Lane, P.R. and Milesi-Ferretti, G.M., 2001. Long-term capital movements. *NBER Macroeconomics Annual*, 16, pp.73-116.

Lee, J. and Strazicich, M.C., 2003. Minimum Lagrange multiplier unit root test with two structural breaks. *Review of economics and statistics*, 85(4), pp.1082-1089.

Mann, C., 2002. Perspectives on the U.S. Current Account Deficit and Sustainability. Journal of Economic Perspectives, 16(3), pp.131-152. https://doi.org/10.1257/089533002760278758.

Nakajima, J., 2011. Time-varying parameter VAR model with stochastic volatility: An overview of methodology and empirical applications. *Journal of Economic Surveys*, 25(5), pp.1–25.

Nakajima, J. and Watanabe, T., 2011. Bayesian analysis of time-varying parameter vector autoregressive model with the ordering of variables for the Japanese economy and monetary policy. Journal of Economic Dynamics and Control, 35(11), pp.1646–1666.

Obstfeld, M. and Rogoff, K., 1995. The intertemporal approach to the current account. *Handbook of international economics*, In: G.M. Grossman and K. Rogoff, eds. Handbook of international economics, Vol. 3. Amsterdam: Elsevier, pp.1731—1799.

Oeking, A. and Zwick, L., 2015. On the relation between capital flows and the current account. *SSRN Working papers*, No. 2640096.

Orhangazi, Ö., 2014. Capital Flows and Credit Expansions in Turkey. *Review of Radical Political Economics*. doi:10.1177/0486613414537993

Orhangazi, Ö. and Özgür, G., 2015. Capital Flows, Finance-Led Growth and Fragility In the Age of Global Liquidity and Quantitative Easing: The case of Turkey. Working Paper.

Orhangazi, Ö. and Yeldan, A.E., 2021. The Re-making of the Turkish Crisis. *Development and Change*, 52(3), pp.460-503. https://doi.org/10.1111/dech.12644.

Phillips, P.C.B. and Perron, P., 1988. Testing for a unit root in time series regression. *Biometrika*, 75, pp.335-346.

Primiceri, G.E., 2005. Time varying structural vector autoregressions and monetary policy. *The Review of Economic Studies*, 72(3), pp.821-852.

Rey, H., 2015. Dilemma not trilemma: the global financial cycle and monetary policy independence. *NBER Working papers,* No. 21162.

Tille, C. and van Wincoop, E., 2010. International capital flows. *Journal of International Economics*, 80(2), pp.157-175.

Varlik, S. and Berument, M.H., 2016. Credit channel and capital flows: A macroprudential policy tool? Evidence from Turkey. *The B.E. Journal of Macroeconomics*, 16(1), pp.145-170.

Ventura, J., 2001. A portfolio view of the U.S. current account deficit. *Brookings Papers on Economic Activity*, 2001(1), pp.241-253.

Wong, C.-H. and Carranza, L., 1999. Policy responses to external imbalances in emerging market economies: Further empirical results. *IMF Staff Papers*, 46(2), pp.225-237.