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Economic sentiment and foreign portfolio flows: Evidence from Türkiye

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ABSTRACT

The notable surge in capital flows in recent years has emerged as a key factor shaping the dynamics of international financial markets and influencing economic performance of emerging economies. Even though macroeconomic fundamentals of an economy can explain some of the patterns in international capital flows, behavioral factors also seem to be essential for positioning capital flows across countries. In this study, we aim to examine whether overall economic sentiment towards Turkish economy plays a significant role on net portfolio flows to Türkiye. To this end, we first construct a novel text-based sentiment index called "Turkish Economic Sentiment Index (TESI)", to capture the behavioral tendencies of international investors and media towards Türkiye. Our subsequent step integrates TESI into autoregressive distributed lag models (ARDL) alongside major pull-push determinants to assess whether market sentiment holds discernible influence on capital influx into Turkey. The results reveal that the TESI and VIX stand out as pivotal determinants influencing international portfolio flows. The TESI has a positive impact on portfolio flow dynamics, whereas the degree of global risk aversion inversely affects these flows. These findings align with the contention that a favorable sentiment can boost portfolio inflows to emerging markets. Conversely, heightened volatility expectations in global markets can prompt outflows from these economies.

1. Introduction

The marked increase in capital flows over recent decades appears to be a significant factor in defining international financial market dynamics and influencing economic trajectories. While capital flows can be harmful or beneficial depending on the size, volatility, and timing of in/outflows, in an increasingly interconnected global economy, they appear to affect economic development, technology transfer, employment creation, risk diversification, stabilization of local financial markets, and integration into the global economy, particularly for emerging countries. Therefore, there has been a growing academic attention to the question of what factors drive international capital flows.

In a foundational study by Calvo et al. (1993), a list of pull (domestic) and push (global) factors is put forward as the major determinants. Their research suggests that global determinants, such as subdued US interest rates and global cyclical trends, are pivotal in shaping capital flows. However, subsequent research employing a similar lens offers varied conclusions. While some studies (Fernandez-Arias 1996; Albuquerque et al., 2005) support Calvo et al. (1993)'s initial assertions, others spotlight the importance of domestic elements such as domestic money supply and productivity growth (Montiel and Reinhart 1999; De Vita and Kyaw 2008). Other research also emphasizes the conjoined significance of global and domestic influencers (Chuhan et al., 1998; Baek, 2006; Fratzscher, 2012).

While early empirical studies within the conventional pull-push framework primarily examine the influences of quantitative economic determinants, subsequent researchers turn their attention to qualitative factors such as institutional integrity (Binici et al., 2010; De Santis and Lührmann, 2009) and behavioral dynamics such as market expectations and investor sentiment (Tetlock, 2007; Hwang et al., 2019). Notably, there has been rising interest in the literature suggesting that behavioral factors are also essential for positioning capital flows in today's global financial landscape. These studies, concentrating on market psychology, posit that sentiment regarding the origin or the destination country plays a significant role in directing international portfolio flows. Specifically, it is proposed that a positive sentiment towards a destination economy serves as a pull mechanism. Conversely, an adverse sentiment regarding an origin country can act as a push mechanism, prompting

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increased capital outflows from that nation to others with a more favorable market sentiment.

Market sentiment, also known as investor sentiment, embodies the collective feelings and perceptions of market players about foreign investment opportunities. It integrates psychological and emotional drivers that can influence decisions to buy or sell financial assets, causing fluctuations in global portfolio flows. In fact, the relationship between portfolio flows and sentiment is not unidirectional; it is a feedback loop where each factor affects and reinforces the other. To illustrate, large foreign capital inflows can improve sentiment, leading to further investments and potentially driving up asset prices.

However, abrupt capital outflows or a sentiment shift can trigger market downturns, magnifying pessimistic investor feelings and spawning a downward spiral of fleeing capital and heightened market instability. Given its potential impact on asset valuations and overall market stability, comprehending the interrelation between international flows and sentiment becomes paramount for investors, policymakers, and market participants. Particularly, tracking sentiment is pivotal for policymakers aiming to counterbalance the possible perils posed by capital flow volatility, ensuring resilience against sentiment-induced portfolio shifts. Moreover, policymakers can integrate sentiment metrics into macroeconomic projections and risk evaluations, aiding in the formulation of more informed policies that bolster market transparency, strengthen investor protection, and improve regulatory frameworks. Yet, gauging sentiment presents challenges, and traditionally hinges on survey-oriented approaches, which often face criticisms due to their high costs and potential sampling issues, as Ludvigson (2004) noted.

Thanks to improvements in computational data analytics and rising awareness of alternative data forms, text-based measures have garnered interest among academics and policymakers alike. While some notable studies have crafted country-specific text-based sentiment indicators (Shapiro et al., 2020; Garcia, 2013; Fraiberger, 2016), there has been a noticeable gap in devising such a sentiment metric for the Turkish economy through text analytics, especially concerning its influence on capital inflows to Turkey. As an emerging market, Turkey stands as the 19th largest economy in the global arena, boasting a GDP of approximately 906 billion US dollars and being an active member of international organizations.[1] Türkiye also embodies quite attractive financial markets for not only domestic but also foreign investors. According to the World Federation of Exchanges,[2] the Turkish capital market ranked 20th in terms of equity trading volume and 1st in terms of turnover ratio in 2021, while the Turkish bond market ranked 15th based on the number of listed corporate bonds in 2022.

To this end, we initially establish a novel text-based sentiment index for the Turkish economy, as a behavioral measure of international investors, for the periods of January 2004–June 2022 and evaluate its time varying pattern along with major global and domestic events. The sentiment index, namely "Turkish Economic Sentiment Index (TESI)", is developed using computational text analysis techniques and relying on extensive textual data. In contrast to traditional survey-based indicators, the TESI concentrates on sentiment reflected within the news articles and reports focused on Türkiye's economic landscape. Our subsequent step involves integrating the TESI into models alongside major pull-push determinants to assess whether market sentiment holds discernible influence beyond conventional catalysts on capital influx[3] into Türkiye. Given the mixed integration degrees of the variables, we utilize the bounds testing methodology devised by Pesaran et al. (2001) using an apt Autoregressive Distributed Lag (ARDL) framework, aiming to discern the existence of a cointegrating relation. Upon establishing a significant long-run relationship between capital inflows and market sentiment, we evaluate the nature and scale of their short-term interactions via an error correction model.

One of the primary contributions of this study lies in the introduction of a novel text-based sentiment indicator for the Turkish economy, which addresses the limitations of existing approaches. The study integrates machine learning algorithms with lexical techniques, offering a more accurate and advanced analysis of the sentiment towards the Turkish economy. The TESI could be used as an alternative measure for survey-based indicators, or could contribute to the studies investigating the behavioral/expectational aspects of the Turkish economy and financial markets. Moreover, since the TESI provides practical information about the current and prospective state of the Turkish economy, it could be a useful tool for researchers and policymakers to analyze and anticipate potential shifts in cross-border financial flows.

Additionally, this research provides empirical insights into analysis of portfolio flows to Türkiye, incorporating traditional determinants of capital flows across borders and behavioral factors such as investor sentiment and risk appetite. The findings reveal that, in the long term, the TESI and VIX stand out as pivotal determinants influencing international portfolio flows. The TESI exhibits a positive correlation with portfolio flow dynamics, whereas, as anticipated, the degree of global risk aversion inversely affects these flows. This aligns with the contention that a favorable sentiment can boost portfolio inflows into emerging markets. Conversely, heightened volatility expectations in global markets can prompt outflows from these economies.

The structure of this paper unfolds as follows: The subsequent section offers an overview of the relevant literature. This is followed by the explanation of adopted methodology. Afterward, we present and delve into the data selection process and empirical findings. The paper culminates with a summation of the key findings and an exploration of their implications for policy-making.

2. Literature Review

Understanding the rationale behind the determinants of international capital flows has generated extensive academic literature. In their seminal paper, Calvo et al. (1993) introduce an analytic framework to explain the behavior of capital flows and conclude that global factors, in particular low interest rates in the US and global cyclical conditions, are the main drivers of the surge in capital flows to developing economies. Through an analytic framework based on country risk, Fernandez-Arias (1996) scrutinizes the question of whether favorable domestic factors in an emerging economy pull capital flows or unattractive foreign conditions in an advanced economy push these flows. The author finds that a decline in international interest rates is the key factor of capital flows to emerging countries. It is also noted that the policy reactions of advanced economies during financial instability periods shifted the academic attention to a new push factor, namely the impact of expansionary monetary policies by developed countries on capital flows to emerging economies. Fratzscher et al. (2012) underline the role of loose monetary conditions in directing capital flows to emerging countries and find an economically meaningful effect of asset purchases of monetary authorities in advanced countries on portfolio flows to emerging economies. Despite their particular focus on the policy actions by the Federal Reserve, Koepke (2019), and Dahlhaus and Vasishtha (2014) add a new dimension to the traditional push-pull framework by including market expectations for prospective Federal Reserve policy decisions and suggest that market expectation is one of the important factors in determining a course of international capital flows.

While these empirical studies suggest that global factors play a dominant role, some studies document that domestic factors are more prominent in driving capital flows. For instance, in the study of De Vita and Kyaw (2008), productivity growth in emerging economies is suggested to be the main engine behind the flow of foreign direct investment to those economies, while domestic monetary aggregates are the

[1] https://www.worldbank.org/en/country/turkey/overview.

[2] https://www.world-exchanges.org/.

[3] The study takes into account net portfolio equity and debt flows, because they are subject to short-term financial fluctuations and economic news (see, for example, Montiel and Reinhart 1999; Baek 2006).

fundamental determinants of portfolio inflows. Similarly, Hernandez et al. (2001) analyze the determinants of capital flows toward some developing countries in the 70s and 90s, focusing on potential contagion derived from the trade linkages and similarities in terms of their macroeconomic outlook. The authors find that country-specific factors of the recipient country determine the behavior of capital inflows, particularly in the 90s. Cavallo and Frankel (2008) underline the importance of institutional quality in host economies and argue that better institutional quality is associated with a higher degree of stability in capital inflows and more inflow. There are also studies that aim at connecting both global and domestic factors to the movement of capital flows across boundaries. For example, Chuhan et al. (1998) examine the behavior of bond and equity flows from the US to nine Latin America and nine Asia countries. Their results indicate that not only global factors are essential in explaining capital flows, but also domestic factors motivate capital flows to those economies. The study of Baek (2006), which examines the role of push and pull factors in determining portfolio investments toward some Asian and Latin American economies, suggests that the push-pull framework varies between the economies of the two regions. While external factors dominantly push portfolio investments in Asian economies, those in Latin America are determined by both external and domestic factors.

Considering the possible unpleasant effects of portfolio flows on domestic cycles, the number of studies digging into the main determinants of capital flows to Türkiye has also gained momentum. Çulha (2006) examines the determinants of capital flows into Türkiye for the pre- and post-banking crisis periods. According to the author's results, the pull factors become essential over external ones in determining capital flows into the Turkish economy. Kucukkaya (2011) investigates the push-pull framework for the Turkish economy by employing the VAR Methodology and finds that the domestic interest rate, US interest rate, stock exchange price index, USDTRY exchange rate, and capital account balance have an influence on the portfolio investments to Turkey. By integrating the potential impact of expectations on FED's future policy actions into their regression model, Aktas et al. (2018) investigate the reaction of emerging economies' share in total portfolio flows to FED's signals on further decisions. In their study, Aktas and Eksi (2020) analyze the drivers of portfolio flows to Türkiye and other emerging economies, focusing on cyclical versus structural drivers. Their results suggest that the risk appetite of investors is the main global driver, while growth performance, sovereign risk, and real interest rate are identified as the main domestic factors affecting international flows. Akdoğan et al. (2021) investigate the effect of capital flows across nations with a special focus of cross-border banking sector liabilities to global banks. The authors suggest that the disaggregation of the non-core liabilities of the banking sector into their demand and supply pillars holds value in distinguishing the global liquidity impact from domestic conditions. This differentiation yields valuable insights into the apt structuring of countercyclical macroprudential policies. Çepni et al. (2021) explore the impact of uncertainties related to global economy and trade-policies of the US on predicting the portfolio flows to Türkiye. Their results reveal a causal relationship between capital flows and uncertainty, especially during the global financial crisis and the election of the Trump administration. Gemici et al. (2023) argue that the risk appetite of investors has a causal relationship with both local and global factors and obtain that the main drivers of risk appetite are changes in CDS spreads, financial stress and VIX. Their results imply that all variables exhibit a negative influence on changes in risk appetite indices and that investors tend to adjust their overall investment positions in response to adverse shocks stemming from both local and global factors.

As noted above, research on the determinants of capital flows has mainly paid attention to the quantitative factors. Nevertheless, recent studies aim to address the issue with a perspective that focuses on qualitative factors such as market sentiment. There is no doubt that sentiment is not a new concept in the literature, but it occupies a particular place in the field of finance to investigate the role of investor sentiment in explaining and predicting asset prices (Baker and Wurgler, 2006; Tetlock, 2007, 2011; Tetlock et al., 2008; Loughran and McDonald, 2011; Soo, 2013). There are a few studies in the literature regarding the examples that combine this new perspective with the traditional literature on international portfolio flows. For example, Hwang et al. (2019) analyze the relationship between global investor sentiment and capital flows across the Korean economy and other Asia-Pacific countries. The authors build a global investor sentiment indicator using an average sentiment score based on foreign editorials about Korea. Their results suggest that the sentiment indicator provides important insights into the determinants of international capital flows to the Korean markets. The study of Hwang (2011), exploring whether retail investors' non-fundamental reasoning can affect international capital movements, reveals that individual investors' portfolio holdings in a foreign country are highly related to the popularity of that foreign country in the United States. Birru and Wynter (2023) demonstrate that economies with higher sentiment not only experience higher portfolio inflows to their local markets but also face lower portfolio outflows from that country. The authors also elaborate that sentiment in an economy has spillover impacts on demand for assets in other countries. Despite these reviving academic efforts on international capital flows, no studies examining the flows of portfolio investments to Türkiye utilizing market psychology. This study contributes to the related literature by integrating a new variable representing investor mood and market expectations toward the Turkish economy into the traditional push-pull framework.

3. Methodology

This research examines the influence of both external and domestic fundamentals on portfolio flows, paying particular attention to market sentiment towards the Turkish economy. To understand the relationship between economic sentiment concerning Türkiye and international portfolio flows, we employ the Autoregressive Distributed Lag (ARDL) method, a cointegration approach pioneered by Pesaran et al. (2001). The ARDL bounds test method offers several advantages over other cointegration tests. Notably, it facilitates the examination of the long-term relationship between variables, even if they are integrated in varying orders. Specifically, the technique is effective regardless of whether the model's variables are purely I(0), solely I(1), or a combination of both. This versatility circumvents potential challenges arising from unit root tests. Additionally, the ARDL approach addresses the endogeneity concerns of independent variables and proves suitable for studies with limited sample sizes. One of its distinct benefits is its capacity to concurrently estimate the short- and long-term interplay between variables.

In order to investigate if sentiment towards the Turkish economy has a bearing on the behavior of international portfolio flows into Türkiye, we consider the Federal Reserve System's asset value as a global liquidity indicator. Additionally, we factor in the production and interest rate disparities between Türkiye and the US to reflect real and monetary divergences between emerging and advanced economies (Calvo et al., 1993; Ahmed and Zlate, 2014).

The following regression is estimated using the ARDL approach:

$$\begin{aligned}\Delta Netflows_t = {} & \beta_0 + \sum_{i=1}^{p-1}\beta_i \Delta Netflows_{t-i} + \sum_{i=0}^{q-1}\delta_i \Delta TESI_{t-i} \\ & + \sum_{i=0}^{q-1}\tau_i \Delta VIX_{t-i} + \sum_{i=0}^{q-1}\theta_i \Delta IntRate\_Diff_{t-i} + \sum_{i=0}^{q-1}\gamma_i \Delta IP\_Diff_{t-i} \\ & + \sum_{i=0}^{q-1}\alpha_i \Delta FED\_BS_{t-i} + \varphi_1 NetFlows_{t-1} + \varphi_2 TESI_{t-1} + \varphi_5 VIX_{t-1} \\ & + \varphi_3 IntRate\_Diff_{t-1} + \varphi_4 IP\_Diff_{t-1} + \varphi_5 FED\_BS_{t-1} + \mu_t \end{aligned} \quad (1)$$

where "Netflows" refers to the net portfolio flows directed towards Türkiye, "TESI" signifies the sentiment indicator pertinent to the Turkish economy, "VIX" represents the global risk aversion levels, "IntRate_Diff"

represents the discrepancy in interest rates between Türkiye and the US, "IP_Diff" indicates the growth rate differential between Türkiye and the US and "FED_BS" stands for the aggregate asset value held by all Federal Reserve Banks. β, δ, τ , θ, γ and α correspond to the short-term coefficients, while the φ values represent the long-term coefficients. μ refers to the error term. Lastly, "p" and "q" denote the lag lengths associated with dependent and independent variables, respectively.

Cointegration is assessed using the Bounds testing approach, where the joint significance of the lagged values of the variables is examined via an F-test. The null hypothesis, suggesting no cointegration, is denoted as H_0: $\varphi_1 = \varphi_2 = \varphi_3 = \varphi_4 = \varphi_5 = 0$. We consider two sets of critical values derived by Pesaran et al. (2001) and Narayan (2005). Pertaining to the interpretation of Bounds testing, if the F-statistic exceeds the upper critical bound, it provides statistical evidence refuting the null hypothesis of no cointegration, regardless of the integration order of the variables in the model (be I(0) or I(1)). Conversely, if the F-statistic falls below the lower critical bound, the null hypothesis remains uncontested. In instances where the computed F-statistic is positioned between the critical bounds, it necessitates a unit root test to ascertain the integration order of the variables, whether they are I(0) or I(1).

If there is evidence of a cointegrating relationship, an error correction model can be employed to capture the short-term dynamics of this long-term association, which is defined as:

$$\begin{aligned}\Delta Netflows_t = {} & \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta Netflows_{t-i} + \sum_{i=0}^{q} \gamma_i \Delta TESI_{t-i} \\ & + \sum_{i=0}^{q} \beta_i \Delta VIX_{t-i} + \sum_{i=0}^{q} \delta_i \Delta IntRate\_Diff_{t-i} + \sum_{i=0}^{q} \theta_i \Delta IP\_Diff_{t-i} \\ & + \sum_{i=0}^{q} \pi_i \Delta FED\_BS_{t-i} + \partial ECT_{t-1} + \mu_t \end{aligned} \quad (2)$$

where ECT represents the error correction term, capturing the speed at which adjustments are made to return to equilibrium in the enduring relationship among net portfolio flows, economic sentiment, and other control variables.

4. Data and empirical analysis

This section outlines the data utilized for the study, including construction of a composite sentiment indicator for the Turkish economy, "Turkish Economic Sentiment Index (TESI). It details the methodology employed to examine the relationship between sentiment regarding the Turkish economy and the recent trends in private portfolio flows.

4.1. Construction of sentiment index

Recent advancements in text analytics provide a gateway to mine information from unstructured textual sources and to numerically represent these features. Sentiment analysis, a pillar of text analytics, is characterized as a method to gauge the emotional tones present in qualitative data, using an array of techniques, including natural language processing, computational linguistics, machine learning, and statistical methods.

While sentiment analysis has been discussed in the literature for some time, only a handful of studies focus on gauging the overall economic mood of an economy. Shapiro et al. (2020) craft an economic sentiment metric, rooted in economic and financial journalism, to explore its correlation with the economic activity in the US. They scrutinize the interplay between their news-oriented sentiment index and US economic activity by employing computational text analysis, predominantly lexical methods. Garcia (2013) constructs a market sentiment indicator based on articles from the New York Times. Using a lexical method, the author tallies positive and negative terms for every article column, referencing the lexicon curated by Loughran and McDonald (2011). Similarly, Fraiberger (2016) dissects the informational content of news-based sentiment metrics and their link with economic activity fluctuations across 12 nations. The author integrates the positive and negative word dictionaries from both Loughran and McDonald (2011) and Young and Soroka (2012) for the analysis.

To construct that novel sentiment metric for the Turkish economy, we source 31,084 news articles concerning the Turkish economy from Thomson Reuters and the Financial Times. Furthermore, we obtain 12,900 reports from major international institutional investors renowned for their deep acumen and familiarity with the Turkish economic landscape. These reports hail from the top 15 global investment banks that routinely pen insights on Turkey's key economic and financial evolutions. These reports were accessed from the respective institutions' online platforms with explicit permissions. To preserve confidentiality, the identities of both the institutions and the authors remain undisclosed in this context.

After the data gathering phase, the news articles and investor reports proceed to a pre-processing stage in which noisy elements and irrelevant information, such as special characters, punctuation, etc., are eliminated. Following this, the refined textual data is divided into tokens, forming the fundamental basis for the subsequent sentiment analysis. These tokens can encompass words, phrases, or sentences, with the choice dependent on the desired level of granularity for the sentiment analysis. Within this study, the evaluation of the semantic orientation of the news articles and investor reports is conducted at both word and sentence levels. In the word-level sentiment scoring, each individual word within the news articles and investor reports is assigned a sentiment score (positive, negative, or neutral). In the sentence-level sentiment scoring, the overall sentiment or emotional tone expressed within a sentence is assessed, taking into account the context and interaction between words.

Furthermore, a variety of sentiment scoring models are applied, considering the advantages and limitations associated with diverse sentiment analysis methodologies. Specifically, both lexical and machine learning techniques are employed to quantify the sentiment expressed within each news article and report. The lexical approach relies on a predefined dictionary in which sentiment scores are assigned to tokens. This approach utilizes a list of opinion words (lexicons) and their associated valence shifters, as well as a set of rules for determining the sentiment orientation. In the initial phase, words are compared with opinion words found in the relevant lexicon. Each word that matches an opinion word is given a sentiment score, categorizing it as positive, negative or neutral. The subsequent step addresses valence shifters, which are words that alter or intensify the meaning of opinion words. "Negators" are typically adverbs that negate the meaning of words, while "amplifiers" are generally adverbs or adjectives that enhance the meaning of words. The final stage involves sentiment aggregation to determine the overall sentiment orientation within the textual data. If the cumulative sentiment score is positive, the text is classified as "positive," and vice versa.

Within the scope of the lexical approach, the word-level sentiment scoring is applied using the lexicons of Bing, Loughran & McDonald (LM), Afinn and Nrc lexicons. Respecting calculation methods of sentiment scores, for the Bing and LM lexicons, the sentiment scores are obtained by the difference between positive and negative sentiment counts. For the Afinn and Nrc lexicons, overall sentiment score is measured by the sum of sentiment scores. Thus, eight word-level sentiment series are yielded. Four of them is derived from the news articles about the Turkish economy and the rest is obtained from the investor reports.

Moreover, the sentiment analysis is enriched by adding a sentence-level analysis based on the study of Silge and Robinson (2017) in which the authors propose that sentence-sized or paragraph-sized sentiment analysis generally displays better performance. To extract overall sentiment from the text data, the sentences are integrated with "Jockers", "Senticnet", "Sentiword", "Syuzhet", "Bing", "Afinn", "LM" and "Nrc" dictionaries. Hence, eighteen sentence-level sentiment indices are obtained. Nine of them are derived from the news articles about the Turkish economy and the rest is obtained from the investor reports.

As a result of lexical process, a total of twenty six sentiment indices for the Turkish economy is derived. Having such a great variety of indices enables to improve the robustness of the analysis and offers a substantial comparison for the accuracy of the different methods and lexicons.

Recognizing that the sentiment analysis can be enriched by combining alternative approaches to leverage the strengths of each, the news articles and investor reports are also analyzed by the machine learning (ML) algorithm. Considering its flexibility and fined-tuned touch in the sentiment analysis, the dataset undergoes analysis using Google's Cloud Natural Language API algorithm. While its user-friendly interface is often underscored, the primary rationale for selecting Google's API is its provision of pre-trained powerful NLP models. This comes at a relatively low cost for such an intricate process, owing to the declining average costs of cloud services. The efficacy of the ML models within the API is typically deemed commendable, especially for English-language datasets, given that the models benefit from training on vast document corpora.[4]

In total, twenty-eight raw sentiment scores are calculated—fourteen from news articles and the remaining from investor reports—all of which are on different scales. To harmonize these raw sentiment scores, we adopt the methodology put forth by Baker et al. (2016). This involves scaling the raw scores by the total count of text documents in a given month, followed by standardization. Given that every sentiment scoring model possesses distinct strengths and limitations, we employ principal component analysis (PCA) to derive a composite index from the twenty-eight sentiment scores. The first component, accounting for 52% of the variance, is designated as the monthly composite sentiment index, termed the "Turkish Economic Sentiment Index (TESI)" (refer to Fig. 1).

As seen in Fig. 1, the TESI reflects numerous spikes and drops in overall sentiment towards the Turkish economy across the timeline. To assess the TESI's ability to detect the main developments affecting the overall economic climate, an event analysis is conducted below to explore the periods in which the TESI exhibits fluctuations and the significant events that align with these periods.

- It would not be misleading to state that the period spanning from 2004 to 2007 was predominantly shaped by its economic reform agenda under the IMF Stand-by program and Türkiye's EU accession process. Other pivotal moments from this era, which could potentially sway the broader sentiment towards the Turkish economy, include the discussions concerning the reunification of Greek and Turkish Cypriots in 2004, the depreciation of the Turkish Lira (TL) influenced by global market volatility arising from stricter monetary policies in advanced economies in 2006, and the increased stress in the global financial market in late 2007 due to issues in the US subprime markets.
- Between 2008 and 2012, the most significant event was the subprime mortgage crisis that began in the US in 2007. This localized crisis escalated into a global financial and economic downturn following the collapse of Lehman Brothers in September 2008. However, by the latter half of 2009, there was a marked and abrupt uptick in global sentiment and investor risk appetite, leading to substantial capital inflows into emerging markets, Türkiye included, in search of higher yields. Although 2011 saw the detrimental effects of the European Debt Crisis, the onset of 2012 marked a resurgence in global risk appetite coupled with expansionary stances by central banks.
- During the timeframe from 2013 to 2018, it is pertinent to emphasize a significant juncture marked by the announcement made by FED Governor Bernanke regarding an exit strategy from quantitative easing policies. This announcement led to a swift contraction in global financial conditions, resulting in capital withdrawals from emerging markets. In this period, often referred to as the "taper tantrum," Türkiye is perceived as one of the most vulnerable emerging markets due to its significant external financing requirements and a high proportion of private external debt. The sentiment scores exhibited a notable plunge, which was offset when the Central Bank of the Republic of Turkey (CBRT) instituted a significant interest rate surge and streamlined its monetary policy framework during an emergency meeting on January 28, 2014, where the repo rate leaped from 4.5 percent to 10 percent. Another critical juncture that triggered one of the most profound drops in sentiment scores was in 2018, when the tensions escalated between Türkiye and the US government. This tension resulted in the TL's significant depreciation against the dollar due to a massive sell-off in August 2018. A series of TL/FX liquidity measures were enacted to counter the TL's devaluation in August, followed by aggressive rate hike decisions on the monetary front in September.
- Subsequently, sentiment toward the Turkish economy reached a nadir, primarily influenced by the onset of the Covid-19 pandemic. The close of 2019 saw the global community grappling with the emergence of the first Covid-19 case in Wuhan, China. By March 11, 2020, the World Health Organization officially recognized it as a pandemic. Türkiye, on that very day, announced the first coronavirus case. By March 17, with the pandemic profoundly affecting both the global landscape and the Turkish economy. However, the CBRT, alongside other relevant entities, quickly reacted and initiated measures to eliminate the pandemic's negative ramifications and bolster financial stability. Hence, in this period, the sentiment towards Türkiye displayed a strong recovery thanks to these policy steps taken. Following a significant decline in the second quarter of 2020, due to diminished domestic and international demand, the Turkish economy witnessed a swift resurgence post-May, in line with the gradual rollback of pandemic-related restrictions. This strong recovery led to a 1.8 percent growth in Turkey for 2020, positioning it as the second fastest-growing economy after China. The sentiment towards Turkey rebounded from its historic lows, hitting a zenith in November 2020.
- However, the Turkish economy witnessed a subsequent depreciation surge in TL in the following period, coinciding with the downward movement in the sentiment. Against this backdrop, the CBRT embarked on a monetary policy tightening journey, coupled with simplifying its monetary policy framework. The market largely perceived these conventional policy measures, as overwhelmingly positive, leading sentiment indices to crest in the final quarter of 2020 and the initial quarter of 2021. Yet, as of the second quarter of 2021, the sentiment index began a descent, reflecting market participants regarding a shift back to unorthodox economic policy choices. Additionally, the Russia-Ukraine war became another significant event that led to a downward movement in the TESI in the first quarter of 2022.

4.2. Data series

As traditional pull-push factors, the VIX index as a proxy indicator for global risk appetite, the interest rates differences between Türkiye and the US, the difference in industrial growth rates of these two economies and the aggregate asset value held by all Federal Reserve Banks as a global liquidity indicator are included. In addition to these factors, the TESI is integrated into the analysis as a metric for market psychology that can significantly impact investment decisions.

As dependent variable, the net portfolio flow into Türkiye is established, because we posit that the overall economic sentiment towards Turkey might influence portfolio flows in two ways, as articulated by Birru and Wynter (2023). Firstly, an elevated economic sentiment about Türkiye could lead to increased portfolio inflows. Secondly, during times of higher sentiment, there might be reduced portfolio outflows from Turkey. Finally, we incorporate two dummy variables representing the Global Financial Crisis and the Covid pandemic as non-dynamic factors.

[4] NLP with Google Cloud Natural Language API by Maximilian Hopf.

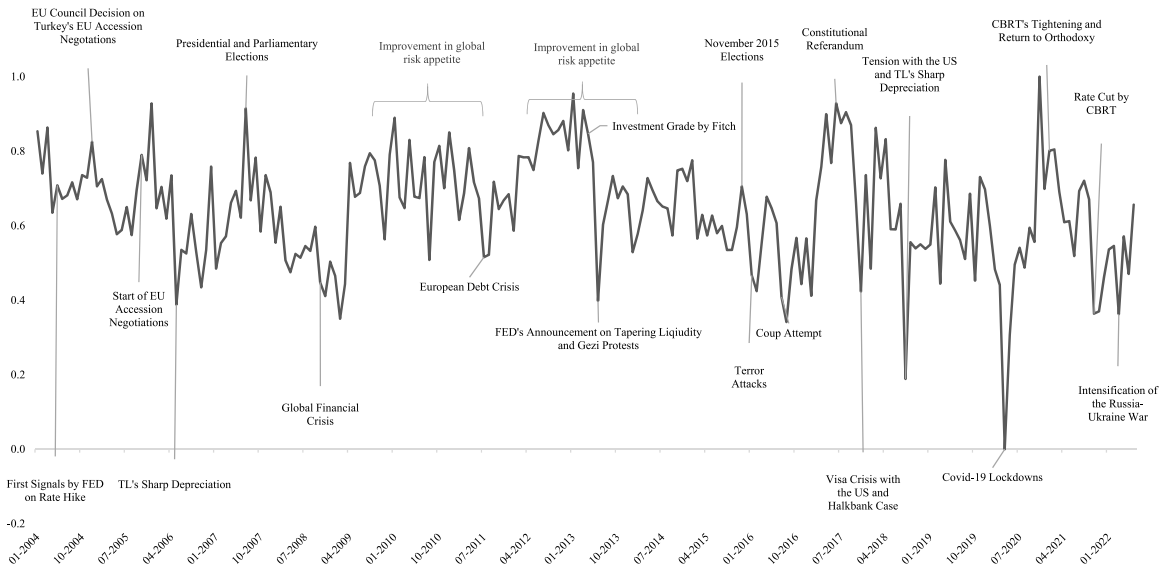

Fig. 1. Evolution of the TESI

The raw data of industrial production, interest rate, VIX, and the asset values of the Federal Reserve System are acquired from the Bloomberg Terminal. Conversely, the data pertaining to net portfolio flows to Türkiye are sourced from the Institute of International Finance's data portal. The sentiment metric concerning the Turkish economy is derived from the authors' computations, with the methodology detailed in the subsequent section. All data sets are on a monthly basis, spanning from January 2004 to June 2022 (see Table 1).

4.3. Model estimation and empirical results

In order to examine if the TESI and portfolio flows form a meaningful and stable relationship, one needs to check the order of integration of the variables in question. To this end, three commonly used unit-root tests are employed: Augmented Dickey-Fuller (ADF), Phillips-Perron (PP), and Kwiatkowski–Phillips–Schmidt–Shin (KPSS). The results are presented in Table 2. As seen, the interest rate differentials and the aggregate value of the FED's balance sheet achieve stationarity after the first difference. Meanwhile, the remaining variables exhibit stationarity at the level. In other words, the variables in the model are either I(0) or I(1).

Thus, we apply the bounds testing technique for cointegration using the ARDL model. To do so, one needs to determine the optimal lag orders, p and q, for the dependent and independent variables in the ARDL regression, as shown in equation (1), the Akaike Information Criteria is utilized. The results of the optimal lag orders are presented in Table 3.

Furthermore, diagnostic tests such as no autocorrelation, homoscedasticity, normality, and stability tests are conducted to ensure that the regressions with specified lag orders adhere to the classical regression assumptions. The results are reported in Table 4. As it is seen, there is no evidence of serial correlation or heteroscedasticity in the model residuals. Furthermore, the residuals appear to follow a normal distribution, and the models seem to be correctly specified.

As a result, we can run bounds tests for cointegrating relationships using the optimal lag lengths reported in Table 3. The F-statistics for bounds test is displayed in Table 5. The results indicate the cointegrating relationship between the variables.

Table 1
Definition of variables.

Variable	Short Definition
Net Portfolio Flows	Monthly net foreign flows to Türkiye (in billion US dollars)
TESI	Sentiment index representing the overall perception of the Turkish economy
VIX	Global risk aversion indicator
Industrial Production Differential	Natural log of Turkish Industrial Production Index - Natural log of US Industrial Production Index
Interest Rate Differential	Turkish ON Interest Rate - Wu-Xia shadow federal funds rate
FED_Balance Sheet	Natural log of total value of the assets of all Federal Reserve Banks

4.3.1. Analysis of the long-run relationship

Considering the cointegration between the net portfolio flows to Turkey and derived sentiment indicator alongside other variables, the long-run coefficients are estimated. From the outcomes of the model estimations, it becomes apparent that, over the long run, the sentiment towards the Turkish economy and the extent of global risk aversion are pivotal determinants influencing net portfolio inflows to Turkey. Furthermore, it is also noted that the signs of the estimated coefficients align seamlessly with theoretical expectations.

Delving deeper into the results, the model reveals that, over the long run, TESI, VIX, IP_Diff, and FED_BS emerge as statistically significant drivers of the net portfolio flow to Türkiye, as displayed in Table 6. Specifically concerning the TESI, a direct and positive correlation exists between overall sentiment towards the Turkish economy and net inflows from non-residents to Türkiye, as expected. Conversely, the degree of global risk aversion, represented by the VIX, exerts an expected inverse influence on net portfolio flows. Such findings align with the idea that favorable sentiment can stimulate international portfolio influx into emerging markets, while heightened global market volatility expectations can induce outflows from these economies. Another variable positively correlated with the portfolio flows is the total asset value of all Federal Reserve Banks. (For robustness check of the long-run model estimations, see Appendix B).

4.3.2. Analysis of the short-run relationship

Following the analysis of the long-run relationship between the economic sentiment towards Türkiye and net portfolio flows, we proceeded with the estimation of error correction model to examine the short-term dynamics and the speed of adjustment to the long-run equilibrium. The estimations from the error correction model underscore that the error correction term (ECT) is negative and statistically significant.

Table 2
Unit root test results.

		ADF Test		PP Test		KPSS Test		Order of Integ.
		Level	1st Diff	Level	1st Diff	Level	1st Diff	
Portfolio Flows	NetFlows	0.01 ***		0.01 ***		0.05 *	0.1 ***	I(0)
Sentiment	TESI	0.01 ***		0.01 ***		0.05 *		I(0)
Global Risk	VIX	0.18	0.01 ***	0.01 ***		0.1 ***		I(0)
Interest Rate Differential	IntRate_Diff	0.01 ***		0.13	0.01 ***	0.04 *	0.1 ***	I(1)
Industrial Production Differential	IP_Diff	0.01 ***		0.01 ***		0.01	0.1 ***	I(0)
Global Liquidity	FED_BS	0.55	0.01 ***	0.96	0.01 ***	0.01	0.1 ***	I(1)

Table 3
Optimal lag orders.

Variable	Net Flows	TESI	VIX	IntRate Diff	IP_Diff	FED_BS
Lag Order	2	5	1	2	0	2

Table 4
Results of diagnostics tests.

TEST	P-VALUE	NULL HYPOTHESIS
AUTOCORRELATION - BREUSCH-GODFREY	0.87 (up to 1) 0.27 (up to 2)	There is no serial correlation of any order up to p
HETEROSKEDASTICITY - STUDENTIZED BREUSCH-PAGAN	0.50	The error variances are all equal
NORMALITY - SHAPIRO-WILK	0.07	The population is normally distributed
STABILITY - RAMSEY'S RESET	0.22 (df1 = 1) 0.36 (df2 = 2)	The model is correctly specified.

Note: The figures are the p-values of the corresponding test statistics.

Table 5
Bounds test results for cointegration.

F-Statistic	p-value	Critical Values Lower Bound	Critical Values Upper Bound
12.89	0.000	4.26	6.04

Table 6
Long-run coefficients.

Variables	Coefficient	p-value	Significance
Intercept	−9.00	0.072	*
TESI	4.47	0.008	***
VIX	−0.08	0.002	***
IP_Diff	−3.51	0.050	**
IntRate_Diff	−0.03	0.428	
FED_BS	1.051	0.081	*

The coefficient suggests that any departure from the equilibrium level of net portfolio flows in the current period would be rectified in roughly 1.2 months. Additionally, the results indicate that the TESI has a statistically significant and positive relationship with the net portfolio flows to Türkiye. Another evidence is such that although its impact fades out over time, the sentiment exerts a positive short-term influence on net portfolio flows to the Turkish economy, both in the current and preceding periods. It is also worth noting that the degree of global risk aversion plays a statistically significant role in explaining the short-term variations in portfolio flows to the Turkish economy (refer to Table 7).

5. Conclusion

This research examines the influence of both external and domestic fundamentals on portfolio flows, paying particular attention to the market sentiment towards the Turkish economy. To analyze the relationship between economic sentiment concerning Türkiye and international portfolio flows, we introduce a novel text-based sentiment indicator for the Turkish economy, integrating lexical techniques and machine learning algorithms. To assess whether market sentiment holds discernible influence beyond conventional catalysts on capital influx into Turkey, the obtained sentiment indicator, TESI is analyzed alongside major pull-push determinants.

Our results suggest the cointegration between the net portfolio flows to Türkiye and the derived sentiment indicator along with other controlling variables. The outcomes of the analysis reveal that, in the long term, the sentiment towards the Turkish economy and degree of risk appetite of investors stand out as pivotal determinants of international portfolio flows. In fact, the sentiment indicator, TESI exhibits a positive correlation with portfolio flow dynamics; whereas, as intuition suggests, the degree of global risk aversion inversely affects these flows. This aligns with the conventional view that favorable global market sentiment can boost portfolio inflows into emerging markets, whereas deteriorated sentiment and negative expectations can prompt outflows.

The significance of sentiment in influencing portfolio flows underscores its critical relevance for both policymakers and market participants, given its profound implications for economic stability, market dynamics, and overall financial well-being. The potential impact of market psychology on guiding portfolio flows extends beyond short-term market dynamics, exerting a lasting influence on trends in financial and capital markets, and consequently shaping long-term investment strategies. Hence, by monitoring and understanding sentiment

Table 7
Short-run coefficients.

Variables	Coefficient	p-value	Significance
$\Delta NetFlows_{t-1}$	0.05	0.472	
$\Delta TESI_t$	4.60	0.000	***
$\Delta TESI_{t-1}$	2.17	0.058	*
$\Delta TESI_{t-2}$	−0.29	0.800	
$\Delta TESI_{t-3}$	1.68	0.128	
$\Delta TESI_{t-4}$	1.12	0.257	
ΔVIX_t	−0.16	0.000	***
ΔIP_Diff_t	−3.69	0.031	**
ΔIP_Diff_{t-1}	2.90	0.083	*
ΔFED_BS_t	7.25	0.060	*
ΔFED_BS_{t-1}	−10.49	0.028	**
ECT	−0.85	0.000	***

indicators, policymakers can craft timely and effective responses aimed at promoting economic stability, cultivating investment, and safeguarding financial markets against unwarranted disruptions.

Appendix

Appendix A: Lexicons Used in the Analysis.

Lexicon	# of Words	Score/Value	Calculation Method
Afinn	2477	between −5 and +5	Sum of individual scores
Bing	6789	Positive and Negative	(# of positive words - # of negative words)
Nrc	5555	Positive and Negative	(# of positive words - # of negative words)
LM	3917	Positive and Negative	(# of positive words - # of negative words)
Senticnet	23,626	between −1 and +1	Sum of individual scores
Jockers	11,710	between −1 and +1	Sum of individual scores
Sentiword	20,093	between −1 and +1	Sum of individual scores
Syuzhet	10,748	between −1 and +1	Sum of individual scores

Appendix B. Robustness check of the long-run model estimated using the DOLS

Considering potential biases in the estimation of a cointegrated relationship due to endogeneity and serial correlation, the long-term relationship between sentiment toward the Turkish economy and international portfolio flows is also estimated using the Dynamic Ordinary Least Squares (DOLS) technique. The results from the DOLS-based models suggest that the coefficients derived from the ARDL estimation align closely with those from the DOLS estimation. Another consistent finding across both methodologies is the statistical significance of sentiment indicators and the VIX across all models.

Table B1
Results of DOLS Estimation for Model 1

Variables	Coefficient	p-value	Significance
Intercept	−8.92	0.001	***
TESI	6.20	0.000	***
VIX	−0.07	0.000	***
IP_Diff	−2.91	0.001	***
IntRate_Diff	−0.05	0.004	**
FED_BS	0.92	0.002	**

Table B1 exhibits the results from the DOLS estimation, incorporating the composite TESI into the model. The empirical evidence implies that TESI and net portfolio flows have a strong and positive relationship. In contrast, a surge in global risk aversion might result in a decrement in net portfolio flows. Furthermore, the output and interest rate disparities between Turkey and the US inversely affect net portfolio inflows, while an increase in the FED's balance sheet value could potentially boost net portfolio inflows.

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