

A STUDY ON EXCHANGE RATE AND STOCK MARKET VOLATILITY AND SHORT-TERM REGULATIONS

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Yunus Hamza Turk¹, Destan Halit Akbulut²¹Galatasaray University, Business Administration, Istanbul, Türkiye.yunushamza.turk@ogr.gsu.edu.tr, ORCID: 0009-0005-3868-4692²Galatasaray University, Business Administration, Istanbul, Türkiye.dhakbulut@gsu.edu.tr, ORCID: 0000-0002-0705-9553

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ABSTRACT

Purpose- In order to maintain economic stability in Türkiye, new economic regulations are often introduced during periods of economic distress. This study aims to determine the impact of such regulations on price fluctuations.**Methodology-** The analysis focuses on the volatility in the USD/TRY exchange rate and the BIST100 index in relation to swap limit regulations introduced by the Banking Regulation and Supervision Agency (BDDK) in 2018 and 2020. Volatility was examined before and after the implementation of the regulations using ARCH, GARCH, and TGARCH models. Additionally, F-tests were employed to determine whether the variances before and after the implementation of the regulations were statistically different.**Findings-** The ARCH and its extended models indicate that volatility in exchange rates increased following the implementation and subsequent easing of the regulations. The F-tests also confirm that there is a significant difference in variance for both the USD/TRY exchange rate and BIST100 index before and after the relevant regulatory changes.**Conclusion-** Three main conclusions can be drawn from the results. First, short-term regulatory measures swiftly implemented by the BDDK during times of crisis can provide temporary stability, but do not offer long-term solutions. Second, when the process of removing or relaxing these regulations is not carefully planned, markets may experience renewed volatility. Third, ARCH-based models prove to be highly effective and reliable tools for measuring volatility and analyzing the impact of such regulatory measures during periods of financial instability.**Keywords:** ARCH, price volatility, economic stability, BDDK, BIST100**JEL Codes:** G28, G21, F31

1. INTRODUCTION

The economic crisis that has gripped Türkiye since 2018 could not be contained for a long period and continues to exert its effects to this day. The implicit inflation targeting regime, adopted temporarily in 2002, initially achieved success thanks to the structural reforms implemented in the aftermath of the 2001 crisis. However, due to a lack of determination in the consistent implementation of these structural reforms, price stability could not be ensured between 2006 and 2017 (Durmuş, 2018). Although various micro-level factors contributed to this situation, macroeconomic factors proved to be predominant. In Türkiye, exchange rates are among the macroeconomic variables that cannot be ignored in studies focusing on inflation.

To understand the link between inflation and exchange rates, the initial question that arises is whether one causes the other. Indeed, research on this topic has demonstrated the impact of exchange rates on inflation, whereas the effect of inflation on exchange rates has been found to be statistically insignificant (TÜRK, 2016). Moreover, econometric studies using data on the real effective exchange rate, unemployment, and the Consumer Price Index (CPI) between 1990 and 2012 have revealed a direct causal relationship between the real effective exchange rate and CPI (Selim & Güven, 2014). The influence of this macroeconomic variable on CPI data — a direct indicator of price fluctuations — is particularly significant for our analysis. In fact, we believe it would be beneficial for finance scholars to examine economic fluctuations in a context where none of the factors influencing inflation data exhibit long-term stability.

Following the economic crises of the late 20th century, Türkiye was able to weather the 2008 global financial crisis relatively unscathed, owing to the structural reforms undertaken since the early 2000s. However, by the early 2010s, exchange rate instability emerged as a key issue on Türkiye's financial agenda, particularly following the sharp depreciation of the Turkish lira in 2018, when the dollar nearly doubled in value — a situation that continues to persist today. The Central Bank of the Republic of Türkiye (CBRT) and various financial authorities have since employed a range of instruments to attempt to stabilize exchange rates and prices.

In order to curb exchange rate volatility, financial authorities have focused on measures such as limiting the role of foreign currency in corporate risk planning and promoting alternative investment instruments, in response to growing interest in foreign currencies driven by

the depreciation of the Turkish lira. Due to exchange rate volatility, both individual investors and corporations have increasingly sought out foreign currency-linked investments to preserve the value of their financial assets. The subsequent implementation of the foreign exchange-protected deposit scheme (FX-protected deposit or “KKM”) was initially well received by the market (CBRT, 2021). However, the cost of this measure — aimed at preventing exchange rate fluctuations — was borne primarily by the central bank, resulting in significant monetary expansion. As of September 2023, 860 billion Turkish lira out of the total 1 trillion lira cost of the scheme had been financed by the CBRT (Kartal, 2024). Due to the substantial fiscal burden imposed by the system, the Ministry of Treasury and Finance has announced that the scheme is expected to be phased out in the long term. The effects of such crisis-period measures and ad hoc regulatory frameworks — such as the FX-protected deposit scheme — may trigger further market volatility, particularly when they are not designed with long-term sustainability in mind.

On August 13, 2018, following a two-day surge in exchange rates, the USD/TRY rate experienced a significant fluctuation of 50%, prompting financial authorities to respond with a sudden regulatory intervention, adopting a similar short-term approach. During the week of August 13–17, the Banking Regulation and Supervision Agency (BDDK) imposed various restrictions on banks' currency swap transactions, where one leg was denominated in foreign currency and the other in Turkish lira, and later extended these restrictions to other derivative transactions beyond swaps. This decision, which was originally intended as a short-term measure—similar to the FX-protected deposit scheme (KKM) introduced years later—was in fact maintained for several years, repeatedly eased, revised, and accompanied by various exemptions. It is natural to expect market volatility in response to the introduction of such restrictions. However, it is often overlooked that markets also exhibit significant fluctuations when these short-term regulatory measures are lifted.

The aim of this study is to examine the regulatory decisions taken by the BDDK in August 2018, as a representative example of short-term financial regulations in Türkiye. The scope of our analysis covers the period from the implementation of these measures until their removal in September 2020. To understand the dynamics of market fluctuations, we employ ARCH, GARCH, and TGARCH models to analyze and interpret the periods before and after both the imposition and the removal of these restrictions. Our study places particular emphasis on the volatility observed during the deregulation phases, which has largely been neglected in prior research.

2. LITERATURE REVIEW

The Banking Regulation and Supervision Agency (BDDK) was established on June 23, 1999. Created by Decree Law No. 23734, published in the Official Gazette (1999), the BDDK's mandate is defined by law as “to protect the rights and interests of depositors, to ensure the sound functioning of the credit system by considering confidence and stability in financial markets, as well as the requirements of economic development, and to regulate the principles regarding the establishment, management, operation, transfer, merger, liquidation, and supervision of banks.” The BDDK operates with this objective in mind and closely monitors domestic markets. It contributes to economic stability by updating or amending banking regulations when necessary. For this reason, during periods of monetary crisis or economic downturn, the BDDK influences bank policies through regulatory interventions and pursues a strategy aligned with the needs of the economy.

The year 2018 can be considered as the starting point of the recent currency crisis in Türkiye, and as the moment when this issue began to draw substantial public and media attention. Throughout 2018, the value of the U.S. dollar increased by nearly 40% against the Turkish lira, and the exchange rate exhibited significant volatility. A similar trend was observed with the euro exchange rate. August 2018 was the month with the most pronounced fluctuations. These developments were mainly attributed to Türkiye's widening current account deficit, declining investor confidence, growing concerns over the erosion of institutional independence in economic governance, and, most notably, escalating geopolitical tensions. From March to July 2018, foreign and total capital flows declined significantly. However, the negative impact of this contraction was mitigated to some extent by ‘improvements’ in April and July. In August 2018 and thereafter, capital flows reversed again, and their negative effects on the economy began to emerge in the following two months (Borotov, 2019). On August 10, 2018, the Turkish lira lost approximately 15% of its value against the dollar in a single day, prompting financial authorities to swiftly adopt measures aimed at stabilizing the markets.

Table 1: Normalization and Easing Decisions on Swap Transaction Limits by the BDDK

Date / Type of Regulation	Scope of Regulation
BDDK (August 13, 2018) / Restrictive (tightening)	Banks' FX-TL swap transactions were limited to 50% of their regulatory capital. No new transactions or renewals would be allowed in case of breaches.
BDDK (August 15, 2018) / Restrictive (tightening)	The limit on banks' FX-TL swap and similar transactions was further reduced to 25% of their regulatory capital, imposing a significant constraint.
BDDK (August 17, 2018) / Restrictive (tightening)	All derivative transactions involving TL purchases at maturity (including forwards and options) were included within the previously introduced 25% limit.
BDDK (September 17, 2018) / Partially easing	A more flexible calculation method was introduced: transactions with maturities of 90–360 days would be counted at 75%, and those above 360 days at 50%.
BDDK (February 9, 2020) / Restrictive (tightening)	The existing 25% limit on FX-TL derivative transactions was tightened further to 10% as of February 8, 2020.
BDDK (April 12, 2020) / Highly restrictive	Due to financial risks arising from COVID-19, the limits on TL purchase and sale derivative transactions with non-residents were significantly reduced and maturity-based restrictions tightened.
BDDK (September 25, 2020) / Easing	Within the post-COVID normalization framework, the BDDK loosened the strict limits on banks' TL derivative transactions with non-residents.
BDDK (November 11, 2020) / Easing	The limits on TL-selling derivative transactions with non-residents were further increased, allowing for greater operational freedom.

In Table 1, regulatory limits based on banks' legal capital regarding TL-selling currency swaps, forwards, options, and other derivative transactions with non-resident counterparties are employed as a significant regulatory tool. On 25 September 2020, with Decision No. 9169 issued by the Banking Regulation and Supervision Agency (BDDK), these limits were increased based on maturity durations, starting from 2%

and reaching up to 20%. Subsequently, with Decision No. 9248 dated 11 November 2020, the limits were further expanded to 5% for transactions maturing in 7 days, 10% for those maturing in 30 days, and 30% for those with a one-year maturity. Under these regulations, if the specified limits are exceeded, banks are not allowed to initiate new transactions, renew maturing ones, or modify existing ones before maturity without obtaining prior written approval from the authority. These implementations are evaluated and applied within the framework of normalization measures taken in response to the global market uncertainties and increasing financial risks triggered by the COVID-19 pandemic, with the aim of supporting financial stability.

3. DATA AND METHODOLOGY

In this study, we used the daily USD/TRY closing exchange rates published by the Central Bank of the Republic of Turkey (CBRT) for the years 2018 and 2020, and the daily BIST100 index closing prices, obtained from the financial platform Investing.com.

The first method developed to examine time-varying variance behavior in financial return series, as opposed to constant variance, was the ARCH model (Autoregressive Conditional Heteroskedasticity) introduced by Engle (1982). Later, Bollerslev (1986) generalized this model and introduced the GARCH model, which provides a more effective analysis of long-term memory effects. However, the GARCH model does not account for asymmetric volatility, which refers to the phenomenon where bad news increases volatility more than good news. To address this issue, Jean-Michel Zakoian (1994) developed the TGARCH model (Threshold GARCH), which introduces a threshold-based conditional variance response and allows for the modeling of both positive and negative shocks with different weights.

Each of these three models—ARCH, GARCH, and TGARCH—has strengths and weaknesses in terms of capturing accurate data dynamics. Due to its simple structure, the ARCH model is useful for modeling short-term volatility. The GARCH model extends this by incorporating lagged variances, enabling a more comprehensive analysis of volatility. The TGARCH model goes further by distinguishing between the impact of positive and negative shocks, making it a particularly useful tool in detecting asymmetric volatility and long-term fluctuations. In this study, we employ all three models simultaneously in order to minimize the risk of misinterpretation and to obtain a more robust picture of market volatility during regulatory periods.

The results obtained from these models were further evaluated using the F-test, focusing on the 60-day windows before and after the regulatory changes listed in Table 2.

An F-test is a statistical method used to compare the variances of two datasets, or to evaluate whether the ratios of variances across multiple datasets are significantly different. The test statistics follow an F-distribution, assuming the null hypothesis is true and that the error terms (ϵ) satisfy standard assumptions (Berger et al., 2018).

H_0 : There is no significant difference in variance between the pre- and post-regulation periods.

H_1 : There is a significant difference in variance between the pre- and post-regulation periods.

Table 2: F-test Parameters to be Performed

Parameters	α	df_1	df_2
August 13-15-17, 2018	0,05	59	59
February 9, 2020	0,05	59	59
April 12, 2020	0,05	59	59
September 25, 2020	0,05	59	59
November 11, 2020	0,05	59	59

4. FINDINGS

Another important detail regarding the hypothesis test we conducted in August 2018 is that Turkey is entering a recession. Turkey experienced an economic downturn that lasted from the third quarter of 2018 to the second quarter of 2019. (TÜİK, 2019).

Table 3: Results of F-tests performed on the BIST100 index

Results of hypothesis tests				
Rule	Rejected/Cannot Reject	Variance (Before)	Variance (After)	Variance
August 13-15-17, 2018	H_0 cannot be rejected	697,291561	1369,429631	$\sigma_1^2 = \sigma_2^2$
February 9, 2020	H_0 rejected	12705,25836	3587,913391	$\sigma_1^2 \neq \sigma_2^2$
April 12, 2020	H_0 cannot be rejected	5279,296182	19633,20807	$\sigma_1^2 = \sigma_2^2$
September 25, 2020	H_0 rejected	8138,252482	1720,530916	$\sigma_1^2 \neq \sigma_2^2$
November 11, 2020	H_0 rejected	9355,25421	1778,243378	$\sigma_1^2 \neq \sigma_2^2$

Using the F-tests, 60-day periods before and after the implementation dates of the regulations were compared, allowing for the assessment of the statistical significance of variance differences. According to the findings of the study, the regulations were found to have a significant impact on market volatility during the vast majority of the period examined. However, the regulation introduced on February 9, 2020, did not exhibit a statistically significant difference, likely due to the exceptional macroeconomic conditions caused by the pandemic.

Table 4: Results of F tests Performed on USD/TL Parities

Results of hypothesis tests				
Rule	Rejected/Cannot Reject	Variance (Before)	Variance (After)	Variance
August 13-15-17, 2018	H0 rejected	0,040518953	0,153354377	$\sigma_1^2 \neq \sigma_2^2$
February 9, 2020	H0 cannot be rejected	0,008736721	0,119276485	$\sigma_1^2 = \sigma_2^2$
April 12, 2020	H0 rejected	0,071677985	0,011212548	$\sigma_1^2 \neq \sigma_2^2$
September 25, 2020	H0 rejected	0,078006173	0,047399856	$\sigma_1^2 \neq \sigma_2^2$
November 11, 2020	H0 rejected	0,115207987	0,055285947	$\sigma_1^2 \neq \sigma_2^2$

5. CONCLUSION

It appears that for short-term regulations to be effective, they must be integrated into a broader, predictable, and structural economic strategy. Instead of temporary interventions, long-term policies should be developed to strengthen market participants' confidence and reduce financial vulnerabilities. Regulatory decisions made by bodies such as the BDDK can only be truly beneficial if they are part of a coherent and comprehensive strategic framework.

The results obtained in this study and the analyses conducted across different domains can also contribute to enriching academic literature. In particular, it would be valuable to perform similar analyses using the XBANK index (BIST banking index) to examine fluctuations observed in the banking sector and address this gap in the literature within the context of BDDK decisions. Moreover, a broader study that is not limited to a single exchange rate could be beneficial; such a study might analyze the euro/TRY parity and the average of the two parities in addition to the dollar/TRY parity.

One limitation of our analysis concerning the BDDK regulations is that the regulations considered were implemented at unusual times. Since the observed fluctuations cannot be solely attributed to BDDK regulations but may also stem from various measures taken by other financial authorities during the period to ensure economic stability, as well as the global recession, isolating the baseline effect of the regulation is challenging. To determine the pure effect of regulation, it would be useful to conduct analyses during periods when the influence of external factors is minimal, which could further contribute to the literature on this subject.

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