

## IMPACT OF COVID-19 ON THE DAILY RETURNS OF ISTANBUL STOCK EXCHANGE

Burcu Zengin\* Sahnaz Kocoglu\*\*



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#### Abstract

**The purpose of the article/hypothesis:** The measures taken by the governments to fight Covid-19 such as social distancing and lockdowns not only crippled the social life, but also the economies of their countries. The purpose of this paper is to analyze the impact of the Covid-19 pandemic on the Turkish economy. The authors used the Istanbul Stock Exchange Index which is a sort of barometer to measure the health of the economic and financial system in Turkey. The aim of the paper is to show the impact of Covid-19 together with the risk in the global market, exchange rates and government responses to the pandemic on the Istanbul Stock Exchange.

**Methodology:** The authors analyzed the impact of the pandemic studying the relations between the Istanbul Exchange and a number of deaths due to Covid-19 together with VIX index, the Government Response Index and exchange rate of USA dollar/Turkish Lira with Toda-Yamamoto Causality test.

**Results of the research:** The results suggest that the number of deaths due to Covid-19 and exchange rates cause the loss in value in the Istanbul Stock Exchange while VIX index and the Government Response Index are found to be ineffective in explaining the volatility in the ISE.

**Keywords:** Covid-19, Istanbul Stock Exchange, global crises.

**JEL Class:** B26, G11, G15.

\* Doctor, Department of Business Administration, Ankara Hacı Bayram Veli University, e-mail: [burcu.zengin@hbv.edu.tr](mailto:burcu.zengin@hbv.edu.tr), <https://orcid.org/0000-0001-5275-6748>

\*\* Doctor, Department of Business Administration, Ankara Hacı Bayram Veli University, e-mail: [sahnaz.kocoglu@hbv.edu.tr](mailto:sahnaz.kocoglu@hbv.edu.tr), <https://orcid.org/0000-0002-2061-1242>

## INTRODUCTION

The first Covid-19 case was confirmed in Wuhan state of China in 2019 and on March 11, 2020 the World Health Organization categorized this contagious disease as a pandemic. Since then, almost 7 million people died because of it and almost 800 million people were confirmed as Covid-19 infected (World Health Organization, 2023). The pandemics before Covid-19 also caused millions of people to die but the main difference is that the whole world is very much connected thanks to efficient and fast transportation opportunities. Wuhan is a rich, export dependent, industrialized state with close bonds with the rest of world, hence it took only a couple months of Covid-19 to disperse all around the world. Since the start of the pandemic, Covid-19 has caused many negative effects on the social relations, working life, education, corporations and economic life as well as on the physical health of people. All of these factors soon turned this pandemic into a global crisis. It is acknowledged that the pandemic has left deep marks, especially on developing countries on the path of sustainable development, with the decrease in financial access, increase in inequality, deepening of poverty and increase in economic fragility (World Bank, 2022a: 4–5).

The World Bank analyzed many global crises and compared them with the Covid-19 pandemic in one century with regard to the percentage of countries in the world experiencing a negative GDP per capita growth. According to this analysis, the impact of Covid-19 on the GDP growth of countries was deeper than the other historical crises the world experienced. As seen in Chart 1, even the Great Depression is the second deepest crisis after the pandemic. A study supporting these findings was also conducted by the European Investment Bank. Albeit for different reasons, both economic downturns produced similar effects. Accordingly, the increasing uncertainties and risks resulting in negative and long-term effects and the dimensions of demand and supply shocks are similar to the Great Depression (ECB, 2020: 5).

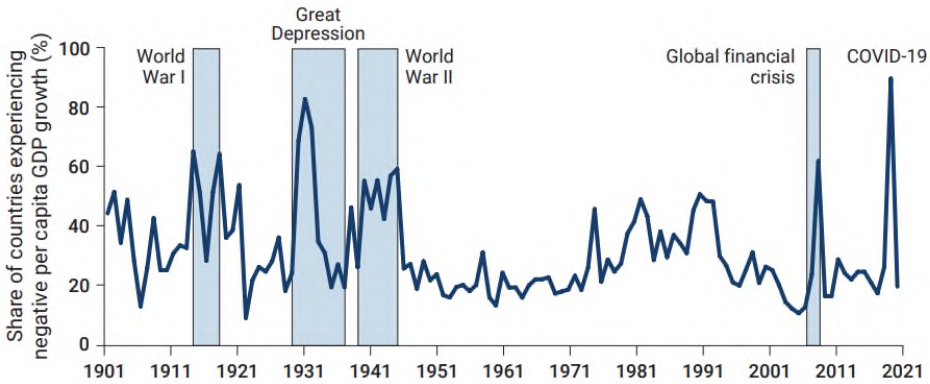


Chart 1. Economic Impact of Covid-19 in Historical Perspective

Source: World Bank, 2022a: 2.

### Turkish Economy and the Impact of Covid-19

Along with the first Covid-19 case in March 2020, Turkey began to feel the effects of the pandemic in many areas just like the whole world. In this process, changes in areas such as education, production, and employment, as well as health, transformed the economy. Accordingly, economic losses were experienced due to problems such as lockdowns, job losses, increased risk, investors' tendency to avoid uncertainty, and consumers' loss of confidence, liquidity problems, and decreased financial accessibility. As can be seen in the chart prepared with the World Bank data, the biggest decrease in GDP growth and GDP per capita growth in Turkey in 10 years, and on the contrary, the biggest increase in inflation and unemployment were experienced during the Covid-19 period. Although there was a contraction in the economy before this process, the pandemic made this contraction more visible and made this situation permanent by preventing the effects from recovering in a short time. The outlook of the Turkish economy over the 10-year period is shown in Chart 2.

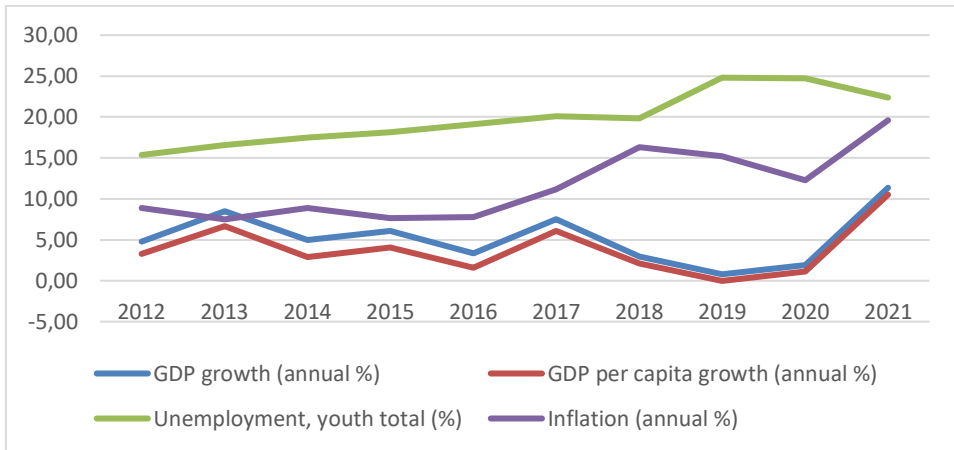


Chart 2. Turkey Development Indicators (2012–2021)

Source: own study based on World Bank Data.

Just like other emerging economies, Turkey has suffered deeply in its process on the way to sustainable development. Due to the uncertainty and loss of confidence experienced with the pandemic, there had been major problems in total demand and employment, especially in the tourism and accommodation sectors. Income inequality and gender inequalities that existed before the pandemic turned to be major and chronic problems. With the depreciation of the Turkish Lira in this period, corporate debt in foreign currency increased, and the balance sheets deteriorated due to the problems experienced in enterprises' access to liquidity and financing (OECD, 2021: 16–20; World Bank, 2022b: 61). Dollarization is a process that generally occurs in developing countries. Due to insufficient capital and low savings rates in developing countries, these countries rely heavily on international financial markets to finance their national economies (Bumin and Özçalıcı, 2023: 3). For this reason, they begin to use the dollar instead of their own country's currency. Countries that have lost confidence in their own currency cannot avoid currency depreciation, as they spend and save in dollars. Turkey also went through such a process during the pandemic. As a result of dollarization, Turkey has started to use dollars in all its transactions instead of the Turkish lira. According to the World Bank report in 2022, the Turkish Lira is the most depreciated currency among all Emerging Markets (World Bank, 2022a: 1). The comparison between emerging markets and Turkey is shown in Chart 3.

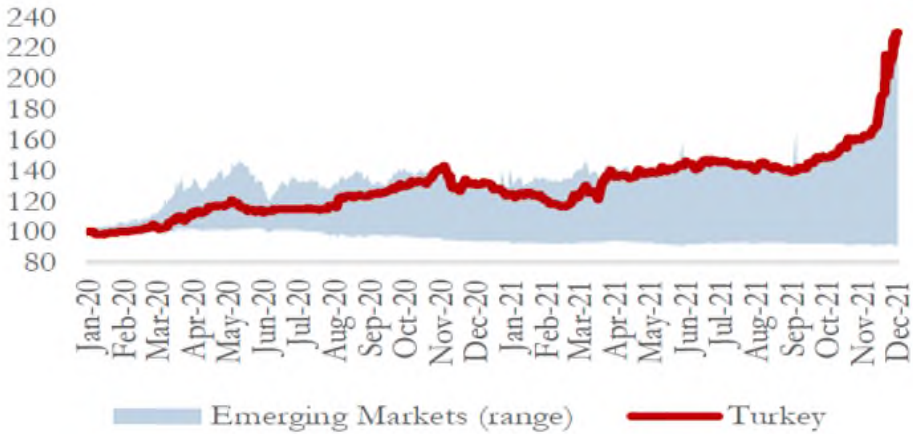


Chart 3. Emerging Market Local Currencies per US\$ and Turkish Lira per US\$

Source: World Bank, 2022a: 1.

The loss of confidence of businesses and investors, the lack of belief that uncertainties could be eliminated immediately, deepened this crisis. This caused a 16% value loss in the BIST 100 index between January and March 2020, and the index, which was 1010 basis points just before the number of cases was announced, declined to 842 basis points. Afterwards, even though there were fluctuations in the stock market index, thanks to the economic and health-related measures taken, the recovery process has started.

While Turkey was trying to secure public health with social distance and vaccination, on the other hand, it had to take new measures to improve the deteriorated health of the economy. Macroeconomic policy measures have been taken to reduce severe effects for vulnerable groups and financial risks. Aiming to provide the liquidity needed by the banking sector and the real sector these measures had been implemented by providing flexibility to banks in Turkish Lira and foreign exchange liquidity management. While ensuring uninterrupted credit flow to the real sector and supporting exporting companies, other actions aimed at supporting the cash flow of exporting companies with rediscount loans, and strengthening the monetary transmission mechanism by increasing the liquidity in the Government Debt Securities market (World Bank, 2022b: 35; CBRT Statements, 2023). Turkey tried to keep the income level and purchasing power of the households at a certain level by increasing pensions, transferring resources to those in need, and providing low-interest loans to low-income citizens through public banks (TUR-MOB, 2020: 84).

To reduce unemployment such measures as helping businesses that do not dismiss their employees in the debt financing, supporting businesses with minimum wages and making changes in short time working allowances have been introduced, and most importantly, preventing the dismissal of workers for three months, except for behaviors that do not comply with ethical rules (OECD, 2021: 20; TURMOB, 2020: 86). However, it is acknowledged that the effect of these resource transfers was short-lived and the effect of the Covid-19 outbreak on economic factors was longer-lasting. It took a long time to ensure that households' demand and consumption, investors' confidence in the investment environment return to the pre-pandemic period, and that enterprises do not experience any difficulties in their production and access to finance. In this environment of uncertainty, although the Istanbul Stock Exchange experienced a long recovery period, like the stock markets of other countries, it was observed that the pandemic had long-term effects. The paper is an attempt to carry out the study in order to reveal the relationship between the observed effects in the BIST 100 index and the pandemic.

## 1. LITERATURE REVIEW

Baker et al. (2020) state that previous pandemics and endemics had impact on the stock markets just like Covid-19 had, but they argue that the impact of Covid-19 was incomparable to the previous ones with the extreme volatility it caused in stock markets. Therefore the researchers are very enthusiastic to analyze the short term and long term impact of Covid-19 pandemic on the stock markets returns and volatility in different countries. Considering the studies carried out since 2020, the articles present different countries and different sectors analyzed with different methods. Al-Awadhi et al. (2020) revealed that stock returns in the Hang Seng Index and Shanghai Stock Exchange Composite Index in China were negatively affected by the number of cases and deaths. The study covers the early period of the pandemic and analyzes stock prices, market capitalization rates, market-book ratios, number of cases and deaths with panel data analysis. Zhang et al. (2020) analyzed the top 10 countries in terms of the number of confirmed cases with the emergence of the pandemic and showed that the uncertainty and economic loss expectations created by the pandemic turned the stock markets into an unpredictable structure. In the study, which states how crucial government regulations are for the control of the pandemic. Zhang et al. (2020) state that these regulations should not disturb the balance between countries and should not create more uncertainty and long-term problems. Apergis and Apergis (2022) analyzed the impact of Covid-19 in China where the pandemic started with GARCHX

model. In the analysis, the impact of both number of deaths and cases on the Chinese Stock market returns and volatility were found to be significantly negative while the death toll's impact was revealed to be stronger. For Canada and USA, Xu (2021) proved that the number of cases had negative impact on the stock returns in the USA while the impact was both negative and asymmetric in Canada due to rising uncertainty.

Liu et al. (2020) consider the short-term impact of Covid-19 on 21 leading stock markets. The authors, using the case study method, pointed out that the outbreak had a significant negative impact on stock market returns. Asian countries experienced the impact of the pandemic in a shorter time and more deeply, and the fear of investors about their future returns acted as an intermediary in conveying the impact of the outbreak to stock markets. Another study that examines the confidence of investors in the economy and the effect of the fear spread by the outbreak on the stock markets is Engelhardt et al. (2020) study. In this study, it was examined whether the fear caused by the Covid-19 outbreak was effective on 47 stock markets. It was found that stock market volatility is significantly low in countries where trust is high in both the governments that take measures, and the citizens who comply with these measures. One of the studies evaluating the relevance of the volatility in the stock market to the outbreak. Baek et al. (2020), focused on the impact of positive-negative news and economic indicators about the Covid-19 outbreak on stock market volatility. Accordingly, it was concluded that news about Covid-19 (especially negative news) is more effective than economic indicators on stock market volatility. Hizaraci and Zeren (2020) analyzed the impact of the pandemic on the stock markets of China, South Korea, Italy, France, Germany and Spain with cointegration test. They argue that the death toll had a certain negative impact on the stock markets of all the countries in the analysis while the number of cases without rising death toll affected only some of the countries in their sample.

There are also studies examining the effects of the regulations imposed by governments in the literature related to the pandemic. To control the effects of the Covid-19 pandemic, governments had to take different measures for distance education, online business regulations, requirement for wearing mask, locks-downs and closures. Governments intervened once more to remedy the financial losses caused by the measures of the pandemic. Although these interventions differed from one country to another, they were crucial for the recovery of economic actors along with the stock markets. For this reason, it is a realistic approach to address this issue in studies examining the effect of Covid-19 on stock markets. Khan et al. (2020) examined the effect of the pandemic on the stock markets of 16 countries and found that investors reacted negatively to the number of cases but not to the media news in the early stage of the pandemic. Additionally, the speed of the recovery process of the Shanghai Composite Index was attributed to the drastic

measures taken by the Chinese government. Khan et al. (2020) argue that the positive reactions of investors to these measures have led to this result.

Kizys et al. (2021) evaluated the effects of government regulations through behavioral finance and herd psychology. Accordingly, the study was conducted with the stock market data of 72 countries and checked whether investors were affected by the herd psychology during the pandemic. Kizys et al. (2021) analyzed whether government regulations and short selling restrictions alleviate this psychology. In their study, using the Oxford Government Response Stringency Index that records and scores government regulations on a country basis and creates an index. Kizys et al. (2021) found that herd behavior was effective during the pandemic, but the control of governments and EU short selling restrictions reduced the effect of herd psychology. Kizys et al. (2021) pointed out that herd behavior is caused by the fear factor indicated by the VIX volatility index and the negative effects of this investor psychology can lead to crises.

Tran and Tran (2021) also examined the effect of the pandemic on stock markets in the context of behavioral finance. In their study, the hypothesis that the culture of uncertainty avoidance and strictness of government measures determine the degree of this effect is tested. The index of Hofstede, which tracks uncertainty avoidance behaviors that differ based on national cultures, and the Oxford Government Response Stringency Index for government controls were used. In addition to the effect of uncertainty avoidance, it is stated that investors' expectations about the effectiveness of government controls also shape the reaction of investors. In the study, which analyzes 20 developing countries, Tran and Tran (2021) pointed out that the irrationality of the decisions taken by investors in countries with high uncertainty avoidance motive during the pandemic increased, but strict government controls had positive effects on investor confidence in these countries. At this point, Tran and Tran (2021) emphasized that these controls should be balanced, and underlined that the extreme severity of these measures should not lead to a new deadlock that would frighten the investors about the extent of the pandemic and economic losses.

Regarding the impact of the pandemic on the Istanbul Stock Exchange, Oner and Aybaras (2021) revealed that Covid-19 had a significant negative impact on the all sub-indices of Istanbul Stock Exchange. Goker et al. (2020) document similar results and add that especially Sports, Tourism and Transportation indices under the Istanbul Stock Exchange reacted dramatically to the pandemic. This study aims to supplement the literature by including VIX index, exchange rate and Government Response Index to analyze the impact of Covid-19 on the Istanbul Stock Exchange.



## 2. DATA AND METHODOLOGY

Toda-Yamamoto causality test was used in the study to analyze the effects of the Covid-19 outbreak on the Istanbul Stock Exchange (BIST). The main hypothesis of the study is about proving the effect of the pandemic on the BIST 100 index. For this reason, the data between the date of 11.03.2020 when the Covid-19 outbreak emerged in Turkey and the date of 27.05.2022 was evaluated. While the Turkish government firstly announced the restrictions to be implemented due to pandemic in March 2020, the analysis period for this study ended in May 2022 as the government decided to remove most of the Covid-19 related restrictions. In order to reveal the process of the Covid-19 outbreak in Turkey, WHO data were used and new death numbers were evaluated. An evaluation was made on the BIST 100-day closing prices on the same dates. Daily closing prices were applied as they represent the end of day result of trading activities and also seen as a factor affecting the next day trading activities of the stocks. BIST 100 data was taken from CBRT data. Different variables were added to the model to determine other factors in the pandemic on BIST 100. Accordingly, the CBOE Volatility Index (VIX), which is also referred to as the fear index that measures risk and fluctuations in the stock market, was used in the study. In order to explain the exchange rate risk, which is one of the most important risk factors in the Turkish economy, the dollar/TL exchange rate data was taken from the CBRT data. The study also included data from the Oxford Government Response Tracker (OxCGRT), a research project of Oxford University that aims to monitor and compare policy responses around the world. The Government Response Index data in this project was used and the attempt was made to examine whether the measures taken by the Turkish government had an effect on the BIST 100 index. The hypotheses of the study are listed below:

$H_0$ : The Covid-19 outbreak is not the reason for the changes in the BIST 100 index.

$H_1$ : The Covid-19 outbreak is the reason for the changes in the BIST 100 index.

It is argued that the negative effects of the Covid-19 outbreak, both for businesses and investors, caused a sharp value loss in the BIST 100 index. It is assumed that the stock markets were negatively affected by the pandemic as the losses experienced by the real sector due to production, demand, and liquidity problems and the decrease in investor confidence, were reflected in the stock markets. The study examined the existence of this interaction.

$H_0$ : During the Covid-19 outbreak, the changes in the BIST 100 index are not caused by other economic factors, namely the VIX index.

$H_1$ : During the Covid-19 outbreak, the changes in the BIST 100 index are caused by other economic factors, namely the VIX index.

$H_0$ : During the Covid-19 outbreak, the changes in the BIST 100 index are not caused by other economic factors, namely the exchange rate risk.

$H_1$ : During the Covid-19 outbreak, the changes in the BIST 100 index are caused by other economic factors, namely the exchange rate risk.

The Covid-19 outbreak created uneasiness all over the world as a result of both the high death numbers and the proof of its contagiousness from person to person. Dreadful consequences of the pandemic in Turkey created fluctuations in the stock markets and caused dollarization with the depreciation of the TL. To reveal this impact, this hypothesis was tested in the model.

$H_0$ : During the Covid-19 pandemic, the changes in the BIST 100 index are not caused by the policy measures of the Turkish government.

$H_1$ : During the Covid-19 pandemic, the changes in the BIST 100 index are caused by the policy measures of the Turkish government.

It is argued that the Oxford Government Response Index, which evaluates the measures carried out to reduce the economic and social problems during the Covid-19 pandemic, should be included in the model. It is assumed that with the policy measures of the Turkish government, the negative effects of the outbreak on the BIST 100 index decreased, and therefore caused positive changes in the stock market.

In this part of the study, the model described below was used to examine the relationship between the Istanbul Stock Exchange and the variables in the Covid-19 outbreak:

$$BIST100 = \alpha_1 + \alpha_2 DEATH + \alpha_3 GRI + \alpha_4 DOLLAR_{TL} + \alpha_5 VIX + \varepsilon \quad (1)$$

where:

$BIST100$  – day closing prices;

$DEATH$  – number of deaths due to Covid-19;

$GRI$  – the Government Response Index;

$DOLLAR_{TL}$  – Dollar/TL exchange rate;

$VIX$  – CBOE Volatility Index (VIX), fear index.

These hypotheses were tested with the Toda-Yamamoto causality test in the Eviews12 program. The reason for choosing this analysis is that unlike the Granger causality test, it does not take into account whether the variables are stationary. Toda-Yamamoto stated that pre-tests such as stationarity constrain the variables and pre-test biases distort the relationships between the series. In cases

where the preliminary tests evaluating the unit root and cointegration degree have low power, the Toda-Yamamoto method, which is a method of deliberately adding extra delays in the estimation, brings convenience in many points (Toda and Yamamoto, 1995: 246; Reis, 2021: 93). Accordingly, the VAR model applied in the model for the Toda-Yamamoto causality test is shown as follows:

$$Y_t = \alpha_0 + \sum_{i=1}^{k+d_{max}} \alpha_{1(i+d)} Y_{t-(i+d)} + \sum_{i=1}^{k+d_{max}} \alpha_{2(i+d)} X_{t-(i+d)} + \varepsilon_{1t} \quad (2)$$

$$X_t = \beta_0 + \sum_{i=1}^{k+d_{max}} \beta_{1(i+d)} Y_{t-(i+d)} + \sum_{i=1}^{k+d_{max}} \beta_{2(i+d)} X_{t-(i+d)} + \varepsilon_{2t} \quad (3)$$

### 3. RESULTS OF THE ANALYSIS

Firstly, the descriptive statistics for the BIST 100, number of deaths due to Covid-19, Government Response, exchange rate between American Dollar and Turkish Lira, and VIX index are presented in Table 1.

Table 1. Descriptive Statistics

	BIST100	DEATH	GRI	DOLLAR_TL	VIX
Mean	1495.935	123.3472	53.92987	9.298569	0.004663
Median	1417.890	103.0000	58.07000	8.245900	-0.010700
Maximum	2556.810	362.0000	81.88000	17.50460	0.616400
Minimum	842.4617	0.000000	20.31000	6.126100	-0.233700
Std. Dev.	405.1792	89.07662	18.23782	2.821563	0.089783
Skewness	0.824016	0.474177	-0.369261	1.134756	1.973080
Kurtosis	2.944885	2.217814	1.637356	2.763479	11.64045
Jarque-Bera	62.65141	34.82032	55.35099	119.9694	2075.281
Probability	0.000000	0.000000	0.000000	0.000000	0.000000
Sum	827251.9	68211.00	29823.22	5142.108	2.574050
Sum Sq. Dev.	90621926	4379923.	183605.2	4394.591	4.441594
Observations	553	553	553	553	553

Source: own study.

In Toda-Yamamoto (1995) causality test, the first step is to determine the lag length ( $k$ ) in the model with the VAR model, and the second step is to estimate the VAR model with the sum of the integration degree and the lag length ( $k+d_{max}$ ) (Dritsaki, 2017: 122; Gürsoy, 2020: 88).

We define the order of VAR model (k) from lag length taken from Akaike Information Criterion (AIC) and Final Prediction Error (FPE) criteria. In the analysis, the lag length of the model was determined as “5”. Table 2 presents the results for lag order selection criteria.

Table 2. VAR Lag Order Selection Criteria

k	LogL	LR	FPE	AIC	SC	HQ
0	-9381.872	NA	1.12e+09	35.02564	35.06561	35.04128
1	-5172.075	8325.344	185.1836	19.41073	19.65051*	19.50454*
2	-5140.407	62.03623	180.6373	19.38585	19.82545	19.55783
3	-5121.056	37.54707	184.4962	19.40693	20.04635	19.65708
4	-5064.102	109.4455	163.7775	19.28769	20.12694	19.61603
<b>5</b>	<b>-5021.557</b>	<b>80.96169</b>	<b>153.4269*</b>	<b>19.22223*</b>	<b>20.26129</b>	<b>19.62873</b>
6	-5002.428	36.04645	156.8663	19.24413	20.48302	19.72881
7	-4973.086	54.74245	154.4019	19.22793	20.66663	19.79079
8	-4950.261	42.15775*	155.7356	19.23605	20.87457	19.87708

Notes: \* indicates lag order selected by the criterion and LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion.

Source: own study.

In Table 3 the maximum degree of integration (dmax) is analyzed using the ADF Unit Root Test. Integration order is found for each series. It is seen that BIST 100, GRI, DEATH, DOLLAR\_TL variables in the model are stationary in their first differences, and VIX variable is stationary at level. Accordingly, the maximum degree of integration (dmax) of the series is found to be “1”.

Table 3. Augmented Dickey-Fuller Test

	None		Intercept		Trend and Intercept		Order of Integration
	t-Statistic	Prob.*	t-Statistic	Prob.*	t-Statistic	Prob.*	
BIST 100 (0)	2.040	0.9905	0.137	0.9683	-1.708	0.7465	
BIST 100 (1)	-14.005	0.000*	-14.200	0.000*	-14.230	0.000*	I (1)
DEATH (0)	-1.834	0.0634	-3.239	0.018*	-3.203	0.084	
DEATH (1)	-5.388	0.000*	-5.383	0.000*	-5.434	0.000*	I (1)
GRI (0)	-0.363	0.5534	-1.282	0.6391	-4.442	0.002*	
GRI (1)	-22.557	0.000*	-22.536	0.000*	-22.787	0.000*	I (1)
DOL- LAR_TL (0)	1.831	0.9842	0.281	0.9772	-1.541	0.8141	
DOL- LAR_TL (1)	-22.159	0.000*	-22.265	0.000*	-15.215	0.000*	I (1)
VIX (0)	-25.857	0.000*	-25.900	0.000*	-25.944	0.000*	I (0)
VIX (1)	-15.247	0.000*	-15.232	0.000*	-15.214	0.000*	

Notes: \* denotes rejection of the null hypothesis of unit root the at 5% level.

Source: own study.

Structural Vector Autoregression (VAR) model using appropriate lags ( $k+d_{max}$ ) for every equation of the system. As a result of the analysis, a Toda-Yamamoto model with “ $k+d_{max}=5+1=6$ ” is established.

The results suggest that there is no autocorrelation in the variables with the LM Autocorrelation Test. In the LM Autocorrelation Test, which shows that the model don't have an autocorrelation problem, the p-value is found to be 0,1323. ( $0,1323 > 0.05$ ). In addition, the inverse roots of AR polynomials are examined and it is determined that the roots are within the unit circle. Thus, it is determined that the VAR model meets the stability condition.

The reason for choosing the ARDL model in the study is that it is possible to apply the ARDL bounds test regardless of whether the variables to be used in the model are stationary or not (Gülmez, 2015: 146). F test statistic value (5,34) is higher than the upper critical value (4,21). Empirical findings reject the null hypothesis of no cointegration at the 5% significance level according to critical value estimates. Therefore, the result shows a cointegration at the 5% significance level. Table 4 and Chart 4 provide the results from ARDL Bound test.

Table 4. ARDL Bound Test Result

F-Bounds Test		Null Hypothesis: No levels relationship	
Value	Signif.	I(0)	I(1)
5.344404	5%	3.01	4.216

Source: own study.



Chart 4. Cointegration Results

Source: own study.

ARDL long-term model was established for the analysis of the long-term relationship between the variables. The results show that ARDL (3,4,0,3,1) is the most suitable one. The long-term coefficients of the DOLAR-TL exchange rate variable (0,01) and the VIX variable (0,08) are found to be statistically significant at the 10% level. It is determined that there is a long-term relationship between these variables and the BIST 100 index. According to the results estimated by the ARDL model, which is based on the error correction model to examine the short-term relationship between the variables, there is a short-term relationship between the variables. As expected, the term EC represented here as  $\text{CointEq}(-1)$  is negative. This means that any imbalance movement is corrected within a period. Since the p-value is inconsistent with the t-bounds distribution, the t-bounds test is applied to determine the short-term relationship. T-bounds test statistic value (5,18) is higher than the upper critical value (3,99). Therefore, the result shows a short-term relationship at the 5% significance level. The causality between the variables in the paper is evaluated with the Toda-Yamamoto Causality model, with the help of these findings. Toda-Yamamoto Causality test results are shown in Table 5.

Table 5. Toda-Yamamoto Causality (modified WALD) Test Result

Null Hypothesis	Chi-sq	Prob.	Granger Causality
DEATH does not granger cause BIST 100	18.38477	0.00250*	Causality
GRI (Government Response Index) does not granger cause BIST 100	2.061661	0.84059	No Causality
DOLLAR_TL does not granger cause BIST 100	26.2445	0.00008*	Causality
VIX (Volatility Index) does not granger cause BIST 100	3.983942	0.55173	No Causality

Notes: \* denotes rejection of the null hypothesis at 5% level.

Source: own study.

With the rejection of the null hypothesis, the  $H_0$  hypothesis, which states that there is no Granger causality between the variables, is also rejected. Therefore, it is found that the GRI and VIX variables are not the cause of the changes in the BIST 100 index, but the number of deaths due to Covid-19 and the changes in the DOLLAR\_TL exchange rate are the reasons for the changes in the BIST 100 index.

## CONCLUSIONS

The paper evaluated the impact of the Covid -19 outbreak on the Istanbul Stock Exchange. For the analysis, the number of deaths due to Covid-19 from the WHO and the DOLLAR\_TL rate from the CBRT statement, the Government Response Index from Oxford, and the Volatility Index from the CBOE were used. The obtained results show that the reason for the changes in the BIST 100 index was the number of deaths due to Covid-19 and the changes in the DOLLAR\_TL exchange rate, but the Government Response Index and Volatility Index variables were not reasons for the tumble of Istanbul Stock Exchange.

This result is in line with the expectations of the authors. The negative effects of the Covid-19 outbreak for both businesses and investors caused a value loss in the BIST 100 index. It was proved that the stock markets were adversely affected due to the decrease in investor confidence and losses experienced by the real sector due to production, demand, and liquidity problems. Deaths from Covid-19

magnified the crisis and increased uncertainty in the market. The Covid-19 outbreak has deeply affected the Turkish economy, as well as other developing countries. The biggest problem of Turkey, which is an emerging economy with high vulnerability, is dollarization. Authorities could not alleviate the depreciation of the Turkish lira. According to the World Bank report, the Turkish lira is the most depreciated currency among all developing countries (World Bank, 2022b: 5). Therefore, exchange rate changes have also increased risk and investor distrust. The results show that the exchange rate have impact over the BIST 100 index, in line with the expectations.

Moreover, the analysis reveals that the measures taken by the government were not effective in the Istanbul Stock Exchange during the Covid-19 pandemic. This result is related to the fact that the measures are not at a level to prevent the loss of confidence of investors and companies. Although the risk index measured by the VIX index is an important indicator, especially during the outbreak, no such a conclusion was found in the results. Undoubtedly, the reasons for this conflicting result should be examined in more detail in future studies.

The results of the study are in line with Oner and Aybaras (2021) and Goker et al. (2020) that the Covid-19 pandemic had significant negative impact on the stock exchange of Turkey. All the sectors were affected and İstanbul Stock Exchange reacted negatively to the negative expectations in the economy and social life in Turkey.

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