

Impact of Macro Indicators on Istanbul Stock Exchange During Covid-19 Pandemic

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Abstract

This research analyses the effects of the macro indicators like credit default swap, exchange rate, oil prices and gold prices on the Istanbul Stock Exchange (BIST100 Index) during the Covid-19 period by applying vector autoregressive model. In the model, daily data of the indicators are considered. The analysis comprises of two periods: pre-Covid-19 period (first week of 2019 to last week of 2020) and the during Covid-19 period (first week of 2020 to the second week of 2021). The comparison of two periods determines whether Covid-19 influence the impact of macro indicators on Borsa Istanbul. The findings reveal that in the pre-Covid-19 period, the volatility in BIST100 is explained mainly by gold prices. Credit default swap, oil prices and exchange rate affected BIST100 negatively, while gold prices had a positive impact on the Index. In the Covid-19 period, the impact of credit default swap and oil prices on BIST100 increased. A negative relationship is observed between BIST100 Index and the gold prices. A positive relationship is found between BIST100 and the exchange rate. Furthermore, the exchange rate had a greater impact on BIST100 than the impact observed in the pre-Covid period.

Keywords: Credit default swap, exchange rate, oil prices, stock market, VAR analysis

Jel Codes: C58, E44, F62

Covid-19 Pandemi Döneminde Makro Göstergelerin Borsa İstanbul Üzerindeki Etkileri

Özet

Bu araştırma, kredi risk primi, döviz kuru, petrol fiyatları ve altın fiyatlarından oluşan makro göstergelerin Covid-19 pandemi döneminde Borsa İstanbul (BIST100) üzerindeki etkilerini vektör otoregresif modeli uygulayarak analiz etmektedir. Modelde göstergelerin günlük verileri dikkate alınmıştır. Analiz: Covid-19 öncesi dönem (2019'un ilk haftasından 2020'nin son haftasına) ve Covid-19 dönemi (2020'nin ilk haftasından 2021'in ikinci haftasına) olmak üzere iki dönemden oluşmaktadır. İki dönemin karşılaştırılması makro göstergelerin Borsa İstanbul üzerindeki etkisinde Covid-19 pandemisinin etkili olup olmadığını ortaya koymaktadır. Bulgulara göre, Covid-19 öncesi dönemde BIST100'deki oynaklık ağırlıklı olarak altın fiyatları ile açıklanmaktadır. Kredi risk primi, petrol fiyatları ve döviz kuru BIST100'ü olumsuz etkilerken, altın fiyatlarının endeksi olumlu etkilediği ortaya konulmuştur. Covid-19 döneminde ise kredi risk primi ve petrol fiyatlarının BIST100 üzerindeki etkisi artmıştır. BIST100 Endeksi ile altın fiyatları arasında negatif ilişki saptanırken, BIST100 ile döviz kuru arasında ise pozitif bir ilişki bulunmuştur. Ayrıca döviz kurunun BIST100 üzerinde Covid-19 öncesi dönemde gözlemlenen etkiden daha büyük bir etkisi olduğu sonucuna varılmıştır.

Anahtar kelimeler: Kredi temerrüt takası, döviz kuru, petrol fiyatları, borsa, VAR analizi

Jel Kodu: C58, E44, F62

CITE (APA): Kaymaz, V., Yılmaz, Ö.T. (2022). Impact of Macro Indicators on Istanbul Stock Exchange During Covid-19 Pandemic. *İzmir İktisat Dergisi*. 37(1). 206-217. Doi: 10.24988/ije.933686

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1. INTRODUCTION

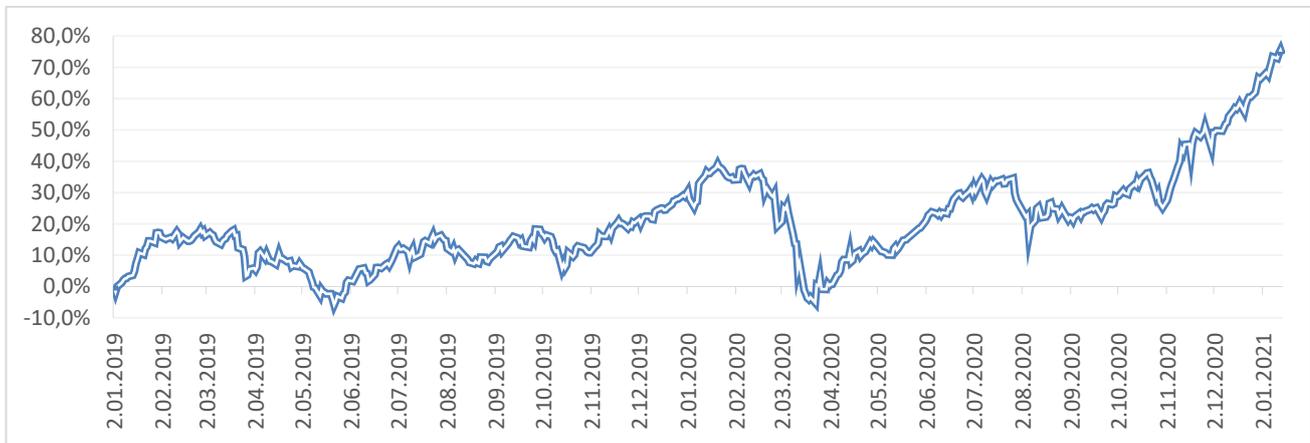
Covid-19 pandemic emerged in China in 2019 and spread to most of the countries in the world in 2020. The contagion turned into a global health crisis which then later caused a slowdown of the economies. The impact of the Covid-19 pandemic on the economy deepened as this health crisis started to change the attitudes of the consumers and the producers. The world has experienced both demand-side shock and supply-side shock. As the cases of Covid-19 have increased, the countries have imposed lockdowns and consequently, production and consumption in some sectors were curtailed. This slowdown of the economy caused also volatility in the financial markets.

The integration of the financial markets reflects in capital movements from one investment instrument to another instrument in the financial area. The portfolio decisions of the investors lie in targeting to take less risk (risks can be reduced but cannot be eliminated) while expecting to get higher returns. As the portfolio investments react to the macroeconomic variables, the investors have been responsive to the Covid-19 pandemic and to the volatility in the financial markets.

The purpose of this study is to investigate the impact of the selected financial instruments on BIST100 in the Covid-19 pandemic period in Turkey. The analysis comprises of two periods: the pre-Covid-19 period (first week of 2019 to last week of 2020) and the Covid-19 period (first week of 2020 to the second week of 2021). The comparison of the two periods will give information about the responsiveness of the BIST100 to the macro variables and Covid-19. In this study, January 2, 2020 was considered as the beginning date of the Covid-19 period, because China reported the pneumonia in Wuhan to the World Health Organisation on December 31, 2019, and as estimated, the Covid-19 had probably already spread globally by January 2020 (Stanway, 2021). Turkish stock market had been affected by the global developments after the spread of the disease in the world in January. Due to the high share of foreign investors in the stock market, the increase in foreign investors' sales led to a decrease in the stock prices. Finally, the foreign investors' share began to decrease after January 2020: the foreign investors owned 61,8% shares in the BIST-100 stock market on December 31, 2019, but the foreign participation fell to 48,84% as of December 31, 2020 (İşyatırım, 2020).

After the outbreak of the initial Covid-19 cases in March 2020, BIST 100 index depreciated appr. 40% during the month (Figure 1). The higher volatility after March 2020 is consistent with the expectation of the negative effect of the Covid-19 on the index. In addition, the stock index became more sensitive to the macro variables during this period. The drop in the index recovered after April onwards, but the index experienced a volatile trend in the following months. The lockdowns and their effects on the businesses lead to the volatility in the stock price performances during the period.

Figure 1: Cumulative change in BIST100 (January 2019-January 2021)



Source: Investing.com, 2021.

Different from previous studies which took only stock markets and exchange markets into consideration in the analysis of Covid-19 impact; this study aims to examine the effect of the selected variables that are expected to be highly related to the stock index like gold prices, oil prices, Credit Default Swap premium (CDS), currency basket. The study consists of five parts. In the second section, some studies examining the relationship between the stock market and economic variables are summarized. The third section includes the data and methodology used in the analysis. The results of the findings are discussed in the fourth section, and the last section concludes the study.

2. RELATED WORKS

The literature of the study is around the issues related with macroeconomics and international finance. One important phenomenon associated with Macroeconomics is the financial markets which represent arenas where buyers and sellers of financial assets such as bonds, stocks, currencies, and other financial instruments meet to trade (Burda and Wyplosz, 2005, p.9). These financial assets also represent the macroeconomic aspects of international economics that are referred to as international finance. International finance applies macroeconomic models to understand the international economy (Suranovic, 2019). The model in this research consists of the question that whether the currency basket, oil prices and CDS explain the volatility in the stock market returns during the Covid-19 Pandemic. In the literature review for this research, these variables are used as reference materials, and the related studies are summarized below.

Sarıgül (2020) investigated the relationship between the stock prices and credit default swaps (CDS), in January 2016 - July 2019 period using Granger Causality Analysis. The author found causality relationships in all countries except Greece and South Korea. Mateev and Marinova (2019) analysed the relation between CDS, and the stock market index of Maf rkit iTraxx Europe over the period of January 2012 to January 2016 by using the Johansen trace test. They found that the stock prices and CDS are cointegrated. Eren and Başar (2016) investigated the impact of credit default swaps on the BIST-100 Index for the period between December 2005 and March 2014 by using the Autoregressive Distributed Lag (ARDL) approach. They concluded that credit default swaps have a negative impact on stock prices in the short term, but it doesn't have any effect on the stock prices in long term. Koy (2015) analysed the relationship between CDS and the stock prices (BIST30, BIST100, BIST Bank and BIST Industry) from January 2013 to April 2014 by using vector autoregression model. She found that the Equity indexes are more effective on CDS than the impacts of CDS on equity indices. Yenice and Hazar (2015) analysed the relationship between CDS and the stock exchanges in Turkey, Argentina, Brazil, Indonesia, Malaysia, and China for the period between April 2009 and April 2014. Data were analysed by regression curve estimation models. In the study, the most sensitive relationship is found in Malaysia, Brazil and Russia. Lower sensitivity is found in Argentine in China and less sensitivity is observed in Indonesia. According to the study, the effects of external variables on stock markets are deeper in developing countries.

The study analyzing the BRICS countries (Dahir et. al., 2018) examines the relationship between exchange rate and stock return using wavelet analysis. The results reveal a positive relationship between exchange rates and stock returns in the medium term. Bhattacharyya et. al. (2020) investigated the effect of coronavirus 2019 and its resulting disease on the foreign exchange rates and stock market indexes of India by applying VAR model. They revealed that the increase in the Covid-19 cases caused suggestive but not statistically significant changes in the values of the exchange rate and stock market indexes. Suriani et.al (2015) analysed the relationship between the stock market KSE-100 and exchange market of Pakistan from January 2004 to December 2009 using Augmented Dickey-Fuller (ADF) test. The findings of the study indicate that there is no relationship between exchange rate and stock price. Narayan et. al. (2020) analysed the relationship between Yen

and stock exchanges during the Covid-19 period by implementing VAR model. They found a strong relationship and concluded that the depreciation of the Yen during the Covid-19 period improved stock market returns by 71% of average returns. Hamad et. al. (2020) examined the relationship between exchange rate and stock indices from January 2009 to March 2020 based on monthly data by applying VAR model. They concluded that changes in exchange rate lead the changes in stock prices and vice versa.

Yağlı (2020) examined the impact of Covid-19 on the Turkish stock market volatility considering two variables: CDS and exchange rate by conducting OLS. The author revealed that the impact of credit default swap and exchange rate on stock market volatility is greater than that of Covid-19.

Topcu and Gulal (2020) have estimated the stock markets of 26 developing countries during the pandemic period with the pooled Ordinary Least Squares (OLS), and revealed that the exchange rates and oil market shocks have shown a negative effect on the stock market. Similarly, Delgado et. al. (2018) applied VAR analysis using data from Mexico. The results show that the depreciation of the local currency has a negative impact on stock market prices.

Senol (2021) analysed the relationship between Borsa Istanbul 100 Index, the exchange rates (\$/₺), the interest rates, and credit default swap from 2 January 2010 to April 10, 2020 in Turkey by using Autoregressive Conditional Heteroscedasticity (ARCH) model. According to his study, there was a positive volatility relationship between CDS premiums, interest rates and exchange rates while there was a negative volatility relationship between CDS premiums, interest rates - BIST 100 index. Sabunri and Robiyanto (2020) examined the effect of the gold prices and exchange rate changes on the Indonesia Composite Stock Price Index during the pandemic period with the DCC-GARCH model. Analysis results reveal that gold prices increase volatility in stock markets. İlhan and Akdeniz (2020) estimated the effects of interest rate, exchange rate, CDS premium, and oil prices on BIST 100 by using the Flexible Least Squares method before and during the Covid-19 period. They determined that the exchange rate is the macroeconomic variable with the highest impact on BIST 100.

Stock returns react quickly to changes in financial and economic variables and to crises. When the literature is analysed, it is understood that the relationship between exchange rates, country risk premiums, gold and oil prices and stock returns varies according to the length of the period and the development levels of the countries. The relationship between exchange rates and stock prices also differs according to the development levels of the countries. Although Dornbush and Fischer (1980) argue that the depreciation of exchange rates will increase stock returns, this bilateral relationship does not always occur due to the increase in spillover effects and the effect of many other economic variables. Although the decrease in exchange rates increases the returns of export-based companies, the stock values of companies do not always increase. Similarly, oil prices can affect the stock markets of exporting and importing countries differently. Hamilton (1983) saw the rising oil prices as the cause of the economic recessions after the second world war; however, one of the reasons for the rapid global growth after the 2008 Financial Crisis is China's increasing demand for oil. Studies in the literature generally reveal that the rapid increase in oil prices negatively affects the oil importer and developing countries' stock market markets. As CDS increases, risk and uncertainty increase and especially foreign shares in stock markets decrease. Therefore, a reverse relationship is expected between CDS and stock prices. Gold prices are also frequently monitored by economic agents and are considered among the determinants of economic activity. Gold is considered as an alternative investment tool and is considered an alternative to stock markets in times of heightened economic uncertainty. Therefore, a reverse relationship is expected between gold prices and stock prices.

3. DATA AND METHOD

The returns of the stock markets may depend on various national macro indicators and on global economic developments. As mentioned before, investing decisions include both taking and hedging risk on the one hand, while expecting higher returns on the other hand. CDS is chosen which shows the risk in the financial markets. It is a financial instrument that transfers credit risk and protects the owner against default risks. Exchange rate (EX) and gold prices (GOLD) are chosen that are effective in the portfolio decisions of the investors as there is a trade-off in the investment decisions between stock market index (BIST100), gold and exchange rate. Oil price (OIL) is chosen as a variable because, an increase in oil prices usually lowers the expected rate of economic growth and decreasing economic growth prospects, then lowers companies' earnings expectations, resulting in pressure on stock prices (European Central Bank, 2004). The natural logarithm of all variables was used in the analysis.

The research methodology is vector autoregressive (VAR) model that is estimated in Stata. Sims (1980) developed the VAR model, in which all variables are considered. endogenous. VAR applications are used extensively, especially in macroeconomics and finance, and provide future forecasts based on the own and lagged values of all variables. VAR model is a standard instrument in econometrics, used to determine the inter-dependencies and dynamic relationships between variables (Pfaff, 2008, p.1). VAR predicts multiple time series variables and provides a consistent approach to data description, forecasting, and structural results (Stock and Watson, 2001, p. 101).

In this sense, VAR model is used to investigate the interaction between the stock markets, currency basket (0.50xUSD/TL+0.50xEUR/TL), gold price, CDS and oil prices during the Pandemic in Turkey. The data are weekly, from the first week of 2020 (when the first Covid-19 cases were recorded in the world) to the second week of 2021. The data are collected from the Website investing.com. Two time periods are taken in this study: pre-Covid-19 period (first week of 2020 to last week of 2020) and the during Covid-19 period (first week of 2020 to the second week of 2021).

4. FINDINGS AND RESULTS

The Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979) and Phillips Perron (1989) tests are performed to determine the stability of variables. Table 1 shows that in the pre-Covid-19 period and Covid-19 period, series are not stationary in their level values, but series become stationary when the first differences of variables are taken. In this study, 1 delay length is preferred by taking into account the results of SIC and HQC criteria due to the limited number of observations and the decrease in the degree of freedom as the lag length increases. The table on the optimal lag length is given in Supplementary Table 1.

Table 1. Unit Root Tests

	Variables	ADF		PP		Order of integration
		Level	First difference	Level	First difference	
Pre-Covid-19	BIST100	-1.034	-6.169	-1.432	-6.155	I(1)
	EX	-1.315	-6.315	-1.466	-6.310	I(1)
	GOLD	-0.526	-6.404	-0.562	-6.395	I(1)
	OIL	-1.904	-6.624	-2.031	-6.624	I(1)
	CDS	-0.829	-6.685	-1.072	-6.695	I(1)
Covid-19 Era	BIST100	-0.470	-4.679	-0.298	-4.701	I(1)
	EX	-1.323	-6.146	-1.314	-6.110	I(1)
	GOLD	-1.734	-5.608	-1.677	-5.587	I(1)
	OIL	-1.870	-5.069	-2.051	-4.834	I(1)
	CDS	-1.499	-7.567	-1.644	-7.621	I(1)

Variance decomposition provides information about whether changes in variables are caused by themselves and other variables. Table III shows the results of variance decomposition. A study of the two periods gives comparative results on how the change in the stock index is determined. Thus, it is possible to make inferences about the effect of Covid-19 on BIST100. Each column represents the percentage of the forecast error variance for BIST100.

In the periods before and after Covid-19, there is little difference in the endogeneity of the BIST100; however, the effects of independent variables differ in the two periods. In general, when periods are examined, BIST100 is affected by its own variable and can be considered strongly exogenous. As the number of periods increases, this ratio decreases as the number of periods increases. The change in BIST100 in the short period within the 12-week forecast before Covid-19 is again explained by BIST100. As periods go by, almost 27 percent of the BIST100 variance is determined by oil prices; the country's risk premium shocks, exchange rates and gold prices are weak in explaining the change in BIST100.

The results in the Covid-19 period differ. A small percentage of the variance of the BIST100 variable is explained by oil prices and the country's risk premium. As the number of periods increases, the rate at which the variance of the BIST100 variable is explained by the exchange rate increases, and this rate exceed 20% in the last predicted period. On the other hand, in the 12th period, almost 10% of the variance of the BIST100 variable is explained by gold prices.

During the Covid-19 process, the exchange rate and the gold prices significantly affect the stock index. Inter-period differentiation is a significant indicator of the effects of shocks caused by Covid-19 in the exchange of stock prices. For BIST100, the shocks in exchange rates have become important. Depreciation in the local currencies of developing countries during the pandemic and changes in the behavior of investors are likely reasons for this result.

Table 2: Variance decomposition of BIST100

	Period	S.E.	BIST100	EXR	OIL	GOLD	CDS
Pre-Covid-19	1	0.0258	100.00	0.0000	0.0000	0.0000	0.0000
	2	0.0331	97.170	0.0228	0.0834	0.0283	2.7782
	3	0.0378	93.211	0.0797	0.1097	0.1203	6.4787
	4	0.0414	89.249	0.1867	0.5098	0.3044	9.7490
	5	0.0442	85.607	0.3580	1.2167	0.6022	12.215
	6	0.0464	82.315	0.6000	2.1621	1.0263	13.896
	7	0.0483	79.325	0.9092	3.2613	1.5802	14.923
	8	0.0499	76.581	1.2738	4.4390	2.2593	15.446
	9	0.0512	74.039	1.6765	5.6341	3.0517	15.597
	10	0.0523	71.672	2.0972	6.7994	3.9403	15.490
	11	0.0533	69.464	2.5159	7.8994	4.9043	15.215
	12	0.0543	67.407	2.9149	8.9087	5.9211	14.847
Covid-19 Era	1	0.0349	100.00	0.0000	0.0000	0.0000	0.0000
	2	0.0473	96.536	0.4580	0.0809	2.4308	0.4937
	3	0.0560	93.612	1.2539	0.0640	4.5246	0.5446
	4	0.0628	90.905	2.3784	0.0548	6.2031	0.4583
	5	0.0683	88.166	3.8381	0.0637	7.5391	0.3928
	6	0.0729	85.329	5.6230	0.0794	8.5597	0.4086
	7	0.0769	82.400	7.7064	0.0926	9.2794	0.5213

8	0.0805	79.411	10.048	0.0991	9.7179	0.7231
9	0.0837	76.402	12.598	0.0990	9.9055	0.9940
10	0.0867	73.412	15.302	0.0946	9.8817	1.3086
11	0.0895	70.473	18.104	0.0889	9.6925	1.6410
12	0.0921	67.613	20.947	0.0846	9.3860	1.9677

Impulse-response analyses provide the opportunity to understand the results of the VAR model. Understanding the effect of one variable on the other helps to make economic inferences. Because variables are stationary, their effects usually have a temporary effect, and the effect of the shock disappears after a while.

Figure 2: Impulse responses of Pre-Covid-19

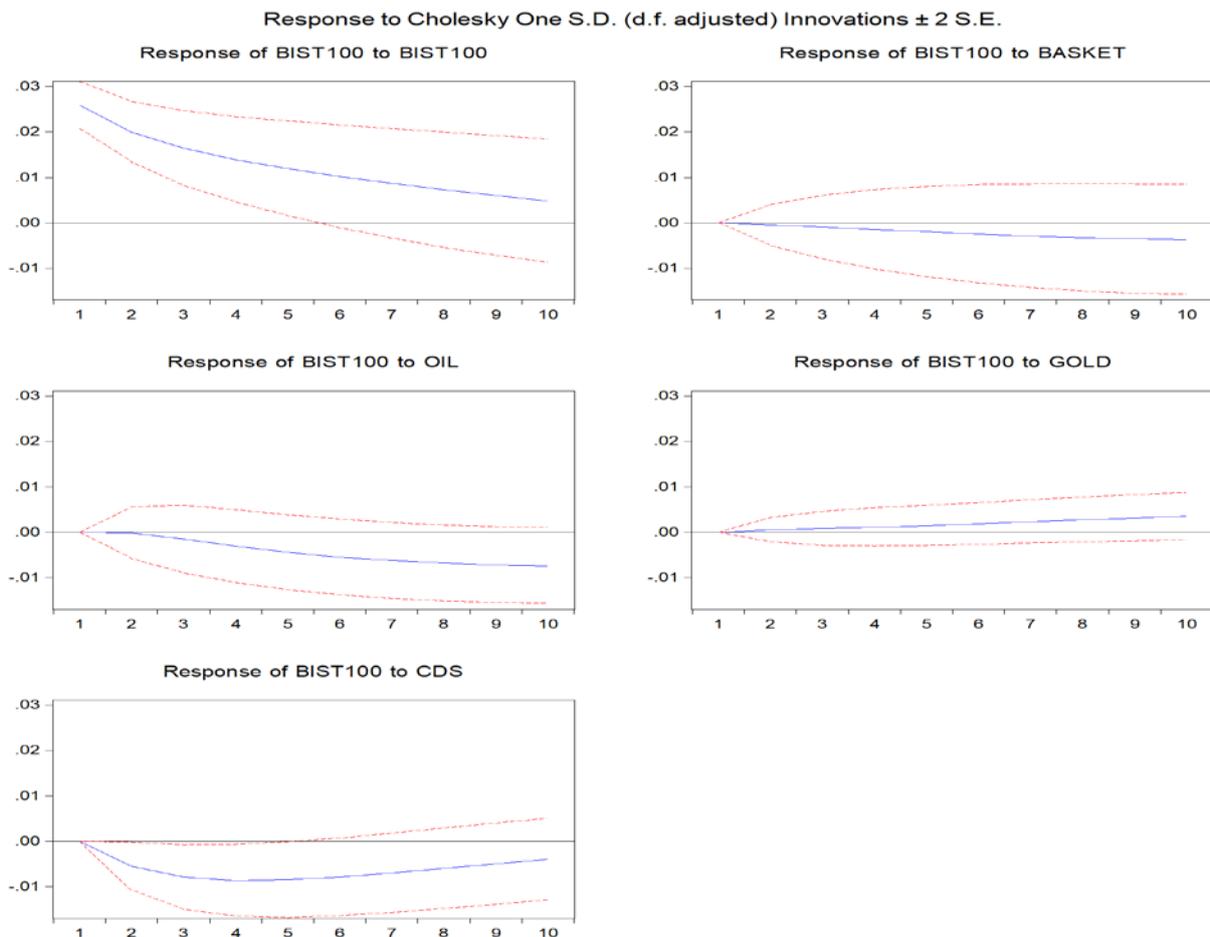
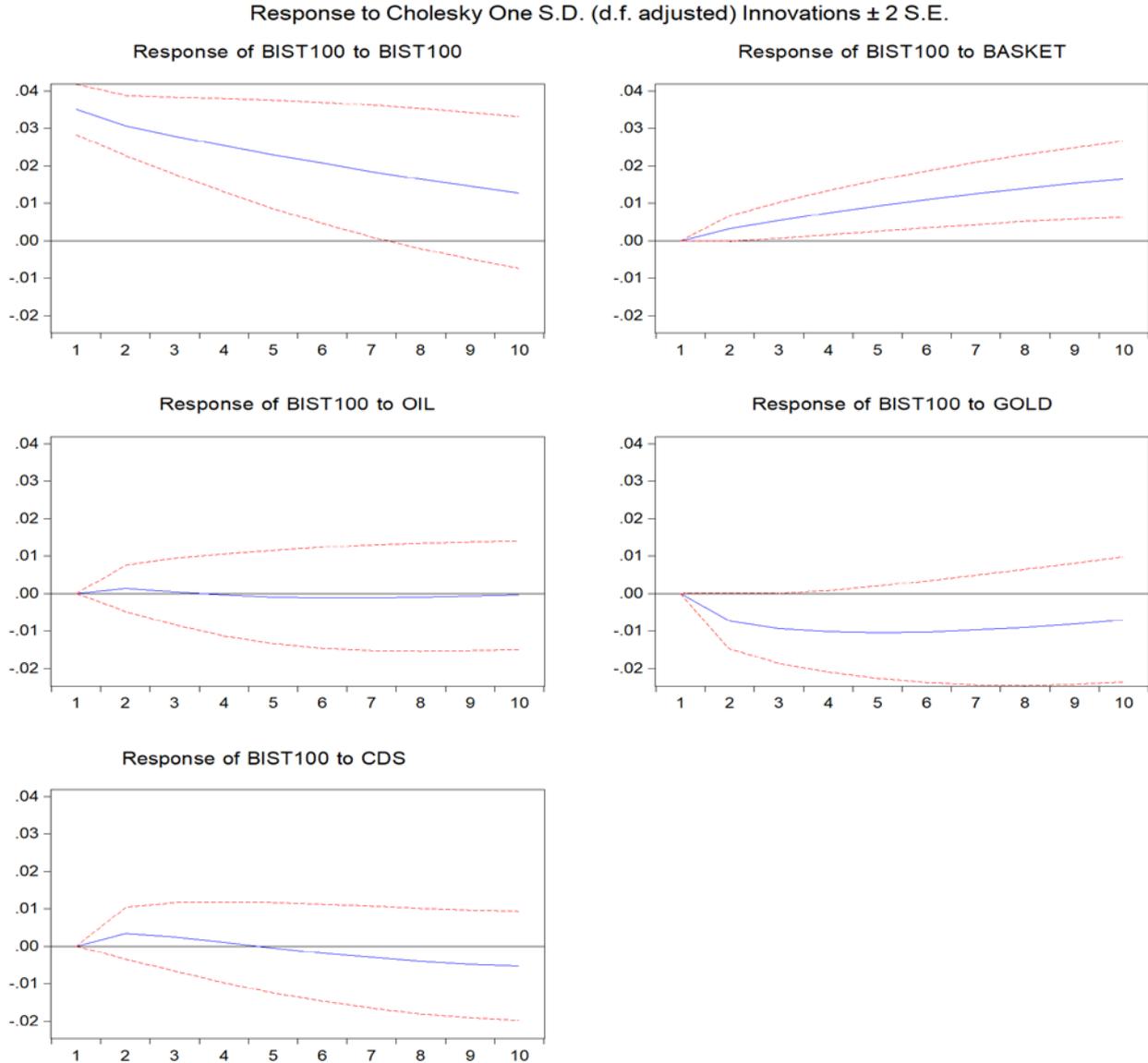


Figure 2 shows the reactions of BIST100 variables to shocks occurring in the pre-Covid-19 period. The initial shock to in BIST100 in the first period BIST 100 slowly loses its effect in the following periods. After the 5th period, impulse responses are insignificant. BIST100's response to the basket

rate shock is statistically significant. BIST100 responds negatively to the change in the exchange rate. Responses to other variables are statistically insignificant.

Figure 3: Impulse responses of Covid-19 Era



Although responses to shocks vary, responses are generally statistically insignificant. The initial shock to BIST100 is similar to the previous period and is significant until the 6th period. CDS results are similar to the results of Vurur (2021) in Turkey. In general, oil shocks do not have a significant impact on stock prices, similar to the studies of Degiannakis (2014) and Lutz, K. and Park, C. (2009). Although it is not possible to reach a general conclusion between gold prices and stock prices due to the limited number of studies in the literature, the results of the study reveal a negligible relationship similar to Raraga and Muharam (2013).

5. CONCLUSION

The Covid-19 pandemic turned into a health crisis as it spread to the most of the countries in the world, then led to the slowing of economic activities. This slowdown of the economies and the contagion of the pandemic caused risks and uncertainties in the financial markets. This study analysed the impacts of macro variables on the stock markets during the Covid-19 period.

In the first period of Covid-19, there was a depreciation in stock markets due to many factors such as stagnation, decrease in total demand and uncertainty. The currencies of the developing countries depreciated against the dollar, and the shrinking demand caused the oil prices to fall rapidly. The fact that gold was perceived as safe caused its prices to increase. Stock prices depreciated against rapidly changing macroeconomic indicators. While there was a negative relationship between the pre-pandemic exchange rate and the BIST100 index, the depreciation of the Turkish Lira during the pandemic made Borsa Istanbul cheaper in dollar terms. During the pandemic period, positive shocks in the exchange rate may be one of the reasons that positively affect BIST100. Gold, on the other hand, was seen as a substitute for Turkey's Borsa Istanbul during the pandemic period, so BIST100 reacts negatively to positive shocks in gold prices. The relationship between CDS and oil prices did not change during the pandemic and its effect increased.

Further research might also include the impact of Covid-19 in European and American stock markets. As Europe and United States were severely hit by the Pandemic, the analysis of the interaction between macro indicators and the foreign stock markets would contribute to the literature.

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