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Is Turkey's Stock Market More Affected by Covid-19 Indicators at National Scales or Global Scales

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Abstract

In the context of wait-and-see policies due to uncertainties in the economy, both real and financial economic decisions bring to the agenda a slowdown. Considering that uncertainty gets ever deeper in accidental situations like wars and disasters, we observe that Covid-19 has not only surrounded the world, but has also further deepened this uncertainty. On the other hand, countries continue to struggle with health problems, while receding back to Keynesian economics to minimize the effects on their socio-economic structure, as economies try to relieve both real and financial economies by implementing expansionary monetary and financial policies. These expansionary policies and interventions by governments against such negativities have created opposite effects. This study examines the oscillations regarding the BIST-100 index, an important indicator of the Turkish economy, against national and global Covid indicators. Using policies expansionary policies and stock exchange alternatives as control variables, this study included MS-VAR analyses for the period of 2019/12/31-2020/06/30. It was observed that BIST-100 was affected by Covid indicators at both national and global levels and that it showed oscillations in the form of expansion and shrinking. These findings indicate that the monetary and fiscal policies in Turkey should be designed based on a proactive approach to minimize the wait-and-see effects of global and national uncertainties on the real and particularly the financial decisions of economic actors.

Keywords: *Covid-19, Turkish Economy, Stock Market Index, MS-VAR Analyses, Non-Linear Time Series.*

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Covid-19'dan Türkiye Borsası Kendi Özelinden mi, Yoksa Küresel Ölçekten mi Daha Fazla Etkileniyor?

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Öz

Ekonomide belirsizliklerin bekle-gör politikaları dahilinde hem reel hem de finansal ekonomik kararlarda yavaşlamayı gündeme taşımaktadır. Belirsizliğin arızi olarak ortaya çıkan savaş ve afet gibi durumlarda derinleştiği dikkate alınırsa, halihazırda düyayı saran Covid-19'un da belirsizliği derinleştirici etkiler yaptığı gözlenmektedir. Diğer taraftan ülkeler bu sağlık problemleri ile mücadele ederken, sosyo-ekonomik yapıya etkilerini minimize etmek amacıyla Keynesyen politikalara rücu edilmekte; ekonomiler genişlemeci para ve maliye politikaları uygulamaları ile hem reel hem de finansal ekonomileri rahatlatmaya çalışmaktadırlar. Covid-19'daki derinleşmelerin yarattığı olumsuzluklara karşı hükümetlerin genişlemeci politikalarla müdahaleleri birbirine ters etkiler yaratmaktadır. Bu çalışmada Türkiye ekonomisinin önemli göstergelerinden biri olan BİST-100 endeksinin ulusal ve küresel Covid göstergeleri karşısındaki salınımları inceleme konusu yapılmıştır. Genişlemeci politikalar bağlamında uygulanan politikalar ile borsa alternatiflerinin kontrol değişken olarak kullanıldığı bu çalışmada 2019/12/31-2020/06/30 dönemi için MS-VAR analizlerine gidilmiştir. Analizlerde BİST-100'ün hem ulusal hem de küresel düzeydeki Covid göstergelerinden etkilendiği gözlenirken, bunun genişleme ve daralma evreleri şeklinde salınım gösterdiği tespit edilmiştir. Bu sonuçlar, Türkiye'de para ve maliye politikalarının küresel ve ulusal düzeyde Covid kaynaklı belirsizliklerin, iktisadi aktörlerin reel ve özellikle finansal kararları üzerindeki bekle ve gör etkisini mümkün olabildiğince minimize edebilecek proaktif bir anlayışla tasarlanmasının gerekli olduğuna işaret etmektedir.

Anahtar Kelimeler: *Covid-19, Türkiye Ekonomisi, BIST Endeksi, MS-VAR Analizi, Doğrusal Olmayan Zaman Serisi.*

Introduction

Described as a new type of the Coronavirus SARS-Cov-2, Covid-19 spread all over the world beginning from Wuhan, China in early 2020 and was identified as a global epidemic by the World Health Organization on March 11th, 2020. Although not as harsh as the Spanish flu that emerged at the beginning of the 20th century, cases such as Sars, Mers, Swine or Bird influenza are outbreaks of infectious diseases that shook the world. However, we can say that these cases were not as shocking as Covid-19 due to the relative weakness of the global effects of transmission. Therefore, it is clear that Covid-19 has no comparable example in terms of the social and economic damage it has caused in the first quarter of the 21st century.

The Covid-19 pandemic has created havoc in both real and financial economy, similar to great wars or natural disasters such as earthquakes, fires, floods, and landslides. Such accidental cases outside of predictability increase uncertainty in economies. Here, findings show that the uncertainty index by Baker et al. (2013) and the global uncertainty index by Davids (2016) have had effects on macroeconomic indicators in general and on stock market indicators in particular. The situation caused by uncertainty on macroeconomic variables (such as investment, consumption, savings, etc.) can be referred to as "wait-and-see" reflections. Since the indexes of uncertainty are organized on a monthly basis, this index will obviously not provide benefit in terms of regular changes. This makes it necessary to take the actual Covid indicators rather than their effect on uncertainty in studies on the current pandemic. Thus, being one of the most important indicators of both the real economy and the financial economy, it is inevitable for stock markets to be also affected by Covid-19. Stock markets are both initial and final indicators for any optimistic or pessimistic environment. Being an initial indicator means that an unfavourable climate manifests itself firstly in stock markets. Being a final indicator means that failing businesses, which are actors of the real economy, and in parallel, their losses or bankruptcy finally manifest themselves in the stock market. The volatility in both the number of cases and deaths regarding the Covid-19 outbreak can create imbalances on stock markets.

It is expected that the measures taken by governments regarding expansionary monetary and fiscal policies and the positive developments in

healthcare will positively affect the stock markets. Therefore, it is highly probable for the reactions of stock markets within the context of disease and counter-measures to be negative or positive. Numerous measures have been taken worldwide and in Turkey to minimize the negative effects of the global epidemic on the real and financial markets of both the world and Turkey. In this context, countries have tried to recover their economies through tax and interest cuts and subsidies within expansionary monetary and fiscal policies. The particular effects of the global epidemic on Borsa Istanbul-BIST have been felt intensely, both directly and indirectly.

Problems arising from the real and financial economy in Turkey in particular and the negativities experienced in major world stock markets in the global economy in general have also led to significant effects on BIST. Considering this, this study aimed to empirically examine the effects of global financial markets and global and national Covid-19 indicators on the financial markets (stock prices) of Turkey. For this purpose, considering that the relations between the pandemic and the stock market operate in a non-linear pattern, we planned to make analyses using non-linear econometric methods. In this framework, indicators that would be considered as an alternative to the stock market were used as control variables.

In the second part of the study, research on the relations between Covid-19 and the stock market were included, and the information obtained here was used in selecting variables and methods. In the third part, the share of total deaths due to Covid-19 and the Turkish stock market were taken both globally and in the context of Turkey to conduct MSM-VAR analyses. Money supply, interest rates, nominal dollar rate, oil and gold prices, and the US stock market indices were used as variables in this context. Daily data were used for the period of 2019/12/31 to 2020/06/30, the data period of the study. Examining the global course of the epidemic and the situation in Turkey, the hypothesis of which one was more effective on the stock market was tested. We also examined the effects of the epidemic on other variables. An overall evaluation was done in the fourth and last part, making it possible to get an idea about the path the stock market will follow in the probable second wave.

Literature Review

Identified as tragic occurrences, major wars, natural disasters or epidemics have generally negative economic consequences. The Covid outbreak was declared as a pandemic by the World Health Organization on March 11th, 2020. The measures taken due to the fast spread of the disease have almost caused turbulence in many areas in world economies, particularly in the stock markets. The US and European stock markets nearly crashed on March 13th. This was the most dramatic crash after the stock market crash of up to 22% on October 17th, 1987, called the Black Monday (9.5% in the USA and 11% in the UK). In parallel with the shrinking economic activities, developed economies such as the USA and the EU triggered a monetization phenomenon, which created an artificial revival effect. Before examining these developments on the basis of the Turkish stock market, the literature dealing with similar processes of the past was examined. Because, investigating past experiences in terms of both data and method will be guiding for this study. Creating mortality and economic effect scenarios for the coronavirus based on the Spanish flu and on the basis of 43 countries, Barro et al. reported that a typical country would experience a decline of 6% in GDP and 8% in private consumption. They emphasized that, with the impact of declines in economic activities and higher inflation, real returns of stocks and short-term government funds will decrease significantly (Barro et al. 2020).

The uncertainty of the evolution of the disease and its effects on the economies of countries makes it difficult for policy makers to determine a suitable macroeconomic policy. McKibbin and Fernando (2020) developed seven different scenarios on how Covid-19 will progress, and analysed the impacts of Covid-19 on macroeconomic variables and financial markets using DSGE/CGE (Hybrid of Dynamic Stochastic General Equilibrium (DSGE) Models and Computable General Equilibrium (CGE) Models). The scenarios show that the epidemic can significantly affect the global economy, even in the short-term. They show the extent of costs in situations where greater investment in public healthcare is avoided, particularly in densely populated economies where healthcare systems are less developed. Zeren and Hızarcı (2020) analysed the effect of the epidemic on stock markets using the Maki cointegration test with daily data between January 23rd-March 13th, 2020. According to their results, all stock markets and total deaths move in the same

direction in the long-term. They found that the total number of cases was in cointegration with SSE, KOSPI, and IBEX35, but was not in cointegration with FTSE MIB, CAC40, and DAX30. It was emphasized that investors were turning to gold markets and virtual currencies. Erdem (2020) analysed the correlation between the freedoms of countries and their stock market indices using the Covid-19 data from 75 countries for the period January 20th-April 30th (number of cases and deaths per million). He found a strong negative correlation between freedoms in the countries and impact of the epidemic on their stock markets. The stock markets of less free countries are more affected by the same magnitude of an increase in the number of coranavirus cases. This result may have overreacted to the same magnitude or deepened bad management in firms, since investors in less free countries are thought to underreport the number of cases. This reduces firm value by suppressing stock market performance in less free countries. Al-Awahhi et al. (2020) analysed the impact of Covid-19 on stock market indices in China based on the period of January 10th-March 16th. It was found that the disease negatively affected stock market indices and stock markets were found to be significantly negatively correlated with daily growth in total cases and deaths by Covid-19.

In another study by Ashraf within the scope of multi-country analyses, the existence of negative correlations between the number of cases and deaths between January 22nd and April 17th for 64 countries and the relations between stock markets were revealed. It was determined that the number of cases resulted in larger losses than the number of deaths. That study took uncertainty avoidance, democratic accountability, freedom of investment, and logarithmic (GDP) as the control variables (Ashraf, 2020). In a study by Şenol and Zeren for the period of January 21st to April 7th using Morgan Stanley, developing market, Europe, and G7 indices, the number of Covid-19 cases and deaths globally and the long-term correlations between the stock markets formed by these indices were investigated. According to the results of the Fourier cointegration test, cointegration was achieved, although the direction of the correlation could not be revealed (Şenol and Zeren, 2020). Liu et al. (2020) examined the effects of breaking in stock market indices in 21 leading countries. According to panel data analysis results for the period of February 21st, 2019-March 18th, 2020, negative correlations were detected between the number of Covid-19 patients and stock market returns. In addition, it was found that the stock market investors were negatively affected by the number

of patients, and that investors displayed pessimistic behaviours due to fear of future returns and uncertainty. He et al. (2020) conducted a study on China, Italy, S. Korea, France, Spain, Germany, Japan, and the USA, and examined three sub-periods as January 3rd-January 22nd, 2020, January 23rd-March 10th, 2020, and March 11th-March 22nd, 2020. They found that Covid-19 had short-term negative effects on stock markets which in turn triggered market-to-market contagion effects.

While it is noteworthy that the pandemic had overall negative effects on the stock markets, it is observed in the common literature that the responses of the markets to the money supply, interest rates, gold and oil prices, and nominal exchange rates have had substitution and complementary characteristics. It is safe to say that there will be reactions other than the effects observed in the common literature. In this context, it can be thought that with the outbreak, uncertainty anxiety will trigger a tendency to cash, preventing any substitution effects. In other words, there may be a shrinkage and in parallel a linearity of such shrinkage in energy use in the real economic course in the pandemic, while uncertainty triggers a tendency to gold, which is highly likely to lead to opposite relations.

Methodology and Data

Aiming to investigate the effects of the Covid-19 global epidemic on the Turkish stock market, this study focuses on the crashes in the global stock markets in general and in the Turkish stock market in particular, which emerged with the global nature of the epidemic. The expansionary monetary policies that aim to eliminate the economic effects of the epidemic in the world and in Turkey create some revival effects. The presence of oscillations in the form of collapse and revival undoubtedly necessitates the use of non-linear models for research, signalling the presence of different regimes depending on the frequency of these oscillations. It is worth verifying whether the effects of the shrinkage in the Turkish economy are affected by its own values or by the values of global large economies.

Markov-Switching Vector Autoregressions (MS-VAR)

The MS-VAR (Markov-Switching Vector Autoregressive) model used in the study is based on the expansion of the linear VAR (Vector Autoregressive)

model developed by Christopher A. Sims (1980) and the non-linear MS-AR (Markov-Switching Autoregressive) model developed by James D. Hamilton (1989, 1994, 1996). In the MS-VAR model developed by Hans M. Krolzig (1997, 1998), the linear VAR model is expanded to include regime changes and the parameters that change according to regimes and the univariate non-linear MS-AR model is adapted to multivariate situations. In this context, the MS-VAR model is based on the adaptation of a p order VAR(p) model for linear time series to a multivariate situation and a non-linear form by including the changes in the regime, allowing the VAR(p) model to be predicted based on regimes and its parameters to change according to regimes (Bildirici et al., 2010, p.107). Examining common regime changes in the stochastic process of economic conjuncture and time series and based on non-linear data processing, the MS-VAR model allows for regime changes to be analysed in a multivariate manner. The MS-VAR model allows for classifications to be made according to whether the average or the constant term changes according to the regimes, whether the error term has variance, or whether the autoregressive parameters vary based on the regimes (Krolzig, 1998, p.3-8). (For comprehensive information on these classifications of the MS-VAR model, see Krolzig (1998)).

Defining Variables and Data Sources

The announcement of the first Covid-19 case, which would later be declared as a pandemic by the World Health Organization on 2020/03/11, being detected in the People's Republic of China (Wuhan city) by official sources on 2019/12/31 was effective in choosing the date of 2019/12/31 as the beginning of the investigation period of the study. Data such as Total Deaths, Total Cases, Total Recovered, Total Tests etc. are published daily from the date the first case at national and global levels, and the short period of time here has caused the variables to be reflected in the analysis as daily data. Table 1 describes the variables and sources used in the MSM-VAR model, aimed to predict the effects of the Covid-19 outbreak on Turkey's stock prices.

Table 1. Definition of Variables Used in Analyses

Abbreviations of Variables	Definition of the Variables	Data Sources of Variables
CVTR	National COVID-19 Indicator	Johns Hopkins University Center for Systems Science and Engineering (JHU CSSE). July-2020.
CVGL	Global COVID-19 Indicator	
SPTR	National Stock Prices	www.investing.com.
SPGL	Global Stock Prices	
GP	Gold Prices	
OP	Oil Prices	
IR	Interest Rates	CBRT-EVDS (Central Bank of the Republic of Turkey-Electronic Data Distribution System-2020).
MS	Money Supply	
ER	Nominal Exchange Rate	

The data transformation process of the variables defined in Table 1 into their forms used in econometric analysis is explained as follows on the basis of variables: The data for CVTR and CVGL variables, representing the epidemic at national and global levels, respectively, were derived from the database using the numbers of Total Deaths and Total Cases, which were continuously available for all countries in the sample in the 2019/12/31-2020/06/30 period Generated to measure the efficiency of the Covid-19 epidemic in Turkey at the national level, the CVTR variable was generated by the steps below. First, the natural logarithmic values of the Total Deaths and Total Cases from Covid-19 (taken from the relevant database of Turkey on a daily basis) were calculated. Second, the number of Total Deaths from Covid-19 in Turkey, calculated in similar magnitude with natural logarithmic transformation, was proportioned to the number of Total Cases and the CVTR variable was created in natural logarithmic form. Created to measure the efficiency of the Covid-19 outbreak at a global level, using the Total Deaths and Total Cases of the world's top 20 economies, based on their economic nominal GDP (Gross Domestic Product) values, located on different continents around the world, covering about 75% of economic and financial activities and constituting nearly 80% of the world's population, the CVGL variable was generated following the steps below. Classified economically by the size of the 2019 nominal GDP (USD) values of the World Bank, these top 20 countries are as follows: the USA, the People's Republic of China, Japan, Germany, India, the UK, France, Italy, Brazil, Canada, Russia, South Korea, Spain, Australia, Mexico, Indonesia, the Netherlands, Saudi Arabia, Turkey, and Switzerland.

Used to represent the financial markets, the data for the national stock prices (SPTR) were taken from the corrected day-end closing prices of the BIST-100 (Borsa Istanbul Compound-100) index from the relevant database. The data for the global stock prices (SPGL) were generated using the data for the corrected day-end closing prices of the United States (S&P-500), Germany (DAX), Brazil (Bovespa), China (Shanghai), South Korea (KOSPI), Australia (ASX-ALL), United Kingdom (FTSE-100), Indonesia (IDX-Composite), France (CAC-40), India (BSE-Sensex), Netherlands (AEX), Spain (IBEX-35), Switzerland (SMI), Italy (FTSE-All Share), Japan (Nikkei-225), Canada (S&P/TSX), Mexico (S&P/BMV IPC), Russia (RTSI) Saudi Arabia (MSCI TAD-AWUL-30) and Turkey (BIST-100) indices. When generating the SPGL variable, we first calculated the natural logarithmic values of the stock price indices of the financial markets of these 20 countries, which correspond to nearly 90% of the global financial markets in terms of transaction volume and number. Then, we obtained the SPGL variable from the arithmetic averages of the stock price indices of the financial markets of these 20 countries, calculated similarly with natural logarithmic transformation.

The data for the gold prices (GP) variable, one of the control variables that are the main determinants of financial markets, was taken from the relevant database as the Gold Troy Ounce data calculated in nominal US dollars (USD). The data for the oil prices (OP) variable was obtained from the relevant database as Brent crude oil price data calculated in nominal USD. The data for the interest rate (IR) variable was obtained from the EVDS database as Monetary Policy-Related Interbank Interest Rates. The data for the nominal exchange rate (ER) variable was obtained from the EVDS database as the nominal equivalents of the national currency unit in terms of the period average in SDR (Special Drawing Right). The data for the money supply (MS) variable was obtained from the EVDS database as broad-defined money supply data (calculated over the sum of cash and time-demand deposits) in nominal Thousand Turkish Liras. The Descriptive statistics of the CVTR, CVGL SPTR, SPGL, GP, OP, IR, MS and ER variables to be used in the analysis within the MSM-VAR model are given in Table 2.

Table 2. Descriptive Statistics

Statistics	Mean	Median	Maximum	Minimum	Std. Dev.
SPTR	11.574	11.600	11.725	11.341	0.104
SPGL	8.998	9.001	9.161	8.745	0.115
GP	13.422	13.750	13.750	10.000	1.062
OP	21.717	21.701	21.826	21.614	0.076
IR	2.182	2.191	2.286	2.090	0.062
MS	7.412	7.422	7.496	7.300	0.049
ER	3.683	3.697	4.233	2.962	0.333
CVTR	0.901	0.955	2.151	-0.058	0.715
CVGL	0.483	0.285	1.596	-0.196	0.513
Observations	183	183	183	183	183

Note: In the Table, Std. Dev. is abbreviation of the standard deviations of the variables.

The MSM-VAR Models and Estimation Outputs

The econometric models to be estimated for the determination of the effects of the Covid-19 epidemic on the financial markets (stock prices) of Turkey, measured on the national-global level (CVTR-CVGL variables), were obtained by expanding the univariate MSM-VAR model equation defined in Equation 2 [for studies in this scope, see Al Tamimi et al. (2011), Vinh (2014), Kang and Ratti (2015), Arouri et al. (2016), Riaz et al. (2018)].

However, the literature for non-linear time series includes linearity tests such as Keenan (1985), Tsay (1986), Broock et al. (1987), Terasvirta (1994) etc. that test the linearity structure of variables and those variables that are investigated for linearity are assumed to remain stationary at the level of their values. Considering the HL and HR linearity findings in Table 3, we see that the Wald test statistics calculated for all variables in the MSM-VAR model are greater than the critical table values at 1% or 5% significance level, which rejects basic hypotheses such as "variables are linear". These findings suggest that the SPTR, SPGL, GP, OP, IR, MS, ER, CVTR and CVGL variables in the MSM-VAR model show a non-linear distribution for the study period, and that it is necessary to use a non-linear time series analysis methodology when analysing these variables.

Table 3. HL and HR Linearity Test Results

Variables		Wald Test Statistics					
		HR				HL	
		W_S	W_U	λ	W_λ	W_T^*	
						% 1	% 5
SPTR		11.48[a]	10.48[a]	0.96	10.40[a]	17.50[a]	14.84[b]
SPGL		15.10[a]	19.01[a]	0.96	17.49[a]	21.82[a]	21.48[b]
GP		7.61[b]	1.16	0.99	7.23[b]	9.89	9.75[b]
OP		18.20[a]	0.00	1.00	18.20[a]	19.29[a]	14.85[b]
IR		6.66[b]	6.88[b]	0.99	6.30[b]	10.42	10.27[b]
MS		16.16[a]	4.00	0.98	15.80[a]	47.60[a]	47.01[b]
ER		4.91	17.84[a]	0.95	17.24[a]	17.04[a]	16.81[b]
CVTR		7.65[b]	7.41[b]	0.97	7.42[b]	13.95[a]	13.72[b]
CVGL		11.15[a]	11.04[a]	0.98	11.05[a]	12.36	12.32[b]
Critical Table Values	***% 1***	***9.21***				***13.27***	
	% 5	***5.99***				***9.48***	

Note: χ^2 The terms "a" and "b" in front of the Wald Test statistics (calculated in 2 degrees of freedom in accordance with the distribution) indicate that the basic hypotheses for linearity are rejected for the variables at 1% and 5% significance levels, respectively. The term "λ" in the calculation of the W_λ test statistics stands for the weights of the W_S and W_U.

The stationary states of the variables in the MSM-VAR model are examined using Kapetanios-KSS et al. (2003) and Sollis-SLS (2009) non-linear unit root tests, which take into consideration the symmetric and asymmetric properties of the variables during the examination period, along with their deterministic and stochastic structure, and the findings are given in Table 4 (Kapetanios et al., 2003: 359-379; Sollis, 2009: 118-125). Considering the KSS and SLS unit root test findings in Table 4, we see that at 1% or 5% significance level, none of the variables in the MSM-VAR model are stationary at their level value [I(0)] and they become stationary in their first difference [I(1)]. This result is reached by the KSS and SLS unit root test statistics that are calculated in the [I(1)] level in a form free of average and trend (DD) being absolutely greater than the critical table values at 1% or 5% significance level and by rejecting basic hypotheses such as "the variable has a unit root".

Table 4. *KSS and SLS Non-linear Unit Root Tests Results*

DD		Test Statistics					
		KSS			SLS		
Variables		**[I(0)]**	**[I(1)]**	**L**	**[I(0)]**	**[I(1)]**	**L**
SPTR		-1.55	-7.99[a]	3	3.81	39.72[a]	3
SPGL		-2.22	-7.98[a]	2	3.28	39.71[a]	2
GP		-0.35	-9.06[a]	2	5.37	17.64[a]	2
OP		-1.86	-9.61[a]	2	3.58	31.57[a]	2
IR		-1.53	-9.77[a]	1	1.25	49.98[a]	3
MS		-2.57	-7.32[a]	4	4.37	28.92[a]	4
ER		-2.44	-11.15[a]	1	3.95	47.83[a]	1
CVTR		-2.77	-8.88[a]	1	6.24	40.41[a]	1
CVGL		-1.66	-7.85[a]	1	2.28	39.64[a]	1
Critical Table Values	***%1***	***-3.93***			***8.95***		
	%5	***-3.40***			***6.59***		

Note: The "[a]" in the test statistics in the table indicates that the variables are stationary at 1% significance level. The "L" column in the table refers to the optimal lag lengths for variables, which are determined using the Schwarz Information Criteria (SIC). The critical table values indicate the values obtained from Kapetanios et al. (2003) and Sollis (2009).

By finding that all variables in the non-linear MSM-VAR model are stationary at the level of [I(1)], the econometric model defined in Equation 6 is estimated within the MSM-VAR model with the first order cyclical differences of the variables. (The test statistics for the model selection criteria, which are used in the specification of the MSM(2)-VAR(0) model, are given in Table 5 along with the MSM-VAR model results). Table 5 shows the findings for the basic MSM-VAR model that is estimated with two regimes and 0 lags to determine the effects of the Covid-19 epidemic on the stock prices of Turkey at national and global levels.

Table 5. MSM-VAR Models Estimation Results

Variables	MSM(2)-VAR(0)			
	$S_t = 0$		$S_t = 1$	
	CE.	**SE.**	**CE.**	**SE.**
$SPGL_t$	0.7985[a]	0.0313[0.000]	1.2027[a]	0.0383[0.000]
IR_t	-0.0040[a]	0.0014[0.005]	-0.0429	0.1574[0.785]
MS_t	0.7039[a]	0.0059[0.000]	0.5734[a]	0.0036[0.000]
ER_t	-0.4761[a]	0.0689[0.000]	-0.5978[a]	0.0842[0.000]
GP_t	0.1997[a]	0.0470[0.000]	-0.2396[b]	0.1018[0.020]
OP_t	-0.0243[a]	0.0079[0.002]	-0.1195[a]	0.0226[0.000]
$CVGL_t$	-0.0109[c]	0.0061[0.075]	-0.0159[b]	0.0076[0.036]

$CVTR_t$	-0.0253[a]	0.0046[0.000]	0.0369[a]	0.0056[0.000]
Constant	-11.1822[a]	0.2272[0.000]	-7.5998[a]	1.2520[0.000]
$Sigma$	0.0112[a]	0.0008[0.000]	0.0081[a]	0.0007[0.000]
Model Selection Criteria				
LL	564.5835			
AIC	-5.93			
SIC	-5.54			
LR (χ^2)	127.09[0.000]			
Diagnostic Test Statistics				
ARCH-LM	2.8180[0.566]			
Normality (χ^2)	4.3737[0.112]			
Portmanteau	22.7520[0.960]			

Note: The "CE." and "SE." terms in the table refer to the coefficients and standard errors of the variables and the "[a]", "[b]" and "[c]" suggest that the t-statistics of the coefficients are significant at 1%, 5%, and 10% significance level, respectively. Where the values in the brackets "[]" refer to the probabilities of the coefficients and the terms "S_t" and "t" indicate the number of regimes determined according to the model selection criteria and the lag order of the coefficients for (t=0), respectively.

Considering the findings of the MSM-VAR model in Table 5, the stock prices of Turkey are defined by the ($SPTR_t$) dependent variable and the cyclical movements of the independent variables ($SPGL_t$,IR_t,MS_t,ER_t,GP_t,OP_t,$CVGL_t$ and $CVTR_t$), which are the main determinants of stock prices, in two different regimes as expansion ($S_t = 0$) and shrinkage ($S_t = 1$). However, regarding the findings in Table 5, we see that the Sigma coefficients that show the variances of the regimes are calculated in a statistically significant manner as (0.0112) in the ($S_t = 0$) expansion regime and as (0.0081) in the ($S_t = 1$) shrinkage regime. These findings suggest that the independent variables, the main determinants of stock prices in the model, have a statistically significant effect on the dependent variable of Turkey's stock prices in two different regimes as expansion and shrinkage.

Therefore, we find that a 1% increase in global stock prices during this period leads to an increase of about 0.79% to 1.20% in the expansion and shrinkage phases of Turkey's stock prices. In addition, the findings reveal that the positive symmetrical effects of the increases in global stock prices on Turkey's stock prices are greater in the shrinkage phase compared to the expansion phase. Revealing that the effects of interest rates on Turkey's stock prices are

negative and symmetrical, these findings indicate that a 1% increase in interest rates during the study period caused a decrease of about -0.004% in Turkey's stock prices in the expansion phase. However, the results also indicate that interest rate changes during the shrinking period have no statistically significant impact on Turkey's stock prices. We see that a 1% increase in money supply causes an increase of 0.57 to 0.70% in Turkey's stock prices in the expansion (0.7039) and shrinkage (0.5734) phases. However, the findings suggest that the positive and symmetrical effects of the increase in money supply on Turkey's stock prices are greater in the expansion phase compared to the shrinkage phase.

The findings indicate that a 1% increase in nominal exchange rates during the study period causes a decrease of -0.59% to -0.47% in Turkey's stock prices in the expansion (-0.4761) and shrinkage (-0.5978) phases. However, the findings suggest that the negative and symmetrical effects of the increase in nominal exchange rates on Turkey's stock prices are higher in the shrinkage phase compared to the expansion phase. Revealing that the effects of gold prices on Turkey's stock prices are positive-negative and asymmetrical, the findings indicate that a 1% increase in gold prices during the study period causes an increase of nearly 0.19% in Turkey's stock prices in the expansion phase. However, the findings show that a 1% increase in gold prices causes a decrease of about -0.23% in Turkey's stock prices in the shrinkage phase. The findings indicate that a 1% increase in oil prices causes a decrease of -0.02% to -0.11% in Turkey's stock prices in the expansion (-0.0243) and shrinkage (-0.1195) phases. However, the findings also show that the negative and symmetrical effects of increased oil prices in Turkey's stock prices are higher in the shrinkage phase compared to the expansion phase.

Taking the MSM-VAR model findings in Table 5 in terms of national $CVTR_t$ and global $CVGL_t$ Covid-19 indicators, which are the core of the current study, we get the following results: a 1% increase in the impact level of the Covid-19 epidemic at the global level causes a decrease of -0.015% to -0.010% in Turkey's stock prices in the expansion (-0.0109) and shrinkage (-0.0159) phases. However, the findings also reveal that the negative and symmetrical effects of the increases in the impact level of the Covid-19 epidemic in Turkey's stock prices are higher in the shrinkage phase compared to the expansion phase. We observe that a 1% increase in the impact level of the

Covid-19 epidemic at the national level causes a decrease of about -0.025% in Turkey's stock prices in the expansion phase. However, the findings also show that a 1% increase in the impact level of the Covid-19 epidemic at the national level causes an increase of nearly 0.036% in Turkey's stock prices in the shrinkage phase. In terms of diagnostic test results, we see that the MSM-VAR model in Table 5 has a constant variance, with normally distributed residues and basic stability conditions without autocorrelation. This result can be achieved by having probability values greater than 0.05 calculated for ARCH-LM, Normality (χ^2), and Portmanteau test statistics. Table 6 below shows the findings of the MSM-VAR model, estimated to determine the effects of the Covid-19 epidemic on Turkey's stock prices at national and global level and in the expansion ($S_t = 0$) and shrinkage ($S_t = 1$) regimes.

Tablo 6. Regime Results of the MSM-VAR Model

MSM-VAR	**Transition Probability Matrix of regimes**		**Properties of Regimes**		
Regime	$S_t = 0$	$S_t = 1$	**Number of Observations**	**Total Time**	**Average Time**
$S_t = 0$	0.9801	0.0402	103	56.28	25.75
$S_t = 1$	0.0199	0.9598	80	43.72	26.67
Classification of Regimes					
$S_t = 0$			$S_t = 1$		
Periods	**Average Times**		**Periods**	**Average Times**	
2019/12/31-2020/01/08	9		2020/01/09-2020/02/18	41	
2020/02/19-2020/03/26	37		2020/03/27-2020/04/13	18	
2020/04/14-2020/04/21	8		2020/04/22-2020/05/12	21	
2020/05/13-2020/06/30	49		—	—	

Considering the regime findings of the MSM-VAR model in Table 6 in terms of the Regime Transition Probability Matrix, Turkey's stock prices are defined by the ($SPTR_t$) dependent variable and the cyclical movements of the independent variables ($SPGL_t, IR_t, MS_t, ER_t, GP_t, OP_t, CVGL_t$ and $CVTR_t$), which are the main determinants of stock prices, in two different regimes as expansion ($S_t = 0$) and shrinkage ($S_t = 1$). The findings in Table 6 suggest that the cyclical movements of Turkey's stock prices and the independent variables that are the main determinants of Turkey's stock prices in the 2019/12/31-2020/06/30 period are relatively balanced between regimes. We

see that stock prices show similar average times in the expansion and shrinkage regimes. Examining the regime findings in Table 6 in terms of the periods and average times of the regimes, we observe that the cyclical movements of Turkey's stock prices and the independent variables that are the main determinants of stock prices are classified in a similar way between regimes for the study period. We understand that the cyclical movements remain in shrinkage regime for about 41, 18, and 21 days for the periods of 2020/01/09-2020/02/18, 2020/03/27-2020/04/13, and 2020/04/22-2020/05/12, respectively.

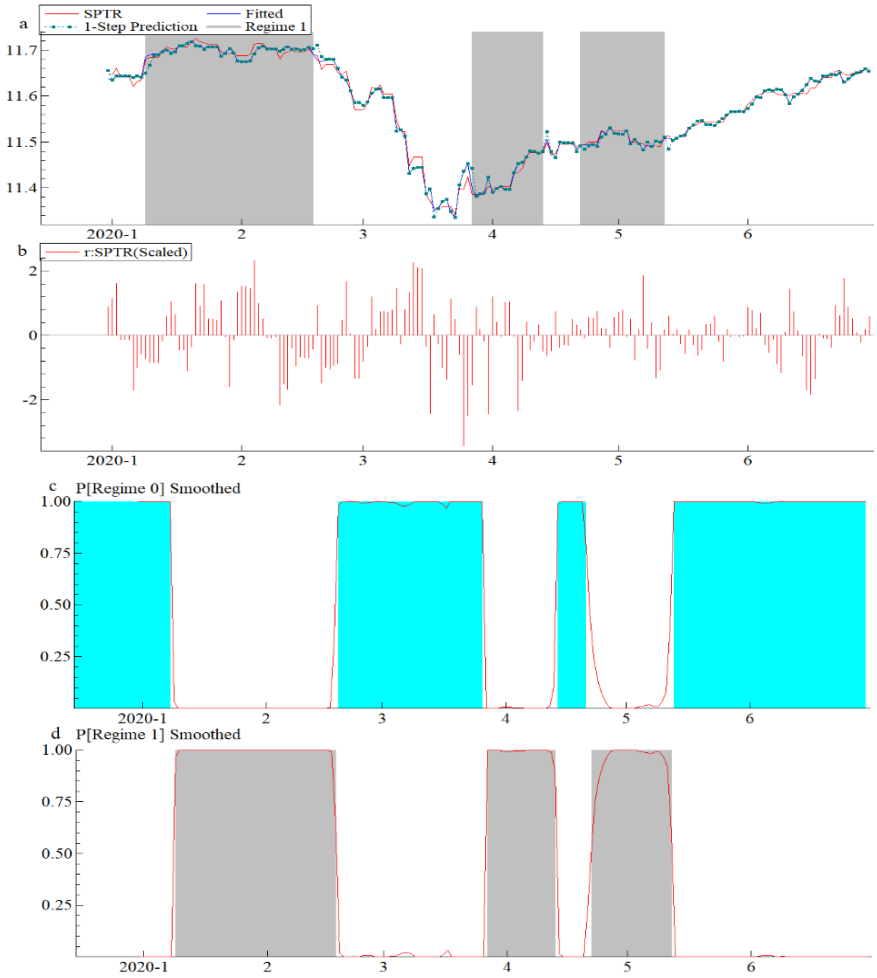

Figure 1. Smoothed Graphics For MSM-VAR Model Regime Transition Probabilities

In Figure 1, Panel (a) 1-Step Prediction shows the cyclical movements of Turkey's stock prices and the independent variables that are the main determinants of Turkey's stock prices between regimes in the study period and Panel (b) shows the scaled (between -2 and +2) form of these cyclical movements. Examining panels (a) and (b), we understand that the joint movements of the dependent variable of Turkey's stock prices and the independent variables (namely national and global Covid cases and control variables) follow trends in accordance with Turkey's exposure to Covid indicators at global and national levels. Examining the graphs for Panel (c) Probability of Smoothed Regime 0 and Panel (d) Probability of Smoothed Regime 1, we see a similar situation in the parallel movements of the dependent variable of stock prices and the independent variables in the expansion and shrinkage regimes.

Examining the MSM-VAR findings in Figure 1 in terms of Regime Transition Probability Graphs, we see that the observation values found in the expansion phase (a in Figure 1) (Regime-0) are higher than the observation values found in the shrinkage phase (b in Figure 1) (Regime-1) in the contraction phase during the study period. In line with the findings in Table 5, this shows that at first glance, both the dependent and independent variables spend a relatively large part of this period in the expansion phase and are more likely to remain in the expansion phase. Finally, looking at Figure 1, we understand that the cyclical fluctuations of Turkey's stock prices and the descriptive variables influencing stock prices are consistent with the national and global impact of the Covid-19 epidemic over the study period within Regime-0 and Regime-1.

Conclusion

Aiming to examine the effect of the Covid-19 epidemic on Turkey’s stock prices at the National and Global levels, this study reveals that the negative effect of global Covid-19 indicators in the shrinkage phase is higher than the negative effect in the expansion period. The fact that during the expansion period the national covid-19 indicator for Turkey was negative and positive during the shrinkage period indicates the presence of different factors on the Turkish stock market. On the other hand, the effect of Covid-19 in the shrinkage phase on international scale being stronger than its effect in the expansion

phase suggests a structure where negative news make the negativity felt deeper in the Turkish stock market.

Taking into account the control variables that are thought to be efficient on the stock prices of Turkey, the impact of higher global stock prices on the stock prices of Turkey during the shrinking period can be interpreted as a sign that the Turkish economy will make a rapid recovery. The policy rate had no significant effect on stock prices during the shrinkage phase, but increased policy rates had a negative impact on stock prices during the expansion phase. It was determined that increased money supply had a positive effect on Turkey's stock prices, as expected, and its effect in the expansion phase is greater than in the shrinkage period. We can say that the increase in money supply has decreased interest rates, rapidly reviving the demand in Turkey's economy, making a trend back towards the stock market through risk appetite. We observed that the increase in nominal exchange rates had a negative effect on Turkey's stock prices. Considering that it has greater negative effects in the shrinkage phase compared to its negative effect in the expansion phase, currency vulnerability is higher within the country. It is safe to say that expectations worsened during the shrinkage phase and speculative attacks created deeper effects. The increased price of gold due to the rise in demand for gold as a safe haven during the shrinkage period causes a decrease in stock prices by reducing the demand for stocks. However, the increase in gold prices during the expansion phase also increased stock prices, causing money, which has become abundant due to expansionary monetary policies, to move in multiple directions.

All these findings indicate that global stock prices, global and national-scale Covid indicators, and variables that are the main determinants of financial markets (gold prices, oil prices, interest rates, money supply, and exchange rate) are significantly influential in Turkey's stock prices in the period of 2019/12/31-2020/06/30. Moreover, the findings reveal that global stock prices, global and national-scale Covid indicators, and variables that are the main determinants of financial markets have created symmetrical and/or asymmetrical effects in two different regimes as expansion and shrinkage. In this context, it is crucial for policy makers to design monetary and fiscal policies to simultaneously reduce and/or eliminate the effects of Covid-driven uncertainties on real and financial markets at the global and national levels.

In this context, monetary and fiscal policies should be planned with a proactive approach that can mitigate the wait-and-see effects of global and national uncertainties on economic actors' actual, and particularly financial decisions at global and national level. Thus, it is possible for temporary measures in real and financial areas to become permanent, and to eliminate the fragility and thus volatility in the financial economy through policies that reduce real economic vulnerabilities and give less ground for uncertainty. In conclusion, suggestions for further studies include researching the effects of global and national-scale Covid indicators, which can be created using different data on Covid-19, and their effects on Turkey's financial markets being examined over BIST-100 sub-indices, which will contribute highly to the empirical literature.

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