

Chapter 3

ASSESSING THE HEDGE AND SAFE HAVEN PROPERTIES OF GOLD IN MAIN BIST SECTORS VIA ADCC-GARCH MODEL: COVID-19 EFFECTS

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INTRODUCTION

COVID-19 pandemic has caused a severe worldwide health crisis. It also affected the economic life and financial markets on a global scale. Financial markets have experienced severe turmoil during the pandemic. Gold is a unique asset that can act as a safe haven during financial stress times. Financial investors redesign their portfolios away from stocks and bonds towards investing in gold which is a safer asset (Gencer and Musoğlu, 2014). Gold is also referred to as TINA (there is no alternative safe haven asset). Abnormal macroeconomic backdrop and times of financial turmoil along with negative real interest rates, create a positive macroeconomic environment for gold (Luke, 2022).

Baur and McDermott (2010) make a distinction between a weak and a strong safe haven asset.² A strong (weak) safe haven asset is an asset that is negatively correlated (uncorrelated) with another asset or portfolio in certain periods only (in times of financial downturn). The key property of a safe haven asset is that it shows its 'safe' property during financial crisis periods. That is why gold is essential and its safe haven property is widely investigated in the pandemic period when analyzing the financial impacts of the pandemic.

Gold is also an important asset for emerging markets where financial and economic uncertainty exist. Turkish stock market (Borsa Istanbul) is no exception. In fact, the data that have been announced by Hobson (2023b) that Switzerland has sent 58.3 tonnes of gold worth \$3.6 billion to Türkiye in January 2023, indicate the importance of gold as a safe means of storing

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² They also distinguish between weak and strong forms of hedge assets, a concept of which will be considered in detail in Methodology section.

wealth in Türkiye during times of currency depreciation, debasement and financial stress.³

There exist different indexes measured, belonging to different sectors within Borsa Istanbul. These indexes represent an industry and reflect industrial field of activity. Economic status-quo and expectations in the business field are also reflected in sector indexes (Güzel, 2022). Diversifying the safe haven property of gold for main BIST sectors and identifying gold's interactions with these sectors have important implications for investors for portfolio diversification purposes and also for policy makers for crisis management purposes.

The multivariate DCC-GARCH model of Engle (2002) is a model that involves two steps. In the first step, the volatility dynamics are modeled in a univariate context. The second step estimates the dynamic correlations. In this study, asymmetric version of DCC-GARCH (ADCC-GARCH henceforth) is employed in estimations, where the dynamics of the conditional correlations account for the asymmetric effects (Capiello et al., 2006). ADCC-GARCH differentiates between the effects of positive and negative shocks, accounting for possible asymmetries (Katzke, 2013). The time-varying correlations are used to model the volatility of two series: BIST main sector indexes and gold. Five main sectors which are considered for this purpose are BIST Technology (XUTEK), BIST Industry (XUSIN), BIST Financial (XUMAL), BIST Services (XUHIZ) and BIST Transportation (XULAS).

Following the approach of Akhtaruzzaman et al. (2021), Chemkha et al. (2021) and Ustaoglu (2022); safe haven (weak or strong) and hedge (weak or strong) properties of gold during the COVID-19 period are assessed for above mentioned five BIST sectors. The sample is divided into two subsamples to account for the effects of the COVID-19 period. The pre-COVID-19 period is represented by the days December 30, 2019 and afore. COVID-19 period is represented by the days December 31, 2019 and onwards.⁴ The empirical results show that gold has acted as a strong hedge and a weak safe haven asset for all these five sector index returns in the COVID-19 pandemic crisis period. In order to obtain conditional correlations, different GARCH models are considered (GARCH, EGARCH, TGARCH, APARCH models) for estimations, the most appropriate model is chosen according to the information criteria.

³ Hobson (2023a) mentions that Switzerland's exports of gold to emerging markets such as China, Türkiye, Singapore and Thailand surged to multi-year highs in 2022.

⁴ December 31, 2019 is the day on which first COVID-19 case has been confirmed in China.

The structure of the study is as follows. Next section presents a review of the literature and discusses the contribution of this study. Data and Methodology sections discuss the data and the ADCC-GARCH model in detail respectively. Empirical results section presents the estimation results, conclusion section reviews the results and concludes.

LITERATURE REVIEW

COVID-19 pandemic has affected the stock markets negatively. It affected the uncertainty in the markets and caused reduction in stock returns worldwide, reducing capital flows and global liquidity availability (Padhan and Prabheesh, 2021). Gold's safe haven and hedging properties during the COVID-19 pandemic in global financial markets are investigated in various studies (Akhtaruzzaman et al., 2021; Chemkha et al., 2021; Salisu et al., 2021a; Kumar and Padakandla, 2022; Wen et al., 2022; Fabris and Ješić, 2023). The case of Türkiye, Borsa Istanbul (BIST-100 index) is studied in Gençyürek and Ekinci (2022), Canbaloglu (2022), Serttaş (2022) and Tuna (2022).

Another line of literature focusing on Borsa Istanbul, examines the BIST sector indexes and the effect of the pandemic on these sectors. Some of these studies focus on the asymmetric effects of the pandemic on BIST sectors. Özdemir (2020), investigates the asymmetric relationship between COVID-19 cases and death numbers and industry indexes through a Hatemi-J asymmetric causality test. The results yield that some sectors are negatively (financials) and some (technology) are positively affected by the pandemic. A study on volatility interaction, Güzel (2022), determines the volatility interaction among the main BIST sectors (technology, industry, financials, accounting for the COVID-19 pandemic and identifies the changes in the volatility structures of the sector indexes during the pandemic. Güven and Uzkaralar (2023) determine that COVID-19 has a more negative impact on tourism, textile and industrial sector indexes of BIST, whereas it has a less negative effect on the food, beverage and transportation indexes. Şenol and Otçeken (2021) investigate the effects of COVID-19 on BIST sectors and find that COVID-19 affects the sectors differently. Individual BIST sectors are also studied in the literature. Tourism sector, how it is affected by the COVID-19 pandemic is investigated by Özen and Özdemir (2021). Tourism and transportation sectors and the effects of the pandemic are considered by

Özcan (2021); manufacturing sector is considered by Asker (2022); banking sector is considered by Şenol and Başer (2022).

The studies that investigate the linkages between BIST sector indexes and other prices such as precious metal prices, exchange rates and oil prices potentially provide information for more robust risk-hedge and diversification strategies for portfolio investors in Türkiye. Tüzemen (2021), for example, examines the volatility spillovers between oil prices and BIST sector indexes of services, electricity, transportation, tourism, wholesale and retail trade, communication, sports, construction through a bivariate VAR-EGARCH model to account for the asymmetric spillovers. The results reveal that negative oil price shocks have more effects on the sectors than the positive shocks, where the most affected sector is the tourism sector and the least affected one is the service sector. Uysal (2021) examines the relationship between different commercial sectors' stocks and precious metals for Türkiye (BIST sectors of industry, chemicals, banking, wood, paper printing, transportation). Gold and silver prices and BIST sectors (except for the banking sector) are found to have a bidirectional causality. A unidirectional causality from silver prices to the banking sector stocks is identified. Akarsu (2022) investigates the volatility spillovers among BIST sector indexes (services, financials, industry, technology), S&P500 index and USD/TRY exchange rate through stochastic volatility modeling and incorporating for COVID-19 period. During the pandemic period, all volatility spillovers are observed to increase, a volatility spillover from BIST Financial index and BIST industry index to USD/TRY exchange rate is detected.⁵ Gold stands out as an important asset for portfolio diversification. Önem (2021) measures the volatility interaction between gold and silver prices and BIST mining index through a diagonal VECM GARCH model. The shocks that increase the volatility of gold and silver prices are shown to reduce the volatility of BIST mining index. Özdemir (2022) studies the hedging effectiveness of gold for six major bank stocks in Türkiye through a TVP-PAR model and concludes that gold can be used as a hedging instrument against banking stocks in bear market conditions.

Morales Fernández Rafaelly and Santillán-Salgado (2021) model the volatility spillovers of oil price and sectoral stock indexes (industrials, materials,

⁵ Here more recent studies that also cover the COVID-19 period are included, earlier studies such as Sattary et al. (2014) and Tüzemen and Köseoğlu (2018) also analyze the volatility spillovers of different BIST sector indexes.

financials and consumer discretionary) through employing diagonal VECH-type bivariate GARCH. The materials sector is shown to have a more intense relationship with oil prices for Mexican stock exchange. Kyriazis (2021) investigates the dynamic conditional linkages between the European STOXX50, and STOXX 600 and its 19 subsector indexes with COVID-19 deaths, gold, and crude oil, following a DCC approach. His findings reveal that the European stock indices are modestly-to-strongly linked with gold in a positive direction, preventing them from abrupt falls during the pandemic. Salisu et al. (2021b) consider 11 US sectoral stocks, S&P500 index and their hedging relationship with gold during the COVID-19 pandemic, showing that gold could improve the risk-adjusted performance of stocks during the COVID-19 pandemic. Mensi et al. (2022) examine the dynamic asymmetric return spillovers between gold and Brent oil commodity futures and 22 European equity sectors (22 subindexes of STOXX 600) incorporating for the 2011–12 European debt crisis, 2014–15 oil crisis, 2016 Brexit referendum, and the COVID-19 crisis episodes.⁶ Gold is observed to diversify the risk of all European equity sectors during crisis and non-crisis periods, whereas oil diversifies a few.

To this end, this study contributes to the literature by considering the main five BIST sector indexes and investigating whether gold has acted as a safe haven or a hedge asset during the COVID-19 period. In this dimension, this study is the first to analyze the different sectors of BIST and gold's role in being a protection for the investors in these sectors. A sectoral analysis for this purpose is crucial because the interactions of different equity sectors with the gold market will not be the same (Mensi et al., 2022). Similar studies to this study on single BIST sectors; Önem (2021) and Özdemir (2022) exist. Önem (2021) focuses on the volatility interactions between two precious metals and the mining sector only, covering daily observations 01.02.2017-01.02.2021, but does not distinguish for the period of the COVID-19 pandemic. Similarly, Özdemir (2022) analyzes the hedge property of gold for daily observations from June 2018 to November 2022, for six major banks' stocks in Türkiye for the banking sector (İş Bank, Garanti Bank, Akbank, Yapı Kredi Bank, Halkbank and Vakıfbank) but does not account for the effects of the pandemic era.

⁶ The reader is referred to the references mentioned in Mensi et al. (2022) on the importance of capturing the different effects of crises on different sectors for investigating the gold-stock nexus.

DATA

Data for sectoral stocks of the BIST and gold prices cover the period May 04, 2001 to February 3, 2023.⁷ The sample period is partitioned into two: (i) pre-COVID-19 (ii) COVID-19. The pre-COVID sample covers the period before the emergence of COVID-19, that is, before December 31, 2019, while the COVID-19 sample covers the period since the outbreak of the COVID-19 pandemic, starting from December 31, 2019.

The sectoral stocks are Borsa Istanbul's five main sectoral stock indexes: BIST Technology (XUTEK), BIST Industry (XUSIN), BIST Financial (XUMAL), BIST Services (XUHIZ) and BIST Transportation (XULAS). Daily data on sectoral stocks in terms of Turkish Lira, are downloaded from the Bloomberg terminal (<https://www.bloomberg.com>), while gold spot prices are obtained from the World Gold Council website (<https://www.gold.org>). The gold spot prices are in US dollars (World Gold Council, 2023). The spot prices are converted into Turkish Lira through USD/TRY exchange rate extracted from the Bloomberg terminal (Bloomberg, 2023).

For each variable, the returns are calculated and are used during the estimations. The returns are calculated as $r_t = \ln(P_t/P_{t-1})$, where \ln denotes the natural logarithm and P denotes the price.

METHODOLOGY

The asymmetric dynamic conditional correlation-generalized autoregressive conditional heteroskedasticity model of Cappiello et al. (2006) is utilized. The method involves two steps. In the first stage a GARCH(1,1) model is estimated. Let r_t be an $n \times 1$ vector of asset returns, for our case: the bivariate case $n=2$. The vector r_t contains the returns of gold and of a sector index:

$$r_t = \mu + \varepsilon_t \quad (1)$$

$$h_t = c + \alpha \varepsilon_{t-1}^2 + \beta h_{t-1} + d \varepsilon_{t-1}^2 I(\varepsilon_{t-1}) \quad (2)$$

⁷ Data after February 6, 2023, the day at which two massive earthquakes have hit Türkiye, are not considered to focus on the COVID-19 effects only.

where μ stands for the conditional mean vector that may include a constant and/or past observations. ε_t denotes a (2×1) vector of residuals conditional on the information set I_{t-1} defined at time $t-1$, h_t is conditional variance, $c=(c_{11}, c_{22})$ is constant, $\alpha = \begin{pmatrix} \alpha_{11} & \alpha_{12} \\ \alpha_{21} & \alpha_{22} \end{pmatrix}$ is ARCH coefficients, $\beta = \begin{pmatrix} \beta_{11} & \beta_{12} \\ \beta_{21} & \beta_{22} \end{pmatrix}$ is GARCH coefficients, d estimates the asymmetric effect.⁸ The second step estimates the correlations:

$$H_t = D_t R_t D_t \quad (3)$$

where R_t represents the time varying conditional correlation matrix, and D_t is the (2×2) diagonal matrix containing the conditional standard deviations of univariate GARCH-type models.⁹ Each conditional variance $h_{i,t}$ of an asset i , for $i=1, \dots, n$, is estimated using the asymmetric exponential GARCH (EGARCH) model. The reason why EGARCH model is used is because different information criteria have been checked to select among four different models (GARCH, EGARCH, TGARCH and APARCH) during the estimation process. The information criteria are Akaike, Bayes, Shibata and Hannan-Quinn. The EGARCH model yielded the minimum of all information criteria studied, thus turned out to be the optimal model.

The following regression is run to specify the hedge and safe haven properties of gold during the COVID-19 period:

$$ADCC_{ij,t} = \delta_0 + \delta_1 ADCC_{ij,t-1} + \delta_2 D_{covid} + v_{ij,t} \quad (4)$$

where $ADCC_{ij}$ is the pairwise dynamic conditional correlation between gold and each return on a chosen sector index. D_{covid} is a dummy variable for the pandemic period; it takes the value of 1 if the returns are realized during the crisis period and takes the value 0 otherwise. If the intercept term δ_0 is estimated to be zero/insignificant (significantly negative), gold is a weak (strong) hedge. If δ_2 is estimated to be zero/insignificant (significantly negative) then gold is a weak (strong) safe haven (Chemkha et al., 2021, p. 75).¹⁰ A weak (strong) hedge asset is an asset that is uncorrelated (negatively) correlated with another asset or portfolio on average (Baur and McDermott, 2010).

⁸ α and β are the ARCH coefficients for short-term effects and GARCH coefficients for long-term effects respectively.

⁹ See Chemkha et al. (2021) on the empirical methodology.

¹⁰ If δ_0 is estimated to be a weakly positive number, gold is a weak diversifier for the sector indexes (Chemkha et al., 2021, p. 75).

EMPIRICAL RESULTS

Tables 1 through 3 present the average of the dynamic conditional correlations between gold returns and sector index returns. The correlations are all negative which is an indication that gold is a safe haven asset for these indexes (Akhtaruzzaman et al., 2021, p. 6). It is also observed from these tables that all dynamic correlations increased (though again negative) during the pandemic period, a result that suggests gold might have lost some of its power as a safe haven asset but might still offer protection as a hedge asset (Chemkha et al., 2021, p. 76).¹¹ In order to further investigate this claim, Equation (4) is estimated and formal hypothesis tests on the estimated coefficients are implemented. Tables 4 through 6 contain the results of the hypothesis tests. Coefficient estimates together with estimated standard errors in parantheses are listed.¹²

Table 1. Mean DCCs between gold and technology and industrials.

	XUTEK	XUSIN
Pre-COVID-19	-0.185	-0.201
COVID-19	-0.052	-0.041

Table 2. Mean DCCs between gold and financials and services.

	XUMAL	XUHIZ
Pre-COVID-19	-0.220	-0.199
COVID-19	-0.122	-0.105

Table 3. Mean DCCs between gold and transportation.

	XULAS
Pre-COVID-19	-0.211
COVID-19	-0.128

¹¹ Similar results exist in the literature for gold and bitcoins (also see Akhtaruzzaman et al. (2021) and Ustaoglu (2022) and the references therein).

¹² All are implemented through the R statistical software.

Table 4. Hedge and safe haven properties of gold.

	XUTEK	XUSIN
δ_0	-0.0014*** (0.0003)	-0.0021*** (0.0004)
δ_2	0.0007 (0.0004)	0.0011 (0.0007)

Table 5. Hedge and safe haven properties of gold.

	XUMAL	XUHIZ
δ_0	-0.0027*** (0.0005)	-0.0024*** (0.0005)
δ_2	0.0008 (0.0007)	0.0007 (0.0006)

Table 6. Hedge and safe haven properties of gold.

	XULAS
δ_0	-0.0031*** (0.0005)
δ_2	0.0006 (0.0006)

Focusing on the results of the (five different) estimations of Equation (4), all intercept terms are found to be significantly negative at 1% significance level (***) and all δ_2 coefficients are estimated to be zero, which indicates that gold has acted as a strong hedge and a weak safe haven asset for these five sector indexes during the pandemic period.

CONCLUSION

Since the epidemic COVID-19 has triggered a large economic and financial crisis worldwide, safe haven assets like gold are sought for by investors to offset possible risks on portfolios. This research addresses the question whether gold can be used as a hedge and/or a safe haven asset versus stocks of BIST at the sector level during the COVID-19 pandemic by using the ADCC-GARCH method. In this regard, five main sectors are investigated: technology (XUTEK), industry (XUSIN), financials (XUMAL), services (XUHIZ) and transportation (XULAS), since sectors are heterogeneous and have different market structures.

The analysis of risk diversification strategies through commodities and digital assets versus stocks at the sector level is still at an early stage in the literature, globally and domestically in Türkiye.

The empirical results have shown that the correlations between gold and BIST sector indexes increased during the COVID-19 era compared to the pre-pandemic period. After applying formal tests on determining the hedge and safe haven properties of gold against the BIST sector indexes, it is observed that gold has indeed acted as a strong hedge and a weak safe haven asset during the COVID-19 pandemic in these sectors.

As mentioned before, research on the effects of the COVID-19 on the financial markets and optimal portfolio diversifications considering the pandemic era is still at an early stage. Especially in Türkiye, additional research specifically focusing on the BIST sectors and the impacts of the government or central bank stimulus packages in soothing the effects of COVID-19 on portfolio diversification, could be further implemented by the curious researchers.¹³

REFERENCES

- Akarsu, G. (2022, May 13–15) *Volatility Spillover Among BIST Sector Indices, S&P500 Index and USD/TRY Exchange Rate: Stochastic Volatility Modelling* [Paper presentation]. VI. Anadolu International Conference on Economics, Eskişehir Turkey.
- Akhtaruzzaman, M., Boubaker, S., Lucey, B. M. & Sensoy, A. (2021) Is gold a hedge or a safe haven asset in the COVID-19 crisis? *Economic Modelling*, 102, 105588.
- Asker, V. (2022). Investigation of financial performance in the manufacturing sector before and during the COVID-19 Pandemic. *Alanya Academic Review*, 6 (2), 2261-2274.
- Baur, D. G. & McDermott, T. K. (2010) Is gold a safe haven? International evidence. *Journal of Banking and Finance*, 34 (8), 1886-1898.
- Bloomberg (2023) Bloomberg terminal, February 7, 2023.
- Canbaloglu, B. (2022) Gold and stock market linkage: Pre- and Post -COVID-19 Periods. *Başkent Üniversitesi Ticari Bilimler Fakültesi Dergisi*, (6) 2, 123 – 131.
- Cappiello, L., Engle, R. F., & Sheppard, K. (2006) Asymmetric correlations in the dynamics of global equity and bond returns. *Journal of Financial Econometrics*, 4 (4), 537-572.
- Chemkha, R., BenSaida, A., Ghorbel, A., & Tavachi, T. (2021) Hedge and safe haven properties during COVID-19: evidence from bitcoin and gold. *The Quarterly Review of Economics and Finance*, 82, 71-85.
- Engle, R. (2002) Dynamic conditional correlation: a simple class of multivariate generalized autoregressive conditional heteroskedasticity models. *Journal of Business and Economic Statistics*, 20 (3), 339-350.

¹³Central Bank of Türkiye has announced several measures for mitigating the economic effects of the COVID-19 pandemic (TCMB, 2020).

- Fabris, N. & Ješić, M. (2023) Are gold and bitcoin a safe haven for European indices? *Journal of Central Banking Theory and Practice*, 1, 27-44.
- Gencer, G. & Musoğlu, Z. (2014) The safe haven property of gold in Turkish financial markets: an investigation of the global financial crisis. *Bogazici Journal*, 28 (2), 75-89.
- Gençyürek, A. G. & Ekinci, R. (2022) Safe haven and hedging roles of precious metals for BRICS and Turkey. *Borsa Istanbul Review*, <https://doi.org/10.1016/j.bir.2022.10.013>.
- Güven, N. & Uzkaralar, M. (2023) The effects of the coronavirus pandemic process on BIST sub-sector indices in Turkey. *Alanya Academic Review Journal*, 7 (1), 413-428.
- Güzel, F. (2022) Volatility interaction of BIST main sector indices: findings on the COVID-19 period. *The Journal of Social Economic Research*, 22 (2), 128-138.
- Hobson, P. (2023a, January 24). Switzerland sent 524 tonnes of gold to China last year, the most since 2018. Thomson Reuters. <https://www.reuters.com/markets/commodities/switzerland-sent-524-tonnes-gold-china-last-year-most-since-2018-2023-01-24/adresinden-ulařılmıştır>).
- Hobson, P. (2023b, February 21). Switzerland sent \$3.6 bln of gold to Turkey in Jan, the most since at least 2012. Thomson Reuters. (https://www.reuters.com/markets/commodities/switzerland-sent-record-breaking-36-bln-gold-turkey-january-2023-02-21/_adresinden-ulařılmıştır).
- Katzke, N. (2013) South African sector return correlations: using DCC and ADCC multivariate GARCH techniques to uncover the underlying dynamics. *Stellenbosch Economic Working Papers*: 17/13.
- Kumar, A. S. & Padakandla, S. R. (2022) Testing the safe haven properties of gold and bitcoin in the backdrop of COVID-19: a wavelet quantile correlation approach. *Finance Research Letters*, 47 (B), 102707.
- Kyriazis, N. A. (2022) Investigating the nexus between European major and sectoral stock indices, gold and oil during the COVID-19 pandemic. *SN Business & Economics*, 1, 57.
- Luke, J. (2022, February 3). Gold - the only "safe haven" asset? Schroders. IN FOCUS. (<https://www.schroders.com/en-us/us/individual/insights/gold---the-only-safe-haven-asset/> adresinden ulařılmıştır)
- Mensi, W., Yousaf, I., Vinh Vo, X. & Hoon Kang, S. (2022) Asymmetric spillover and network connectedness between gold, BRENT oil and EU subsector markets. *Journal of International Financial Markets, Institutions and Money*, 76, 101487.
- Morales Fernández Rafaelly, R. & Santillán-Salgado, R. (2020). Oil price effect on sectoral stock returns: a conditional covariance and correlation approach for Mexico. *Revista Mexicana de Economía y Finanzas Nueva Época REMEF*, 16 (1), 1-15.
- Önem, H. B. (2021) Analysis of volatility interaction between gold, silver and BIST mining index returns with diagonal VECH GARCH model. *OPUS-International Journal of Society Research*. 18 (43), 6220-6240.
- Özcan, M. (2021) Impact of COVID-19 pandemic on financial performance of tourism and transportation enterprises. *OPUS-International Journal of Society Research*. 17, 3542-3567.
- Özdemir, L. (2020) Asymmetric effects of COVID-19 pandemic on BIST sector indices. *Research of Financial Economic and Social Studies*. 5 (3), 546-556.

- Özdemir, H. (2022) Hedging effectiveness of gold: an analysis for the banking sector with different dynamic portfolio approaches. *Journal of Research in Economics, Politics & Finance*, 7 (4), 889-908.
- Özen, E. & Özdemir, L. (2021) How did COVID-19 pandemic affect the tourism index in Borsa Istanbul? *Facta Universitatis Series: Economics and Organization*, 18 (3), 229-242.
- Padhan, R. & Prabheesh, K. P. (2021) The economics of COVID-19 pandemic: a survey. *Economic Policy and Analysis*, 70, 220-337.
- Salisu, A. A., Raheem, I. D., & Vinh Vo, X. (2021a) Assessing the safe haven property of the gold market during COVID-19 pandemic. *International Review of Financial Analysis*, 74, 101666.
- Salisu, A. A., Vinh Vo, X. & Lucey, B. (2021b) Gold and US sectoral stocks during COVID-19 pandemic. *Research in International Business and Finance*, 57, 101424.
- Sattary, A., Temurlenk, M. S., Bilgiç A. & Çelik, A. K. (2014) Volatility spillovers between world oil market and sectors of BIST. *Asian Social Science*, 10 (8), 156-164.
- Serttaş, F. Ö. (2022) Hedge and safe haven properties of gold and cryptocurrencies for the BIST100 index: the COVID-19 pandemic effects. *Ankara Hacı Bayram Veli University Journal of the Faculty of Economics and Administrative Sciences*. 24 (2), 622-635.
- Şenol, Z. & Başer, R. (2022) The effects of COVID-19 on the banking industry: Evidence from Turkey. *Yalova Sosyal Bilimler Dergisi*, 12 (2), 28-37.
- Şenol, Z. & Otçeken, G. (2021) The effect of COVID-19 on ISE sectors. *Research of Financial Economic and Social Studies*, 6 (3), 2602-2486.
- TCMB (2020). *Koronavirüsün Ekonomik ve Finansal Etkilerine Karşı Alınan Tedbirler*. Türkiye Cumhuriyet Merkez Bankası. (http://www.tcmb.gov.tr/wps/wcm/connect/TR/TCMB+TR/Main+Menu/Duyurular/Koronavirus/adresinden_ulaşilmiştir).
- Tuna, K. (2022) The effects of volatilities in oil price, gold price and VIX index on Turkish BIST 100 stock index in pandemic period. *Istanbul Journal of Economics*, 1, 39-54.
- Tüzemen, S. (2021) Analysis of the asymmetrical effect of oil prices on service sector stock prices in Turkey. *Ataturk University Journal of Economics and Administrative Sciences*. 35 (2), 649-665.
- Tüzemen, S. & Köseoğlu, M. (2018) Do negative oil price shocks affect the industrial sector prices more than positive shocks? A bivariate EGARCH analysis for Turkey. *Social Sciences Research Journal*, 1 (1), 1-15.
- Ustaoglu, E. (2022) Safe haven properties and portfolio applications of cryptocurrencies: evidence from the emerging markets. *Finance Research Letters*, 47, 102716.
- Uysal, M. (2021). Analysis of the relationship between precious metals and stock markets: application on Borsa Istanbul commercial sectors. *Fiscaoeconomia*. 5 (2), 652-669.
- Wen, F., Tong, X., & Ren, X. (2022) Gold or bitcoin, which is the safe haven during the COVID-19 pandemic? *International Review of Financial Analysis*, 81, 102121.
- World Gold Council. (2023). *Gold spot prices*. (https://www.gold.org/goldhub/data/gold-prices_adresinden_ulaşilmiştir).
- Yildirim, H., Boyacı Yıldırım, M., & Limoncuoğlu, A. (2021) Escape from COVID-19 pandemic to safe haven *Journal of Public Affairs*, 21, e2728.