Araştırma Makalesi/Research Article *DOU Dergi*, 2023, *24*(2) 479-496

DOĞUŞ ÜNİVERSİTESİ DERGİSİ
DOGUS UNIVERSITY JOURNAL
e-ISSN: 1308-6979
https://dergipark.org.tr/tr/pub/doujournal

HEDGING ABILITIES OF STOCKS, GOLD, AND REAL ESTATE FUNDS AGAINST INFLATION DURING COVID-19: EVIDENCE FROM TÜRKİYE

HİSSE SENETLERİ, ALTIN VE GAYRİMENKUL FONLARININ COVID-19 DÖNEMİNDE ENFLASYONA KARŞI KORUMA YETENEKLERİNİN ANALİZİ: TÜRKİYE ÖRNEĞİ

Levent SÜMER[(1)]

Abstract: The global economy is struggling with many challenges which started with the recession caused by the COVID-19 disease and continued with the high inflation problem. Investors seek safe havens ain crisis periods and among many investment tools, real estate has always been a preferred tool to protect the purchasing powers of investors under high inflationary periods. By using Gultekin approach derived from the Fama-Schwert regression model, this study investigates the hedging ability of the Real Estate Investment Trusts (REITs) and the Real Estate Investment Funds (REIFs) in Türkiye during the COVID-19 pandemic period (January 2020-December 2021). Additionally, the Turkish REIT (T-REIT) Index, Istanbul Stock Exchange (BIST) 100 Index and gold (ounce/USD) and (gram/TL) were also analyzed in the study as benchmark tools. T-test, Jarque-Bera (1980), and Breusch-Pagan (1979) tests were used to validate the regression models. The results of the research revealed that only 4 of 33 T-REITs and 1 of 15 T-REIFs provided a hedge against inflation, while gold, BIST 100, and the T-REIT index did not have the statistical hedging ability during the COVID-19 period. The results of the research exhibited that, there are very few hedging tools under high inflation, and as a result, the purchasing powers of people are decreasing. Hence, the Central Bank of Türkiye Republic should seriously focus on fighting against inflation. Based on the reviewed past literature, this study seems to be the first research that seeks the hedging ability of the T-REITs and T-REIFs during the COVID-19 period.

Keywords: Inflation, Stocks, Gold, Real Estate Funds, Hedging

JEL: *E31, E44, G11, G32*

Öz: *Küresel ekonomi, COVID-19 salgını sebebiyle yaşanan ekonomik daralmanın ardından başta yüksek enflasyon olmak üzere birçok sorunla mücadele etmektedir. Yatırımcılar kriz dönemlerinde güvenli limanlar ararlar ve birçok yatırım aracı arasında gayrimenkul, yüksek enflasyon dönemlerinde yatırımcıların satın alma güçlerini korumak için her zaman cazip bir araç olmuştur. Bu çalışma, Fama-Schwert regresyon modelinden türetilen Gültekin yaklaşımını kullanarak, COVID-19 pandemisi döneminde (Ocak 2020-Aralık 2021) Türkiye'deki Gayrimenkul Yatırım Ortaklıkları ve Gayrimenkul Yatırım Fonlarının riskten korunma kabiliyetini araştırmaktadır. Çalışmada ayrıca T-GYO Endeksi, Borsa İstanbul (BIST) 100 Endeksi ve altın (ons/USD) ve (gram/TL) da karşılaştırma araçları olarak analiz*

[(1)] Boğaziçi Üniversitesi, İktisadi ve İdari Birimler Fakültesi, İşletme Bölümü; levent.sumer@boun.edu.tr, ORCID: 0000-0002-2160-8803
Geliş/Received: 29-04-2023; Kabul/Accepted: 01-06-2023

Atıf bilgisi: Sümer, L. (2023). Hedging abilities of stocks, gold, and real estate funds against inflation during Covid-19: Evidence from Türkiye, *Doğuş Üniversitesi Dergisi*, *24*(2), 479-496. DOI: 10.31671/doujournal.1289675.

edilmiştir. Regresyon modellerini doğrulamak için t-testi, Jarque-Bera (1980) ve Breusch-Pagan (1979) testleri kullanılmıştır. Araştırma sonuçları, 33 T-GYO'dan sadece 4'ünün ve 15 T-GYO'dan sadece 1'inin enflasyona karşı koruma sağladığını, altın, BİST 100 ve T-GYO endeksinin ise COVID-19 sürecinde istatistiksel olarak korunma kabiliyetine sahip olmadığını ortaya koymuştur. Araştırma sonuçları, yüksek enflasyon altında çok az sayıda riskten korunma aracı bulunduğunu ve bunun sonucunda insanların satın alma güçlerinin düştüğünü göstermiştir. Bu nedenle, Türkiye Cumhuriyet Merkez Bankası ciddi bir şekilde enflasyonla mücadeleye odaklanmalıdır. İncelenen geçmiş literatüre bakıldığında bu çalışma, COVID-19 döneminde Türk gayrimenkul sermaye piyasası araçlarının riskten korunma kabiliyetini araştıran ilk araştırma olma özelliği taşımaktadır.

Anahtar Kelimeler: *Enflasyon, Hisse Senetleri, Altın, Gayrimenkul Fonları, Riskten Korunma*

1. Introduction

The Coronavirus Disease (COVID-19) pandemic changed our lives in many aspects and had an important impact on the global economy. While the initial effect of the pandemic caused a global recession in 2020, the year 2021 ended up with a rapid increase in inflation rates in many countries including the United States (US) and the European Union (EU) zone. The US experienced a 7% yearly consumer price index (CPI), the highest rate recorded in the last 39 years, and mostly due to the rapid increase in energy prices, the EU zone had a 5% yearly inflation in 2021. Türkiye, as an OECD member country, had 36,08% of yearly inflation in 2021, 5,46 times the OECD average rate which was 6,6% (OECD, 2022, Statista 2022, Eurostat 2022). Until the third quarter of 2021, the initial and persistent responses of the central banks including the US Federal Reserve (FED) and European Central Bank (ECB) about the rise in the inflation rates were "temporary", but that statement was replaced by "the high inflation will be more permanent than expected" in the last quarter of 2021 and the first quarter of 2022. The rise in inflation continued and, in many countries, almost doubled in the first half of 2022 compared to the previous quarter (Tradingeconomics, 2022). As a result, ECB, FED, and many other central banks decided to increase the interest rates (FED, ECB, 2022).

Türkiye, as an emerging economy, has been fighting against high inflation for decades. Although there was partial success in the early 2010s with the lowest rate of CPI (6,16%) recorded in 2012, the average of CPI rates for the last 20 years was observed as 12,53%. On the other hand, within the last 10 years, the value of the United States Dollar (USD) rose from 1,67 Turkish Lira (TL) to 17,47 where the weakening of the TL against the USD speeded up in the last two pandemic years. The Central Bank of the Republic of Türkiye (CBRT), in contrast to many other central banks, started decreasing the interest rates which had a downward fast-moving effect on the value of TL against many currencies. Despite the high inflation, this policy increased the negative real rate of return in Türkiye and the value of the Turkish Lira hit its lowest record on December 20, 2021, when 1 USD value reached 17,47 TL (CBRT, 2022). On the same day, the President of the Türkiye Republic announced a new tool to protect the value of the Turkish Lira against other currencies. The Treasury of Türkiye announced a new TL account for those who would convert their USD to TL which provided a fixed-interest rate guarantee and a value increase of USD against TL shall also be paid to these new account holders (Sümer, 2023). This new tool

started a new debate in Türkiye. Some economists evaluated this new tool as a concealed rise in interest rates, and some of them draw attention to the potential burden the Treasury of Türkiye may carry if the value of TL keeps decreasing against the USD. Beyond these discussions, while the world economy is fighting with high inflation, Türkiye is listed at the top of the G20 countries with the highest inflation rates due to the monetary policies of the Central Bank of Türkiye Republic (CBRT). As a result, it was essential to develop alternative investment tools to hedge inflation, especially in Türkiye. Among traditional investment tools, gold is considered a safe haven, especially in crisis periods (Sumer and Ozorhon, 2020). On the other hand, the rapidly growing interest in cryptocurrencies cannot be disregarded. Although it is too risky to invest in cryptocurrencies due to a lack of legal framework, many different coins attract investors. Real estate is also considered an important traditional investment tool. While some investors seek long-term regular income, especially for their retirement years, some of them prefer shorter investment periods and focus on capital gains. Although investing in direct real estate is still preferable to many investors, real estate capital market instruments are also important alternatives for those who would like to manage their investments through asset management companies and capital markets.

Among different real estate capital market investment tools, real estate investment trusts (REITs) and real estate investment funds (REIFs) are two emerging alternatives for investors. Regardless of the investment period, investing in direct real estate has some potential risks and burdens such as paying property taxes, insuring the properties, carrying the amortization costs, and being responsible for maintenance costs, yet if the lessee moves out of the property, the owner may also face a loss of rental income until the property is leased to a new lessee. In that sense, investing in real estate through real estate capital market instruments is considered a good alternative compared to direct real estate. Among the real estate capital market instruments, REITs and REIFs provide various alternatives to the investors by enabling them to be either a shareholder of a company in REITs or a participant of a fund in REIFs. In REITs and real estate mutual funds, owning, operating, or financing properties is not required for the investors. While some investors prefer to invest in REITs for obtaining regular income through dividends and profits by buying and selling REIT stocks, others prefer REIFs which provide annual returns by rental incomes or returns through value increases by buying and selling assets. Both REITs and REIFs may have the option to be either listed in stock exchanges or not.

There are three major types of REITs that may invest in different real estate areas. While most REITs are established as equity REITs that own and manage income-generating real estate, money is lent to real estate owners and operators through mortgage loans and mortgage-backed securities in mortgage REITs, and the investment strategies of both equity and mortgage REITs are used in hybrid REITs (Chen, 2023). Three types of real estate funds can be actively or passively managed: Open or closed-ended real estate mutual funds, professionally managed private real estate investment funds that invest in real estate properties directly, and real estate exchange-traded funds which own the shares of real estate corporations and REITs and trade like stocks on major exchanges. According to the National Association of Real Estate Investment Trusts (NAREIT), as of the last quarter of 2020, the gross real estate assets that the REITs own are approximately USD 3.5 trillion. According to the

Preqin Real Estate Report (2021), the total asset under management (AuM) of global real estate investment funds is USD 1,09 trillion at the end of 2Q 2020 (Sumer, 2022).

Direct real estate has been an important investment instrument in Türkiye, but the development of the real estate capital market instruments is new, and the market size is too low compared to the global sizes. The history of REITs back to 1995 in Türkiye and the regulation of REIFs was published only in 2014 (SPK, 2022). Though both investment tools have common incentives for the investors such as being corporate tax-exempt, the structures of the REITs and REIFs are different. As of the end of 2021, the total size of REITs (T-REITs) and REIFs (T-REIFs) in Türkiye is USD 7,5 billion and 1 USD billion respectively (GYODER, 2022). Although the sizes of both tools are too small, the rising demand in the real estate industry during the current high inflation period may provide an opportunity for investors to invest in T-REITs and T-REIFs.

In that context, the hedging ability of the T-REITs and T-REIFs was analyzed for the 24 months of the COVID-19 pandemic period (January 2020-December 2021). Additionally, the T-REIT Index, BIST 100 Index and gold (ounce/USD) and (gram/TL) were also analyzed in the study as benchmark tools as stocks and gold are also considered important investment tools in Türkiye. The results of the study revealed that only 4 of 33 T-REITs and 1 of 15 T-REIFs hedge inflation in the COVID-19 period. This research, being one of the pioneers in the literature provides insight for investors while investing in Turkish real estate capital market instruments during high inflation periods. Based on the results, some policy recommendations were made to increase the size and the returns of real estate capital market instruments in Türkiye.

2. Past Literature

The hedging ability of different investment tools against inflation has always been an important research area for many scholars, and real estate has been considered an important investment alternative to protect the wealth of people. While some scholars such as Fama and Schwert (1977), Hartzell et. al (1987), Limmack and Ward (1988), and Hoesli (1994) found real estate as a tool that hedges inflation, while the analysis of Park et.al (1990), Liu et al. (1997) and Olsson et al. (2008) exhibited an opposite result. The analysis of Lee (2013) showed that the only property type that provides an effective hedge against expected, actual and unexpected inflation was a residential property. In contrast, the research of Fang et al. (2008) provided an ineffective hedge in Taiwan's housing investments. Gyourko and Linneman (1988) found a positive correlation between non-residential property returns and inflation and a negative correlation between REIT returns and inflation. The results of the study of Park and Bang (2012) exhibited a short-run positive co-movement of Korean commercial real estate with both expected and unexpected inflation. Yobaccio et.al (1995) investigated the hedging ability of REITs and concluded with partial protection against expected inflation. Chatrath and Liang (1998) provided no evidence of a positive correlation between REIT returns and inflation, and Lu and So (2001) found a negative relationship between REIT returns and inflation. Bahram et al (2004) also concluded that equity and mortgage REIT investments are not considered good investment tools during inflationary periods. Marcato and Brounen (2015) showed that when the economy gets worse, the listed real estate securities provide a hedge against inflation in developed markets. In Türkiye, while Ekincioglu (2003) and Erol and Tirtiroglu (2008) exhibited a hedging ability of Turkish REITs especially under high inflation

periods, the study of Onder (2010) showed the opposite result. Gurel (2020) also concluded that Turkish housing investments provide hedge inflation in the long run. Although the global past research about the hedging ability of direct and indirect real estate is extensive, the studies in this area are very limited in Türkiye. Thus, this research may contribute to the literature by fulfilling an important gap and providing insights to investors, especially in today's high inflationary period where real estate is considered a protection tool against inflation.

3. The New Challenge of the Global Economy: Inflation

The world economy is battling with high inflation rates. The gap between inflation and interest rates has widened in many countries because of the loose monetary policies of many central banks. Türkiye is the leading country where the real return is – 65% yearly. After FED started increasing the interest rates, ECB also decided to increase the interest rates to fight against inflation. While raising the interest rates seems the most effective tool to slow down the increase in inflation, it also may cause a risk of recession due to the monetary tightening policies of the central banks. In that situation, the governments face a big dilemma: not touching interest rates or even decreasing them as the case in Türkiye and stimulating growth; or increasing the interest rates and challenging a new recession.

It seems like countries like China, Mexico, and Brazil chose the second option, keeping the GDP growth rate slow but matching the interest rates with the inflation rates, while Türkiye, the US, and countries in the Euro area preferred the first one. Figure 1 shows how the FED interest rate policies affect the direction of inflation in the US. The latest interest rate decisions of the FED and ECB show that the US and the European countries shifted their policies from the first one to the second one to fight against inflation. Appendix 1 shows the inflation, interest, and annual GDP growth rates of G-20 countries.

3.1. Türkiye Case

After experiencing high-interest rates in the second half of 2018 and the first quarter of 2019 when the annual interest rates hit 25,5%, the CBRT started decreasing the interest rates and in July 2020, the annual interest rates fell to 7,76%. Since then, the increase in inflation rates in 2020 and 2021 forced the CBRT to increase the interest rates again and in March 2021 the interest rates increased to 19% when the inflation was 16,19% on the same date. While the inflation was continuously increasing, the CBRT kept the interest rates at 19%, and in September 2021, the CBRT, surprisingly decided to reduce the interest rates and gradually the interest rates were fallen to 14% within 4 months.

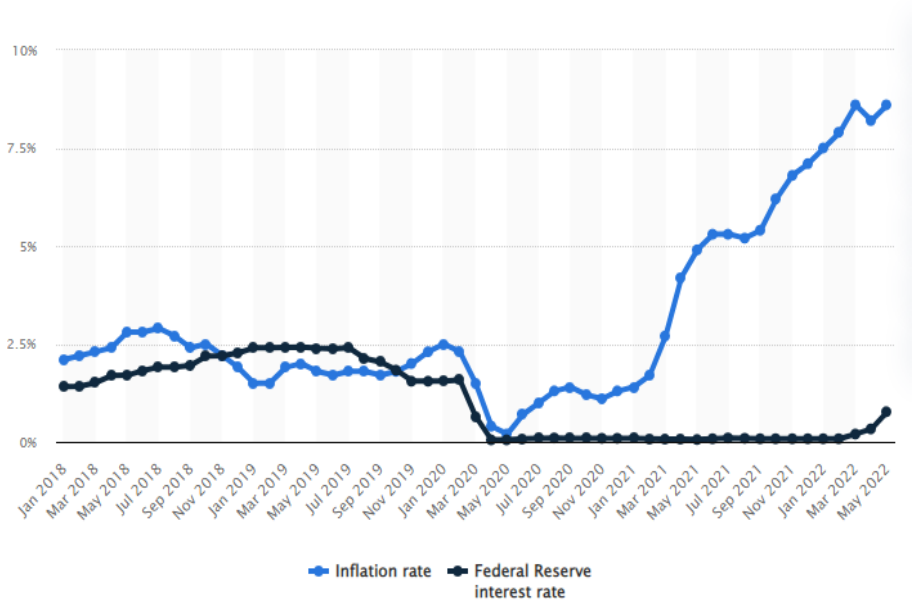

Figure 1. FED Interest rates vs. Inflation rate (Source: Statista, 2022**)**

At the end of 2021, the annual inflation sharply rose to 36,08 and kept increasing during 2022. While the annual inflation hit 78,62% at the end of June 2022, the interest rates remained constant at 14%. Because of the low-interest rate strategy of the CBRT, the Turkish Lira devaluated against other currencies. That increased inflation due to the dependency of production on imported goods and energy prices determined in foreign currencies. Figures 2 and 3 show the inflation rates, interest rates, and the depreciation of TL against the USD.

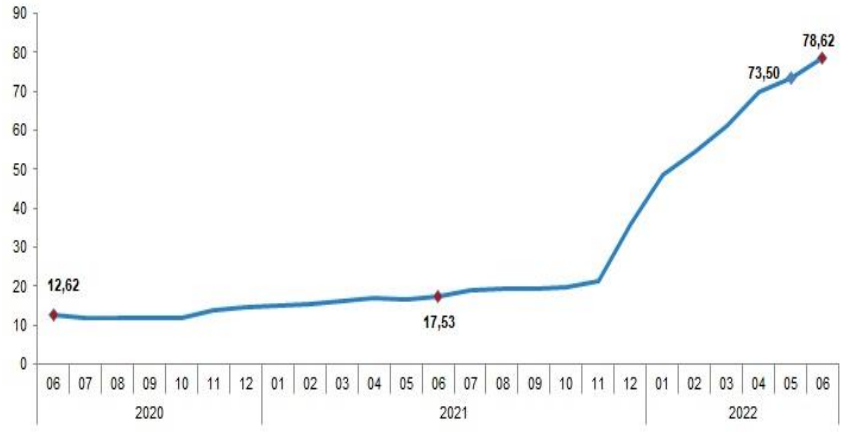

Figure 2. The CPI in Türkiye (Source: Turkstat, 2022**)**

4. T-REITs and T-REIFs

During high inflation periods, investors seek a safe haven to protect their purchasing powers. In that sense, direct or indirect real estate investments seem alternative tools. REITs and REIFs are considered two significant real estate capital market tools, so their hedging ability against inflation may give investors important insights for future investments.

4.1. T-REITs

The first law about REITs was enacted in 1995 by the Capital Market Boards of Türkiye (SPK). In 1997, the first IPO was made (Sumer, 2017). Since then, 37 REITs were founded within 25 years period (Capital Market Board (SPK), 2022). According to the report of the Real Estate Investors Association (GYODER, 2021), the total size of Turkish REITs (T-REITs) reached 94,9 billion TL (7,1 billion USD) in 2021. Appendix 2 shows the market value of 37 T-REITs in Türkiye (Sumer, 2022).

When COVID-19 was first confirmed as a pandemic by World Health Organization (WHO) in March 2020, the value of the T-REIT index was 404 at the end of February 2020. After a sharp decrease in March 2020, the index value reached 721 almost doubling at the end of the year 2021. Figure 5 shows the performance of T-REITs including the COVID-19 period.

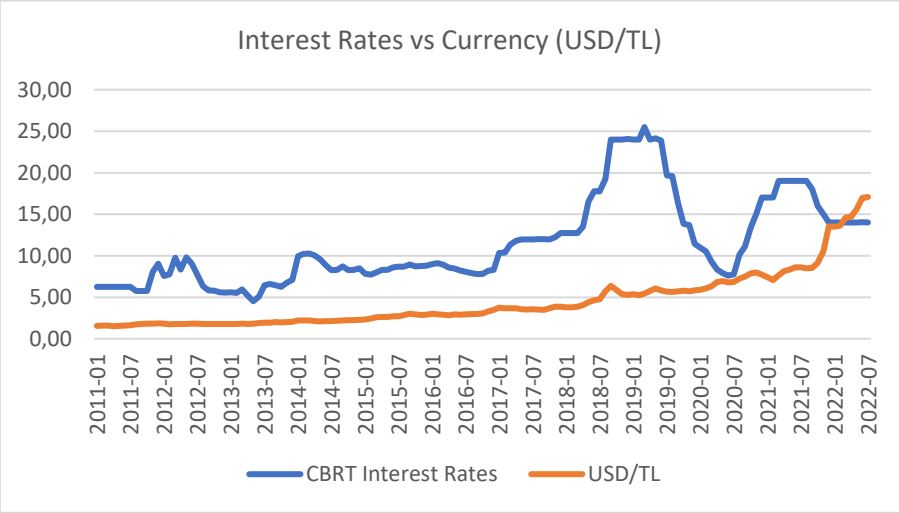

Figure 3. Interest rates vs. Currency (USD/TL) (Source: CBRT, 2022**)**

4.2. T-REIFs

The history of REIFs is very new and dates to 2014 when the first regulation was issued by SPK. Portfolio management or real estate portfolio management companies have the license to establish and operate REIFs, and REIFs have only a very limited legal entity. Turkish REIFs (T-REIFs) can manage portfolios that cover real estate and property rights, local and foreign public and private debt tools, warrants and certificates, lease and real estate certificates, and other debt and money market instruments. The minimum fund size has to reach 40 million TL within one year after

the establishment of the fund (Sumer, 2017, SPK, 2022, Camlibel et al., 2021). T-REIFs also do not pay corporate tax. As of the end of 2021, the total number of T-REIFs in Türkiye which got a license from SPK, and the total value of the T-REIFs reached 93 and 13,06 billion TL respectively (GYODER Report, 2022). Among these funds, only 7 real estate investment funds are traded on Borsa Istanbul. Figure 5 shows the total market value of T-REIFs, and their investment areas are exhibited in Table 1.

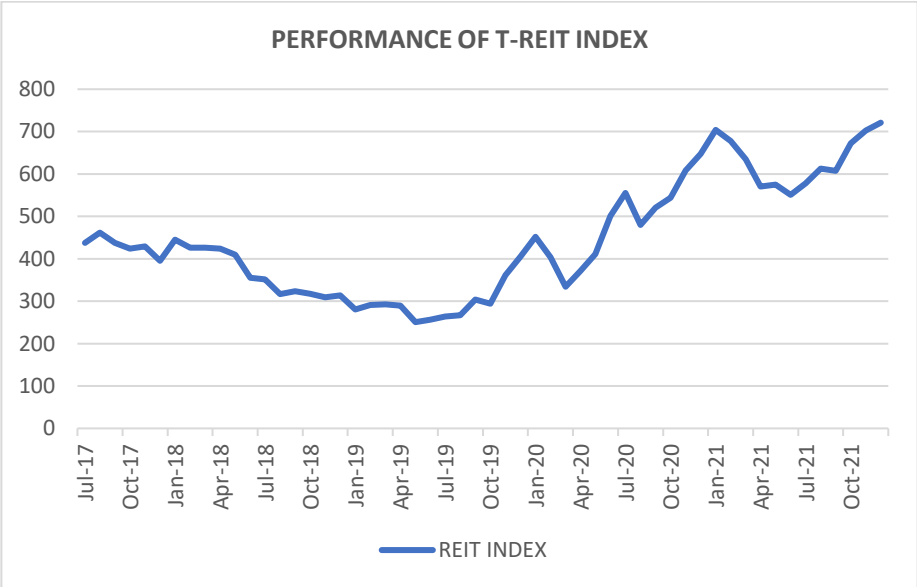

Figure 4. Performance of T-REIT Index (Source: GYODER Report, 2022**)**

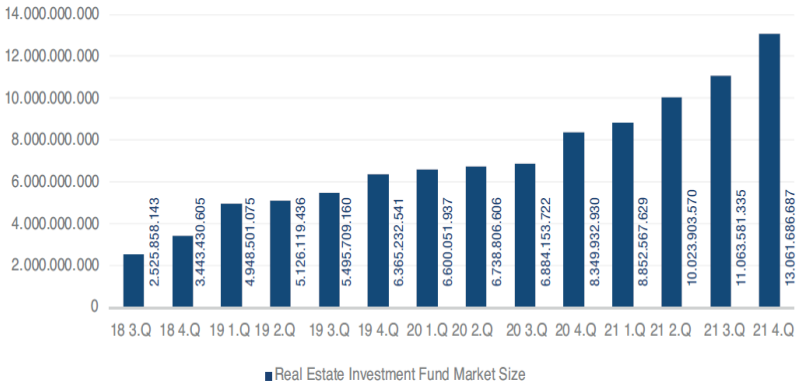

Figure 5. T-REIFs Market Size (GYODER Report, 2022)

Table 1. The Investment Areas of T-REIFs

Investment Area	Share (%)
Mixed	51,98%
Housing	20,31%
Office	18,30%
Shopping Mall/Retail	6,57%
Land	2,10%
Gas Station	0,48%
Education Facilities	0,26%
Total	100,00%

Source: GYODER Report (2022)

5. Data and Methodology

5.1. Data

This study seeks an answer to whether T-REITs and T-REIFs provide a hedge against inflation in the COVID-19 period where the pandemic leads to high inflation rates globally. The returns of the T-REITs were obtained from Borsa Istanbul (Istanbul Stock Exchange) website, Albaraka Portfolio Management Company provided the returns of the T-REIFs, and the monthly inflation rates were got from TUIK (Turkish Statistical Institute) website and covered 24 months of period (January 2020-December 2021). This study aimed to include as many T-REITs and T-REIFs as possible in the research, which is why the data selected covered only the 24 months between January 2020 and December 2021. 15 of 93 T-REIFs that obtained a license from SPK had return data recorded for the investigated period. Similarly, since 4 of them were established after January 2020, the data of 33 of 37 T-REITs were used in the analysis. Additionally, the returns of the T-REIT Index, BIST 100 Index and gold (ounce/USD) and (gram/TL) were also analyzed in the study as benchmark tools. Data for these tools were obtained from the websites of Borsa Istanbul and the Central Bank of the Republic of Türkiye.

5.2. Methodology

The inflation-hedging abilities of assets were analyzed by Fama and Schwert (1977) by using a two-factor model, while the asset return was the dependent variable, and the independent variables were the expected and unexpected inflation rates.

$$R_{it} = \alpha_i + \beta_i(E(\pi t)) + \gamma_i(\pi t - E(\pi t)) + \varepsilon_{it} \quad (1)$$

Where:

R_{it} refers to the return of asset i in period t, expected inflation for period t was shown as $E(\pi t)$, $\pi t - E(\pi t)$ refers to the unexpected inflation for period t, and the residual effects that are not explained by the data is referred as ε_{it}, an error term,

$\beta = 1$ refers to a complete hedge against expected inflation, $\gamma = 1$ refers to a complete hedge against unexpected inflation, and in the case of both β and $\gamma = 1$, then the asset provides a hedge against inflation.

Gültekin (1983) simplified the Fama-Schwert (1977) into a one-factor model by accepting the expectations to be perfect and equalizing the expected inflation with the actual inflation. Thus, actual inflation became the only independent variable:

$$R_{it} = \alpha_i + \beta_i(\pi t) + \varepsilon_{it} \quad (2)$$

Where:

R_{it} is the return of asset i in period t, πt is the actual inflation for period t, and ε_{it} is the error term.

Regression models in this study were established based on Gültekin's (1983) assumption to measure the hedging ability against inflation for each asset included in the study. To verify the validity of these models, it was checked whether the residual values (residuals) were normally distributed around "0". For this, the t-test and Jarque-Bera (JB) (1980) tests were used, respectively. Even if the calculated beta coefficients of the models in which the normal distribution could not be rejected at a 95% confidence interval were statistically significant ($p<0.05$), they were interpreted as biased and were not taken into account. For "Homoscedasticity", another assumption of the regression analysis, the Breusch-Pagan (BP) (1979) test was applied, and in models where constant variance could be rejected at a 95% confidence interval, Beta values calculated as above were not trusted.

6. Analysis, Results, and Discussions

As a result of the regression analysis, while 16 of the 52 assets were found to have a statistically significant calculated beta coefficient, after conducting the JB and BP tests, only 5 assets had their residual values around zero and under the normal distribution, and their variance was constant. Hence, it was concluded that these 5 assets seem to exhibit hedging ability, but for the others, such a claim cannot be made with the data selected covering the COVID-19 period only. Appendix 3 shows the results of the analysis.

The results of the analysis exhibit very remarkable points. While analyzing the monthly returns of the assets that provide hedging against inflation, the monthly returns of Nurol REIT seem very volatile. This may make the investors investigate the risks of investing in such assets in detail. Another point that may be important to underline is the dividend policies of the assets. In Türkiye, despite the corporate tax exemption, interestingly, making dividend payments is not mandatory in T-REIT regulations, and the decision of making dividend payments has been left to the board of the REITs. As shown in Table 2, among the assets which provide a hedge against inflation, Yeni Gimat REIT and Panora REIT have regular dividend payments including the COVID-19 period. Although Is REIT which used to have regular dividend payments until 2018 and Nurol REIT which has no record of dividend payments in the last 10 years did not make dividend payments during the COVID-19 period, they provided a hedge against inflation (GYODER, 2022).

Table 2. The Dividend Payments Made (million TL) (Source: GYODER, 2022)

No	REITs	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
1	**İş REIT**	22,5	30,0	30,0	31,5	47,6	52,1	63,6	68,4			
2	**Panora REIT**				30,1	38,0	39,0	38,1	42,4	49,8	38,5	39,5
3	**Yeni Gimat REIT**				54,1	67,2	89,6	97,5	114,6	149,8	165,7	165,7

Source: GYODER Report (2022)

7. Conclusion

The global economy is being challenged with many problems which started with the recession caused by the COVID-19 disease and continued with the high inflation problem caused by mainly the increase in energy and food prices due to the current war between Russia and Ukraine. Additionally, the broken supply chain, the imbalance between supply and demand, the interest rate policies, and the timing of the decisions made by the central banks to fight against inflation seem major issues that increased the risks which also delayed the recovery. The policies of the FED and ECB about increasing the interest rates add additional risks which may result in stagflation or another recession. The CBRT followed a different path, and instead of ensuring price stability by increasing the interest rates, they decreased the interest rates, which caused a rapid devaluation of the Turkish Lira against foreign currencies. The inflation rate broke records for the last 20 years, and investors started seeking hedging tools to protect their purchasing powers. Real estate prices started increasing very fast, and thus the real estate capital market instruments including real estate investment funds and real estate investment trusts were considered possible hedging tools. Thus, this study analyzed the hedging ability of T-REITs and T-REIFs during the 24 months of the COVID-19 period between January 2020 and December 2021. Gold, T-REIT Index, and BIST 100 Index were also analyzed as benchmark tools. The results of the research revealed that only 4 of 33 T-REITs and 1 of 15 T-REIFs provided a hedge against inflation, while gold, BIST 100, and the T-REIT index did not have the statistical hedging ability during the COVID-19 period. The results of the study have important implications. First, based on the reviewed past literature, this study seems to be the first research that seeks the hedging ability of the Turkish real estate capital market instruments in the COVID-19 period. Second, the globally rising inflation increased the risks of the global economy, and thus, this research analyzed T-REITs and T-REIFs where real estate investments are considered safe havens in high inflationary periods. Third, the results of the research exhibited that, there are very few hedging tools under high inflation, and as a result, the purchasing powers of people are decreasing. Hence, the central banks should seriously focus on fighting against inflation.

High inflation is one of the toughest current problems that the world economy is facing, and its social consequences may be serious from a social perspective such as unemployment rates, rising crime rates, violence, etc. Thus, finding alternative investment tools is essential to protect people from the negative results of high inflation. In that context, this study analyzed different real estate capital market

instruments, as well as the stock market and gold to find out their hedging ability against inflation. T-REIFs and T-REITs are two important real estate capital market instruments. The regulation allows the T-REIFs to invest in T-REITs. In that sense, structuring comprehensive combined investment models may increase the size and the returns of both tools. For instance, the investors of T-REIFs may invest in the residential units of the projects developed by T-REITs, or the T-REIFs may invest in T-REIT shares. As Sumer (2022) suggested, T-REIFs may also be used as a tool for home financing, or a combination of pension funds with T-REITs and T-REIFs may open a path for project financing (Sumer and Ozorhon, 2019). Being one of the pioneers in this area, this study covered the data obtained for only 24 months of the COVID-19 period, but for further analysis, the general hedging ability of the assets may be studied by enlarging the dataset backward and forward. Another study may focus on the risk-return analysis of the assets and search for the cointegration with dividend policies of T-REITs. The investment portfolio of the T-REIFs, the investment strategies of T-REITs, and the ownership structures of the assets shall also be investigated for further analysis.

References

Bahram, A., Arjun, C, and Kambiz, R. (2004). REIT investments and hedging against inflation, *Journal of Real Estate Portfolio Management, 10*(2)*,* 97-112, DOI: 10.1080/10835547.2004.12089701

Breusch, T. S. and Pagan, A. R. (1979). A simple test for heteroskedasticity and random coefficient variation, *Econometrica 47*(5), 1287–1294. doi:10.2307/1911963.

CBRT (2022). Inflation Report. Accessed at https://www.tcmb.gov.tr/wps/wcm/connect/EN/TCMB+EN/Main+Menu/Publications/Reports/Inflation+Report/2022/Inflation+Report+2022+-+I

Chatrath, A. and Liang, Y. (1998). REITs and inflation: A long-run perspective, *Journal of Real Estate Research, 16*(3), 311-326, DOI: 10.1080/10835547.1998.12090955

Çamlibel, M. E., Sümer, L. and Hepşen, A. (2021). Risk-return performances of real estate investment funds in Turkey including the Covid-19 period. *International Journal of Strategic Property Management*, *25*(4), 267-277

Ekincioglu, O. (2003). *GMYO endeksinin enflasyona karsi performansinin Fama-Schwert modeli ile incelenmesi*, (Yayımlanmamış Yuksek Lisans Tezi), İTÜ Fen Bilimleri Enstitüsü, Istanbul.

Erol, I. and Tirtiroglu, D. (2008). The inflation-hedging properties of Turkish REITs, *Applied Economics, 40(*20)*,* 2671-2696. DOI: 10.1080/00036840600970237

Eurostat (2022). Annual inflation up to 7.4% in the euro area. Accessed at https://ec.europa.eu/eurostat/documents/2995521/14497739/2-21042022-AP-EN.pdf

Fama, E. and Schwert, W. (1977). Asset returns and inflation, *Journal of Financial Economics, 5,* 115-146.

Fang, W. S. and Wang, K.M. Nguyen, T.B.T, (2008). Is real estate really an inflation hedge? evidence from Taiwan, *Asian Economic Journal, 22*(2), 209-224.

Gültekin, N. B. (1983), Stock market returns and inflation: evidence from other countries. *Journal of Finance, 38*(1), 49-65.

Gurel, S. P. (2020). Hedging ability of gold, stock market and housing: the case of Türkiye. Gülbahar, M. E. ve Yıldız, H. (Ed.) in *Challenges in Economics and*

Business Studies, From Researches to Practices (pp. 105-123). London: IJOPEC Publication Limited, ISBN: 978-1-913809-08-9.

GYODER (2022). Indicator. Accessed at https://www.gyoder.org.tr/en/publications/gyoder-indicator

Gyourko, J. and Linneman, P. (1988). Owner-occupied homes, income-producing properties, and REITs as inflation hedges: empirical findings. *Journal of Real Estate Finance and Economics, 1*, 347-372.

Hoesli, M. (1994). Real estate as a hedge against inflation: learning from the Swiss case. *Journal of Property Valuation & Investment, 12*(3), 51-59.

Jhen C. (2023). Real estate investment trust (REIT): How they work and how to invest. Available at https://www.investopedia.com/terms/r/reit.asp.

Liu, C. H., Hartzell, D. J. and Hoesli, M. E. (1997). International evidence on real estate securities as an inflation hedge. *Real Estate Economics, 25*(2), 193-221.

Jarque, C. M. and Bera, A. K. (1980). Efficient tests for normality, homoscedasticity and serial independence of regression residuals. *Economics Letters, 6*(3), 255–259. doi:10.1016/0165-1765(80)90024-5.

Lu, C. and So, R. W. (2001). The relationship between REITs returns and inflation: A vector error correction approach. *Review of Quantitative Finance and Accounting, 16,* 103–115.

Marcato, G. and Brounen, D. (2015). The liquidity of international real estate securities, *EPRA Research,* 1-27.

NAREIT (2020). REIT Market Data, Accessed at https://www.reit.com/data-research/reit-market-data

OECD 2022). Consumer Prices, OECD - Updated: 5 April 2022, Accessed at https://www.oecd.org/newsroom/consumer-prices-oecd-updated-5-april-2022.htm

Olsson, F., Persson, A. and Ösmark, J. (2008). Hedging against inflation: A study of Russian real estate funds. *Hönköpin International Business School,* Jönköping University.

Onder, Z. (2010). High inflation and returns on residential real estate: evidence from Türkiye, *Applied Economics, 32,* 917-931.

Park, Y. and Bang, W. D. (2012). Direct commercial real estate as an inflation hedge: Korean evidence, *Journal of Real Estate Portfolio Management, 18*(2), 187-203, DOI: 10.1080/10835547.2012.12089929.

Park, J. Y., Mullineaux D. J. and Chew, IK (1990). Are REITs inflation hedges?, *The Journal of Real Estate Finance and Economics, 3,* 91-103.

Preqin (2021). 2021 Preqin Global Real Estate Report. Accessed at https://www.preqin.com/insights/global-reports/2021-preqin-global-real-estate-report

Reuters (2021). Why Fed's Powell still thinks high inflation is 'temporary'. https://www.reuters.com/business/why-fed-chair-powell-still-thinks-high-inflation-is-temporary-2021-08-27/

Statista (2022). Inflation worldwide - Statistics & Facts. Accessed at https://www.statista.com/topics/8378/inflation-worldwide/

Sümer, L. (2023). *The world economy and financial system: a paradigm change offering a sustainable approach.* Palgrave Macmillan Cham, https://doi.org/10.1007/978-3-031-27530-2, ISBN: 978-3-031-27529-6.

Sumer, L. (2022). An alternative interest-free home financing model. *International Journal of Housing Markets and Analysis, 16*(2), 408-425, https://doi.org/10.1108/IJHMA-02-2022-0027

Sümer, L. (2017). *Developing a real estate-pension fund investment ecosystem: Turkey real estate fund* (Unpublished Ph.D. Thesis). Boğaziçi University Science Institute, Istanbul.

Sumer, L. and Ozorhon, B. (2021). Investing in gold or REIT index in Türkiye: Evidence from global financial crisis, 2018 Turkish currency crisis and COVID-19 crisis. *Journal of European Real Estate Research, 14*(1), 84-99. https://doi.org/10.1108/JERER-04-2020-0023

Sumer, L., and Ozorhon, B. (2019). The shortcomings of pension system in Türkiye: Solutions with a new model proposed. *International Journal of Islamic Economics and Finance Studies, 2,* 23-48.

Tradingeconomics (2022). Inflation Rate. Accessed at https://tradingeconomics.com/country-list/inflation-rate

Turkstat (2022). Enflasyon ve Fiyat. Accessed https://data.tuik.gov.tr/Kategori/GetKategori?p=enflasyon-ve-fiyat-106&dil=1

Yobaccio E., Rubens J. H. and Ketcham D. C. (1995). The inflation-hedging properties of risk assets: The case of REITs. *The Journal of Real Estate Research, 10*(3), 279-296.

Appendix 1. Inflation-CPI, Interest, and GDP Annual Growth Rates (Tradingeconomics, 2022)

Countries	Inflation CPI	Interest Rates	GDP Annual Growth Rates
Türkiye	79%	14%	7,3%
Argentina	64%	52%	6,0%
Russia	16%	8%	3,5%
Brazil	12%	13%	1,7%
Spain	10%	1%	6,3%
UK	9%	1%	8,7%
US	9%	2%	3,5%
Euro Area	9%	1%	5,4%
Netherlands	9%	1%	6,7%
Canada	8%	3%	2,9%
Italy	8%	5%	6,2%
Mexico	8%	8%	1,8%
Germany	8%	5%	3,8%
South Africa	7%	6%	3,0%
India	7%	5%	4,1%
Singapore	7%	2%	4,8%
South Korea	6%	2%	3,0%
France	6%	1%	4,5%
Australia	5%	1%	3,3%
Indonesia	4%	4%	5,0%
Switzerland	3%	0%	4,4%
China	3%	4%	0,4%
Japan	2%	0%	0,2%
Saudi Arabia	2%	2%	9,9%

Appendix 2. The market value of T-REITs in Türkiye (GYODER Report, 2022)

Number	T-REITs	Market Value (thousands TL)	Market Share (%)
1	ZİRAAT REIT	11.405.497	12,01%
2	AKFEN REIT	9.555.000	10,06%
3	BAŞKENT REIT	8.428.000	8,88%
4	EMLAK KONUT REIT	8.132.000	8,56%
5	KIZILBÜK REIT	7.680.000	8,09%
6	SERVET REIT	4.695.600	4,95%
7	TORUNLAR REIT	3.920.000	4,13%
8	PASİFİK REIT	3.766.400	3,97%
9	SİNPAŞ REIT	3.728.536	3,93%
10	YENİ GİMAT REIT	3.386.880	3,57%
11	DOĞUŞ REIT	3.286.877	3,46%
12	İŞ REIT	2.905.013	3,06%
13	HALK REIT	2.376.600	2,50%
14	ÖZAK REIT	2.355.080	2,48%
15	ALARKO REIT	2.120.048	2,23%
16	REYSAŞ REIT	1.875.000	1,97%
17	TSKB REIT	1.865.500	1,96%
18	NUROL REIT	1.799.160	1,89%
19	AKMERKEZ REIT	1.612.786	1,70%
20	VAKIF REIT	1.600.000	1,69%
21	AKİŞ REIT	1.344.350	1,42%
22	KİLER REIT	1.023.000	1,08%
23	DENİZ REIT	952.000	1,00%
24	PANORA REIT	800.400	0,84%
25	ATAKULE REIT	687.317	0,72%
26	PEKER REIT	609.549	0,64%
27	MİSTRAL REIT	561.037	0,59%
28	KÖRFEZ REIT	519.420	0,55%
29	ÖZDERİCİ REIT	387.500	0,41%
30	AVRASYA REIT	330.336	0,35%
31	MARTI REIT	280.500	0,30%
32	KORAY REIT	236.400	0,25%
33	TREND REIT	192.600	0,20%
34	YEŞİL REIT	185.741	0,20%
35	PERA REIT	169.646	0,18%
36	İDEALİST REIT	94.500	0,10%
37	ATA REIT	83.600	0,09%
TOTAL (TL)		**94.951.873**	100,00%
TOTAL (USD)		**7.123.706**	

Appendix 3. Results of the Analysis

Number	Name of the Asset	CPI_beta_p	JB Prob > chi2 for residuals	BP Prob > chi2
	REIFs			
1	Albaraka.Dukkan.REIF	0,0001	0,0000	0,0000
2	**Albaraka.One.Tower.REIF****	0,0289	0,1363	0,5840
3	Albaraka.Batisehir.REIF	0,0219	0,1857	0,0044
4	Arz.Birinci.REIF	0,7790	0,0000	0,8215
5	Arz.İkinci.REIF	0,2807	0,0000	0,7615
6	Arz.Üçüncü.REIF	0,7411	0,0000	0,7059
7	Ak.Birinci.REIF	0,0015	0,0000	0,0000
8	İş.Birinci.REIF	0,0005	0,0014	0,0000
9	Re.Pie.Anadolu.Stratejik.REIF	0,0024	0,0074	0,0000
10	Re.Pie.Avrupa.Stratejik.REIF	0,0304	0,0076	0,0000
11	Re.Pie.Avrasya.Stratejik.REIF	0,0012	0,0092	0,0000
12	Unlu.Ikinci.REIF	0,0002	0,0000	0,0000
13	Unlu.Birinci.REIF	0,0002	0,0000	0,0000
14	X24.Alzamil.REIF	0,8005	0,0000	0,5724
15	X24.Primo.REIF	0,0016	0,0768	0,0000
	REITs			
16	Akfen.REIT	0,8505	0,2121	0,9257
17	Emlak.Konut.REIT	0,6843	0,4073	0,5684
18	Servet.REIT	0,7512	0,2424	0,9444
19	Torunlar.REIT	0,9843	0,6985	0,0955
20	Sinpas.REIT	0,9862	0,7244	0,3506
21	**Yeni.Gimat.REIT****	0,0012	0,0980	0,5976
22	Dogus.REIT	0,8067	0,6689	0,2843
23	**Is.REIT****	0,0096	0,7242	0,6768
24	Halk.REIT	0,4607	0,6395	0,3477
25	Ozak.REIT	0,4472	0,6881	0,3372
26	Alarko.REIT	0,0895	0,3870	0,3386
27	Reysas.REIT	0,1752	0,0156	0,5665
28	TSKB.REIT	0,6382	0,0159	0,5269
29	**Nurol.REIT****	0,0476	0,4122	0,4830
30	Akmerkez.REIT	0,9485	0,0000	0,5647
31	Vakif.REIT	0,8299	0,3798	0,4567
32	Akis.REIT	0,7851	0,9615	0,1998
33	Kiler.REIT	0,4156	0,1652	0,6000

34	Deniz.REIT	0,3116	0,1486	0,6894
35	**Panora.REIT****	0,0165	0,6630	0,1689
36	Atakule.REIT	0,8479	0,8171	0,2627
37	Peker.REIT	0,6018	0,2338	0,4107
38	Mistral.REIT	0,4521	0,4989	0,1984
39	Korfez.REIT	0,9214	0,0000	0,5353
40	Özderici.REIT	0,8399	0,9746	0,1682
41	Avrasya.REIT	0,0939	0,7709	0,2282
42	Martı.REIT	0,8055	0,4399	0,3290
43	Koray.REIT	0,3049	0,0078	0,5863
44	Trend.REIT	0,8251	0,1656	0,4913
45	Yesil.REIT	0,6141	0,8402	0,2736
46	Pera.REIT	0,2666	0,5184	0,4174
47	İdealist.REIT	0,4778	0,5105	0,2675
48	Ata.REIT	0,6043	0,2756	0,5404
	Benchmarks			
49	REIT Index	0,7376	0,7143	0,1604
50	Gold (gr/TL)	0,0350	0,5456	0,0000
51	Gold (ons/USD)	0,9548	0,8105	0,2781
52	BIST 100 Index	0,1008	0,8090	0,8273