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Investments in Bonds, Stocks, Gold and Real Estate as a Hedge Against Inflation

Abstract:

In times of accelerating inflation, financial instruments that protect capital against loss of value are becoming increasingly important. Therefore, an open question remains as to what to invest in to, if not outstrip, at least keep up with the inflation rate in the case of return on investments. This raises the question of whether there are such opportunities in the market. However, according to some authors, this type of analysis is not easy and simple econometric methods are not able to show the appropriate dependencies. An example is real estate investment, which, especially in the short term, may not be a suitable inflation hedge.

The purpose of the study is to determine whether investments in the Polish capital market are able to protect capital from depreciation due to inflation.

The study began with the analysis of distributions, stationarity of returns and correlation of successive investments and the CPI inflation rate, ending with cointegration analysis using the Engle–Granger test. The analysis was performed from the first quarter of 2009 to the fourth quarter of 2021. The following indices were used for the study: the TBSPIndex from the bond market, the WIG from the stock market, gold prices in PLN, the NBP hedonic index of real estate prices in seven largest Polish cities and CPI inflation rates published by Statistics Poland (GUS).

The analysis led to a negative verification of the research hypothesis, as it could not be proved that the analysed indices and prices are related to the level of inflation.

The study fills a gap in the Polish market for analysis of capital protection against inflation. The research concerns only the Polish market, however this issue has not been discussed for years in mature economies either.

Keywords: inflation hedging, gold, stocks, bonds, real estate, Poland

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1. Introduction

Recent years have been very unfavourable for the Polish economy. An epidemic, then the outbreak of war, and on top of that a policy conducted in a way that generated additional money supply have caused the economy to start struggling with unprecedented problems. First of all, a sharp increase in inflation can be now observed. Rising prices force investors to seek alternatives to very low-interest bank deposits. After years of hiatus, the topic of how to protect capital against loss of its value returns. The natural direction seems to be investments, including those traditionally associated with bonds, gold, real estate or shares (Fogler, 1984). Investments in stocks seem less obvious, but the essence of stocks, as an underlying security behind which stands real value, real wealth, makes this option impossible to ignore. Research shows, however, that the possibility of capital protection with investments in the financial market, including the real estate market, depends on many factors and is not obvious, and the analysis of the relationship between inflation and capital investment is not easy. Different research methods may yield different results (Bond, Seiler, 1998; Arnold, Auer, 2015; Aye, Chang, Gupta, 2016). Nevertheless, it is worth trying to analyse and answer the question whether investments in the Polish capital market are able to protect capital from depreciation due to inflation. Answering this question thus became the purpose of this article. In the course of research work, a hypothesis was formulated: investments in bonds, shares, gold and real estate are able to effectively protect the capital held against the negative impact of inflation.

The research will be conducted on quarterly data including indices from the bond market and the stock market, gold price, the real estate index and quarterly inflation data. For the study, Spearman's correlation analysis (Spearman, 1987) and cointegration analysis using the Engle–Granger test (Engle, Granger, 1987) will be used.

2. Literature overview

The topic of inflation and capital preservation through investment emerged relatively late in the literature. The 1970s saw the appearance of the work that is most often cited by researchers as the one initiating the discussion of this issue in the literature (Salisu, Raheem, Ndako, 2020). The analysis of the possibility of hedging against inflation is generally based on the belief presented by Fisher (1930) according to which the expected nominal interest rate should change in line with expected inflation. On this basis, Lintner (1975) constructed the hypothesis that few issues are more important than the impact of inflation on financial markets and the investment process. Similar conclusions were reached by Fama and Schwert (1977), who argued that hedging against inflation means synchronising returns on various asset classes with the level of inflation. They analysed the U.S. real estate market, showing that U.S. residential real estate allows for capital protection against inflation. The researchers examined the relationship of real estate prices to both expected and unexpected inflation. The period from 1953 to 1971 was considered using both quarterly and monthly data. The study found that residential real estate investments hedge against expected inflation, but not against the unexpected part of inflation. Bird (1984) examined the usefulness of investing in the London commodity market between 1959 and 1980 as a hedge against inflation. The commodity index was compared to a series of physical and financial asset price indices. The author compared returns, risk and liquidity of the investments. According to the criteria used, commodities ranked in the middle for inflation hedging assets, with tin proving to be the most suitable commodity for inflation hedging purposes. Stevenson and Murray (1999) conducted research concerning the Irish market that is interesting from the point of view of research in Poland. It is interesting because one may risk a claim that the Irish market is closer to the Polish reality than other markets in developed economies. The study uses data from 1985 to 1996. Regression and cointegration analysis were used. Changes in the direct property market were measured by the Irish Property Index, while inflation was measured by the CPI. The database contained semi-annual quotations. The authors found no relationship between the property market index and the CPI, and this in both the short and long term. In addition, it was shown that an increase in real estate market prices can lead to an increase in inflation. Using an interrupted Markov-switching cointegration model, Aye, Chang, and Gupta (2016) examined the gold inflation hedge properties. The study was conducted on annual data for 1833–2013 in the US market. The authors found evidence that gold can be an inflation hedge, however, not all methods allowed to draw such conclusions. For example, cointegration tested by the Engle–Granger test did not allow such conclusions to be drawn. Lee and Isa (2019) examined the Malaysian market by capturing asset classes such as stocks, bonds and gold in their study. The obtained results indicate that while stocks and government bonds provide

a hedge against inflation, real estate provides only a partial hedge. The study was done from 1980 to 2016, using the Autoregressive Distributed Lag (ARDL) approach for studying the relationship over the long run. Salisu, Raheem, and Ndako (2020) conducted the analysis in the US market on quarterly data for the period 2002–2011. The researchers analysed three asset classes, real estate represented by an index of REIT funds, stocks represented by the S&P 500 index, and gold as quoted on the London Stock Exchange in USD. The analysis pointed to stocks and real estate as inflation hedging investments. Gold did not allow for capital protection against inflationary processes. Choi and Shin (2022) conducted a study on Bitcoin and gold market. By estimating the Vector Autoregression (VAR) model, they obtained confirmation that Bitcoin and gold can provide a hedge of investment against inflation, but cryptocurrency, unlike gold, was subject to large price fluctuations, which means it cannot be considered as a safe investment. The study was conducted on data from 2010 to 2020.

Similar studies have also been conducted in Poland. Trojanek (2007) analysed the relationship of residential real estate prices in Poznan between 1996 and 2004 by examining the relationship in relation to expected and unexpected inflation. The research showed that real estate can effectively hedge capital against inflation. Trojanek used a multiple regression model to examine the sensitivity of real estate returns to expected and unexpected inflation. Fiszeder and Rowiński (2012) conducted a study in Poland, however, they did not precisely examine the properties of assets hedging against the impact of inflation but modelled the impact of macroeconomic processes on the stock market. The macroeconomic indicators included the CPI inflation rate. The study was performed in the years 2000–2010. The authors showed the existence of a long-term relationship between the Warsaw Stock Exchange Index and the level of inflation. This relationship was negative in nature, and this means the lack of capital value protection against inflation when investing in stocks. Kasprzak-Czelej (2015) examined gold quotations and the formation of CPI in the Polish market. The research period from 2007 to 2015 with monthly data was used. The author used the unit root test of Kwiatkowski, Phillips, Schmidt, Shin (KPSS test) and the Engle–Granger test. The author did not find any evidence of integration of gold prices and CPI. According to the author, this means that gold does not protect capital against loss of value under the influence of inflation.

The presented research is only a slice of the very numerous works on the inflation hedging properties of investments in various asset classes. The author decided to cite only a few of them in order to show the variety of methods, assets and results obtained.

3. Findings

Investors seem to believe that investments in the capital market are able to protect capital from losing value under inflation. However, this belief is not fully supported by research. Therefore, the objective of the paper was formulated: to demonstrate whether investments in the capital market are able to protect capital from depreciation due to inflation. To achieve the objective, a research hypothesis was formulated: investments in bonds, shares, gold and real estate are able to effectively protect the capital held against the negative impact of inflation. The realisation of the objective and the verification of the hypothesis was carried out using the research methods described further.

3.1. Data

The research used data available for the Polish capital market. The data were obtained from the Warsaw Stock Exchange, Stooq.pl, the National Bank of Poland, and Statistics Poland (Central Statistical Office of Poland – GUS). The WSE provided data for two indices, the TBSPIndex being an income index of treasury bonds market listed on the WSE BondSpot market and the WIG being a broad market index. Gold prices, expressed in PLN, were taken from the Stooq.pl website, the hedonic index of residential real estate prices calculated for the secondary market of seven largest Polish cities (Gdansk, Gdynia, Lodz, Cracow, Poznan, Warsaw, and Wroclaw) – marked in the study with an abbreviation RealEst7 – was taken from the database published by the NBP (National Bank of Poland). The CPI (Consumer Price Index) was taken from data published by Statistics Poland. All data were quarterly and covered the period from Q1 2009 to Q4 2021. Longer periods were available, but the hedonic index of residential real estate prices has been calculated since 2006. The period up to the end of 2008 was characterised by strong price declines in the residential real estate market and was eliminated from the survey so as not to distort the picture with an incomplete business cycle. All listings are shown in Figure 1.

The RealEst7 Index and the CPI were recalculated by using a value of 1000 as the starting point – Q4 2008.

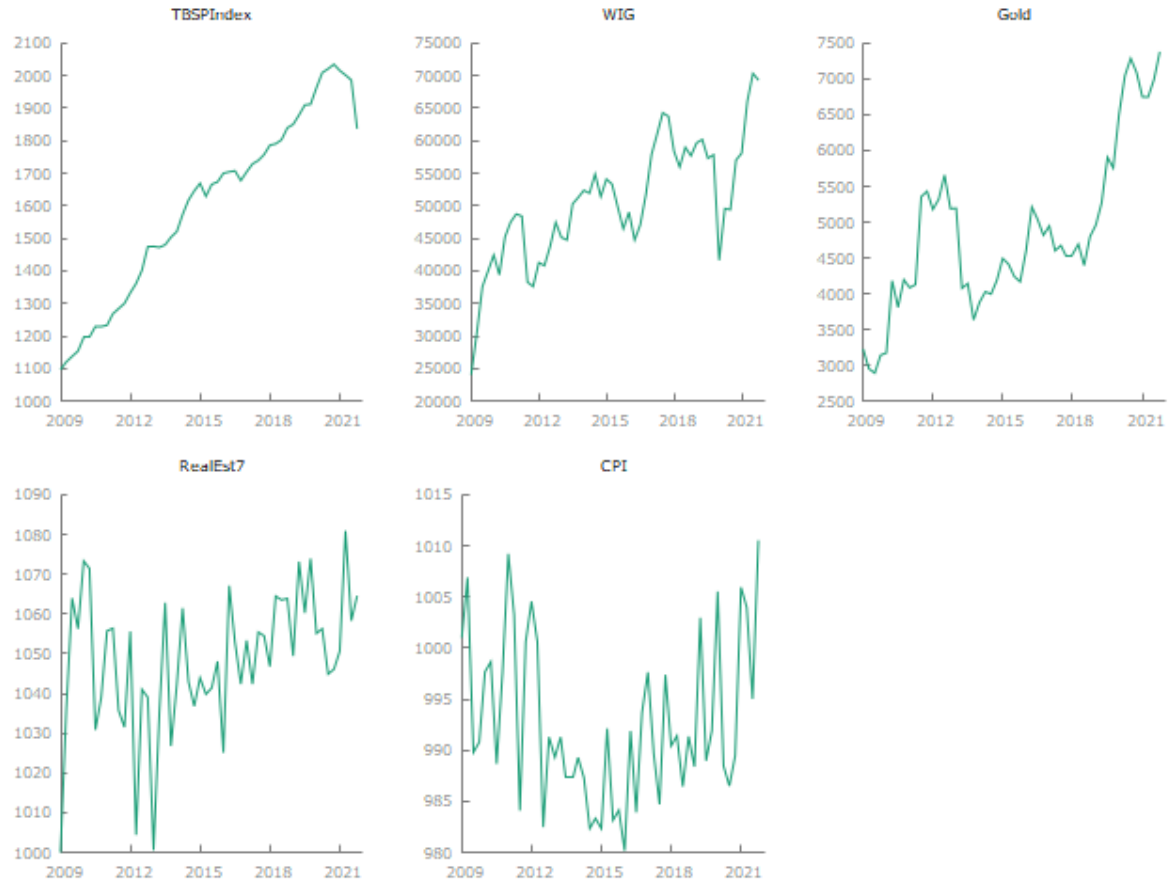

Figure 1. Quotes of individual indices, assets and ratios from Q1 2009 to Q4 2021
Source: own elaboration

3.2. Survey methodology

The correlation analysis was performed consistently with the classical Markowitz portfolio theory approach. According to it, maximisation of portfolio returns while keeping risk at a certain level is achieved mainly through portfolio diversification. (Markowitz, 1952; Sharpe, 1967; Steinbach, 2001). If the indices and the price of gold are not correlated with the CPI, then one can hazard a guess that the investor will manage to reduce the risk associated with the occurrence of inflation. This does not mean that the investor will protect capital from loss of value, but the diversification of investments will occur. According to this approach, ADF stationarity tests, normality of distributions test and then Spearman's correlations were performed (Spearman, 1987). The model tested in the ADF test was: $(1-L)y=b_0+(a-1)*y(-1)+e$. ADF, normality of distributions and Spearman's correlation tests were performed on logarithmic returns.

In the next stage of the research conducted, cointegration analysis was performed, based on the belief that cointegration of index values and asset prices with inflation means that returns follow the inflation rate. Moreover, according to Fisher's (1930) theory, the expected rate of return consists of the real rate of return and the expected level of inflation, therefore the relationship between the inflation rate and stock prices should be positive (Salisu, Raheem, Ndako, 2020). Cointegration analysis was performed using the Engle–Granger test (Engle, Granger, 1987). Cointegration tests were performed between consecutive data and the CPI. The tests used lags of four quarters. In the first step, a unit root test was performed for the following variables. The model with a constant was tested: $(1-L)y=b_0+(a-1)*y(-1)+...+e$ and four lags. The time series of the levels of subsequent variables were expected to be nonstationary, thus the null hypothesis of a unit root was not rejected. In the next step, the unit root was tested for the residuals (uhat) using a model without a constant: $(1-L)y=(a-1)*y(-1)+...+e$ with four lags. This time, the residual (uhat) process from the cointegrating equation was expected to be the process for which the null hypothesis of a unit root is rejected. A similar methodological approach was used in the work of e.g.: Stevenson and Murray (1999), Lee (2013). Cointegration tests were performed on the values of the individual variables.

3.3. Results

In the first step of the study, correlation coefficients were checked. Then the stationarity of the time series was checked. All series given were found to be stationary. The results of the analysis are presented in Table 1.

Table 1. Augmented Dickey-Fuller test, testing down from 10 lags, criterion AIC, unit-root null hypothesis: a = 1, model: $(1-L)y=b_0+(a-1)*y(-1)+e$

Variable	TBSPIndex	WIG	Gold	RealEst7	CPI
Test with constant					
Sample size	50	50	50	49	48
Including	0 lags of (1 – *L*) TBSPIndex	0 lags of (1 – *L*) WIG	0 lags of (1 – *L*) Gold	1 lag of (1 – *L*) RealEst7	2 lags of (1 – *L*) CPI
Estimated value of (*a* – 1):	– 0.70	– 0.99	– 1.11	– 2.10	– 2.92
Test statistic tau_c(1):	– 3.69***	– 7.20***	– 7.86***	– 10.43***	– 8.97***
Asymptotic p-value:	0.00	0.00	0.00	0.00	0.00

Variable	TBSPIndex	WIG	Gold	RealEst7	CPI
1st-order autocorrelation coeff. for *e*:	–0.08	–0.10	0.00	–0.06	0.06
Lagged differences: F(2, 44) =	x	x	x	x	14.14 [0.00]
Test with constant and trend					
Including	0 lags of (1-L) TBSPIndex	0 lags of (1-L) WIG	0 lags of (1-L) Gold	1 lag of (1-L) RealEst7	2 lags of (1-L)CPI
Estimated value of (*a* – 1):	– 0.86	– 1.00	– 1.11	– 2.10	– 3.04
Test statistic: tau_ct(1) =	– 4.49***	– 7.14***	– 7.78***	– 10.30***	– 9.39***
Asymptotic p-value:	0.00	0.00	0.00	0.00	0.00
1st-order autocorrelation coeff. for *e*:	– 0.02	– 0.09	0.00	– 0.07	0.04
Lagged differences: F(2, 43) =	x	x	x	x	16.36 [0.00]

*** Significant at 0.01 (2-tailed significance).

Source: own elaboration

Stationarity was tested for two equations – with a constant and with a constant and a trend. In each case, the alternative hypothesis of the absence of a unit root was accepted against the null hypothesis of the presence of a unit root. Thus, tests of normality of distribution could be performed to see what correlation should be used from the time series study. Four tests were chosen to test the normality of the distribution, which are, according to the author, quite often used in this type of research. The author did not decide on one particular test because, according to the literature, these tests may give different results depending, for example, on the shape of the distribution of data. Thus, the use of several tests may allow for a more in-depth analysis. (Lee, Park, Jeong, 2016). The results of the tests are presented in Table 2.

Table 2. Test for normality

Test	TBSPIndex	WIG	Gold	RealEst7	CPI
	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)
Doornik-Hansen test	22.34*** (0.00)	12.68*** (0.00)	14.72*** (0.00)	0.26 (0.88)	0.22 (0.89)
Shapiro-Wilk W	0.85*** (0.00)	0.93*** (0.00)	0.94** (0.02)	0.99 (0.84)	0.98 (0.38)

Test	TBSPIndex	WIG	Gold	RealEst7	CPI
	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)
Lilliefors test (p approximate value)	0.15*** (0.01)	0.11 (0.10)	0.09 (0.39)	0.07 (0.75)	0.06 (0.90)
Jarque-Bera test	184.22*** (0.00)	23.64*** (0.00)	12.76*** (0.00)	0.21 (0.90)	0.65 (0.72)

** Significant at 0.05 (2-tailed significance).
*** Significant at 0.01 (2-tailed significance).

Source: own elaboration

In all four normality tests, the null hypothesis of normal distribution of observations in the time series was set against the alternative hypothesis of no normal distribution. The hypothesis of normal distribution was not rejected in the case of WIG and gold in the Lillefors test and in each of the tests conducted for the RealEst7 hedonic index of residential property prices and the CPI. In all cases of the TBSPIndex and in the Doornik-Hansen, Shapiro-Wilk and Jarque-Bera tests for the WIG and Gold, the null hypothesis was rejected. This means that one cannot speak of a normal distribution of the data in all cases of TBSPIndex and three cases of WIG and Gold. So, when analysing the correlation, it is necessary to choose an appropriate method, thus Spearman's correlation analysis was performed in the next step, for the performance of which normal distribution is not necessary. However, what makes the correlation analysis credible are the distributions that we suspect are normal. To check whether the distributions of the following variables are close to normal, their frequency distributions were sketched (Figure 2).

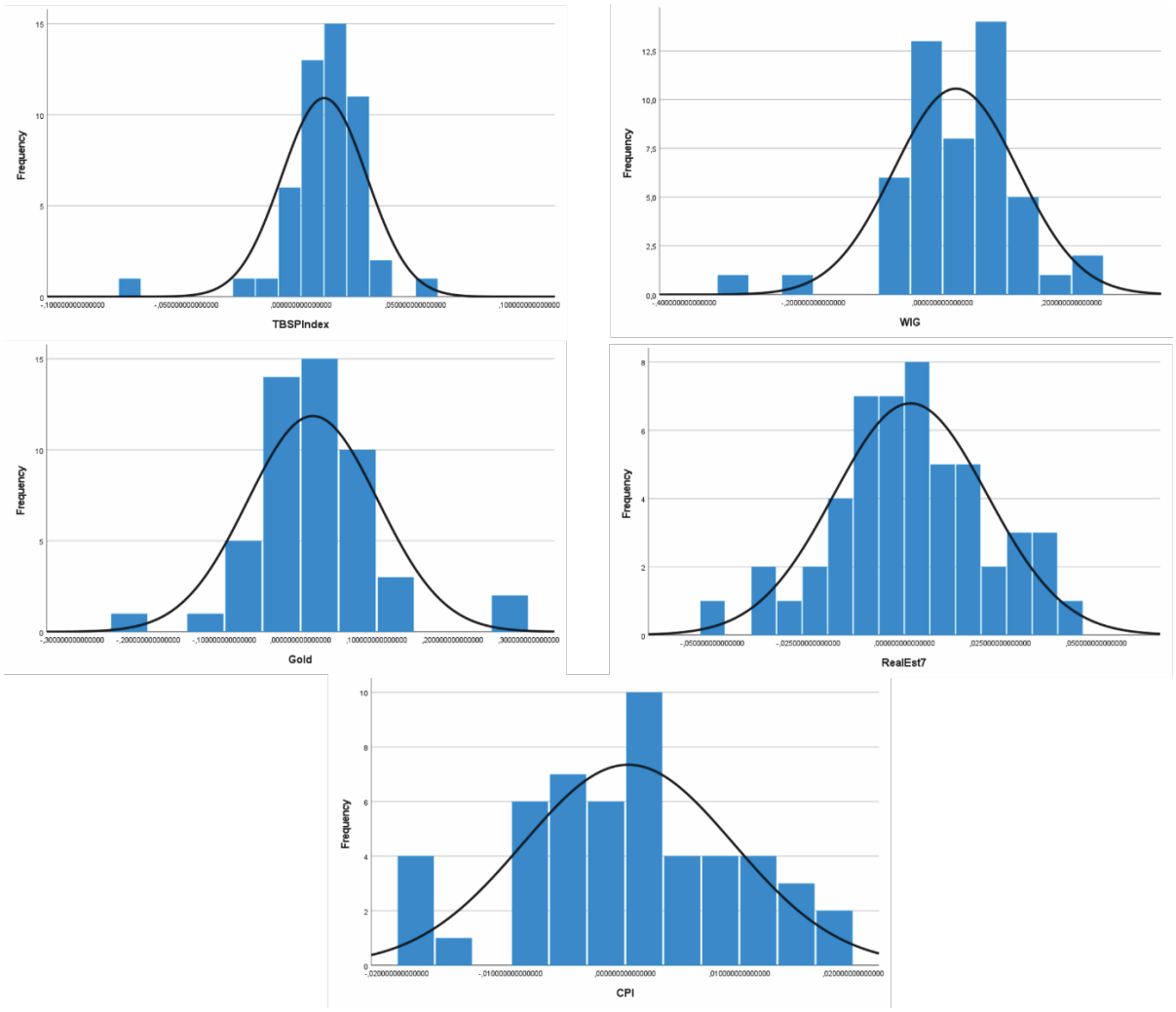

Figure 2. Frequency distribution for all variables
Source: own elaboration

Thus, the Spearman's correlation count was shown to be valid. The results of the study are presented in Table 3.

Table 3. Correlation matrix, Spearman's rho, N = 51

	TBSPIndex	WIG	Gold	RealEst7	CPI
TBSPIndex	1.00	0.14	0.03	– 0.07	– 0.27
WIG		1.00	– 0.36*	0.21	– 0.17
Gold			1.00	– 0.04	– 0.06
RealEst7				1.00	0.27
CPI					1.00

* Significant at 0.1 (2-tailed significance).

Source: own elaboration

What is the most interesting in the table is the relationship of successive asset classes with the CPI. The results of the analysis indicate that all assets have the potential to diversify with respect to inflation. However, only the RealEst7 hedonic index of residential real estate prices is positively correlated with inflation. It should be noted that correlation levels are low. From the point of view of classical portfolio theory, this implies opportunities to diversify investments against inflation using all four asset classes (Markowitz, 1952).

In the last step, a cointegration analysis was performed using the Engle–Granger test. According to the methodology of this test, cointegration occurs if for each process used the null hypothesis of a unit root is not rejected and the residuals (uhat) from the cointegrating regression are not integrated, that is, the null hypothesis of a unit root is rejected. The test results are shown in Table 4.

In order to demonstrate the existence of cointegration, a condition must be met in which for each variable the null hypothesis failed to be rejected, while for the residuals the null hypothesis was rejected in favour of the alternative hypothesis. In the study conducted, the existence of cointegration could not be confirmed in any case. Thus, one can venture to say that investments in bonds, represented by the TBSPIndex, in the stock market represented by the WIG, in gold and in residential real estate represented by the RealEst7 hedonic price index for the seven largest cities and the CPI inflation index are not cointegrated.

Table 4. Cointegration test for subsequent variables and CPI

Augmented Dickey-Fuller test for unit-root null hypothesis: a = 1; test with constant; model: $(1-L)y=b_0+(a-1)*y(-1)+\ldots+e$, No. of observations T = 47, including 4 lags of (1 – *L*)					
Variable	**TBSPIndex**	**WIG**	**Gold**	**RealEst7**	**CPI**
Estimated value of (*a* – 1):	– 0.03	– 0.14	– 0.06	– 0.42	– 0.21
Test statistic tau_c(1):	– 1.60	– 1.46	– 0.81	– 1.85	– 0.90
Asymptotic p-value:	0.48	0.55	0.82	0.36	0.79
1st-order autocorrelation coeff. for *e*:	0.03	– 0.02	0.03	– 0.01	– 0.01
Lagged differences: F(4, 41) =	1.24 [0.31]	0.71 [0.59]	0.33 [0.85]	2.60 [0.05]	3.39 [0.02]

Augmented Dickey-Fuller test for uhat including 4 lags of (1 – *L*)uhat; unit-root null hypothesis: *a* = 1; test without constant; model: $(1-L)y = (a-1) * y(-1) + ... + e$.				
Dependent var./ indipendent var.	**TBSPIndex/CPI**	**WIG/CPI**	**Gold/CPI**	**RealEst7/CPI**
Estimated value of (*a* – 1):	– 0.03	– 0.14	– 0.13	– 0.44
Test statistic: tau_c(2) =	– 1.28	– 1.37	– 1.56	– 1.98
Asymptotic p-value	0.83	0.81	0.74	0.54
1st-order autocorrelation coeff. for *e*:	– 0.14	– 0.01	– 0.01	– 0.01
Lagged differences: F(4, 42) =	4.66 [0.00]	0.62 [0.65]	0.31 [0.87]	2.58 [0.05]

There is evidence for a cointegrating relationship if: (a) The unit-root hypothesis is not rejected for the individual variables, and (b) the unit-root hypothesis is rejected for the residuals (uhat) from the cointegrating regression.

Source: own elaboration

4. Discussion and conclusions

The correlation analysis conducted allows us to conclude that all of the studied assets provide opportunities for diversification of risk against inflation. According to the classical Markowitz theory (Markowitz, 1952; Sharpe, 1967; Steinbach, 2001), all assets with correlation different from 1 give such a possibility. However, the fact that the TBSPIndex, the WIG and gold are negatively correlated means that an increase in inflation is associated with a decrease in returns on these assets. Thus, this is not a desirable behaviour when hedging against inflation. The positive correlation of the RealEst7 hedonic index of residential real estate prices with the inflation index gives a reason to conclude that real estate can provide inflation protection. However, the nature of the correlation is not as well recognised. Without question, the result prompts further investigation with more sensitive measures, such as a measure of sensitivity constructed on a basis of the beta coefficient. However, this is a different issue, going beyond the topic of this article. It is also worth mentioning that, according to the Fisher effect, the expected rate of return consists of the real rate of return and the expected level of inflation, which means that

the relationship between the inflation rate and stock prices should be positive (Salisu, Raheem, Ndako, 2020). Inflation hedging opportunities require that the return on investment is at least equal to the rate of inflation (e.g.: Fang, Wang, Nguyen, 2008; Obereiner, Kurzrock, 2012; Van Hoang, Lahiani, Heller, 2016; Taderera, Akinsomi, 2020). It is also worth noting that similar results in terms of overall conclusions were obtained by Trojanek in the Polish market in 2007. However, it should be emphasised that the author of that article used different data, only studied prices in Poznan, and his work referred to a different economic reality. This may lead to inaccuracies when trying to compare results (Trojanek, 2007).

The results of the cointegration analysis in none of the cases gave rise to the identification of prices and indices as cointegrated with inflation. This part of the research indicates that among the examined assets there is no such class of investments that would provide a hedge against inflationary processes. The question arises, of course, whether cointegration is an appropriate method of assessing the hedging properties of assets. This question seems to be positively answered by the multitude of applications of cointegration in this field in the literature (e.g.: Stevenson, Murray, 1999; Aye, Chang, Gupta, 2016). The results obtained in this article contradict the common belief about the potential of stocks, bonds, gold or real estate in hedging against inflation, but they confirm some of the studies conducted in other economies, for example, in Ireland (Stevenson, Murray, 1999) or Poland (Fiszeder, Rowiński, 2012; Kasprzak-Czelej, 2015). Stevenson and Murray explained this phenomenon, among others, by a too shallow property market that does not allow prices to follow market trends. The lack of cointegration was also observed in situations when inflation was stabilised. If we take into account the volume of mortgages granted per person in Poland and Ireland (EUR 86.09 per person in Poland and EUR 394.20 per person in Ireland)[1], the Polish market seems even shallower than the Irish one. This may compound the effect of house prices being insensitive to inflation.

The results obtained contradict some studies (e.g.: Fama, Schwert, 1977; Lee, Isa, 2019; Choi, Shin, 2022). However, as noted by researchers, different research methods may produce different results (Bond, Seiler, 1998; Arnold, Auer, 2015; Aye, Chang, Gupta, 2016). Moreover, as it has already been written, the Polish market is a specific market. It is a developing economy, where trading in financial assets or residential real estate does not reach such volumes as in developed economies. Furthermore, as indicated by Taderera and Akinsomi (2020), assets may react with a lag to changes in the level of inflation. This implies that the current study may be too early, and the period of rising inflation needs to be longer to capture the hedging properties of investments.

Summarising the results, it should be assumed that the research hypothesis 'investments in bonds, stocks, gold and real estate are able to effectively protect the capital held against the negative impact of inflation' was verified negatively. However, the results

1 Data based on Diaz and Westig (2020) and Eurostat: population on 1 January 2020.

should be approached with caution, as the findings of other researchers indicate a variation of results with the same data depending on the choice of research method. The negative verification of the hypothesis was not influenced by the result obtained for real estate when testing the correlation, as it is not known how exactly the rates of return behave. This issue requires further research using appropriately constructed sensitivity measures.

It is also worth noting that the article did not examine all asset classes within the investor's reach. For example, the author did not examine the relationship between investments in foreign currencies and inflation in Poland. This topic, however, seems much more complex, as the exchange rate is influenced by many factors lying not only in the domestic economy, but also in the economy of the country in whose currency the investment will be made. It is difficult to judge to what extent such an investment can protect capital from loss of value, although looking at exchange rates in 2022, one can get the impression that this would be a profitable investment direction. This topic, however, could be the subject of an entirely separate study.

5. Summary

In the article, the author carried out a study of the relationship between the bond index, the stock index, the prices of residential real estate represented by the hedonic index and inflation indicators. Spearman's correlation coefficients and cointegration analysis using the Engle–Granger test were used. The period from the 1st quarter of 2009 to the 4th quarter of 2021 was examined. The correlation analysis indicated that each investment provided opportunities to diversify risk against inflation. However, only the housing price index was positively correlated with inflation. Thus, changes in the CPI imply changes in house prices, and the direction of these changes is the same for both variables. Since the possibility of hedging against inflation requires that the return on investment be at least equal to the rate of inflation, and this cannot be inferred from the value of the correlation coefficient, it is not possible to make a firm conclusion that real estate hedges capital against loss of value under inflation, although this is likely. The Engle–Granger test showed the lack of integration of subsequent variables with the CPI. This means that, according to this methodology, the inflation-protecting properties of bonds, stocks, gold and real estate cannot be proven. The reasons are seen in the too short period of high inflation and too little development of the Polish economy.

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Inwestycje w obligacje, akcje, złoto i nieruchomości jako zabezpieczenie przed inflacją

Streszczenie:

W czasach rozpędzającej się inflacji coraz większego znaczenia nabierają instrumenty finansowe pozwalające chronić kapitał przed utratą wartości. Otwartą kwestią pozostaje, w co zainwestować, by jeśli nie wyprzedzić, to chociaż zrównać z poziomem inflacji rentowność inwestycji. Zrodziło to pytanie, czy są takie możliwości na rynku. Według niektórych autorów tego typu analizy nie są łatwe, a proste metody ekonometryczne nie są w stanie wykazać odpowiednich zależności. Przykładem są choćby inwestycje w nieruchomości, które – zwłaszcza w krótkim okresie – mogą nie być odpowiednim zabezpieczeniem przed wpływem inflacji.

Celem pracy jest wykazanie, czy inwestycje na polskim rynku kapitałowym są w stanie uchronić kapitał przed deprecjacją spowodowaną inflacją.

Badanie rozpoczęto od analizy rozkładów, stacjonarności stóp zwrotu i korelacji kolejnych inwestycji oraz wskaźnika inflacji CPI, by następnie przeprowadzić analizę kointegracji z wykorzystaniem testu Engle'a–Grangera. Analizę wykonano w okresie od pierwszego kwartału 2009 do czwartego kwartału 2021 roku. Do badania

wykorzystano indeksy: TBSP Index z rynku obligacji, WIG z rynku akcji, ceny złota w PLN, indeks hedoniczny NBP cen nieruchomości w siedmiu największych miastach Polski oraz wskaźniki inflacji CPI publikowane przez GUS.

Przeprowadzona analiza doprowadziła do negatywnej weryfikacji hipotezy badawczej, nie udało się wykazać, by analizowane indeksy i ceny związane były z poziomem inflacji.

Badanie wypełnia lukę na polskim rynku w zakresie analizy możliwości ochrony kapitału przed inflacją. Dotyczyło ono tylko rynku polskiego, jednak problematyka ta nie była podejmowana od lat także w dojrzałych gospodarkach.

Słowa kluczowe: zabezpieczenie przed inflacją, złoto, akcje, obligacje, nieruchomości, Polska

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