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Commodity Market Funds – the Only Ones Suitable for a Polish Investor in the Conditions of Rising Inflation and Increased Interest Rates?

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Abstract

Theoretical background: The order to assess the suitability and adequacy of financial instruments by producers and distributors of investment products was introduced with the first Markets in Financial Instruments Directive (MiFID). In conditions of high inflation, it is justified to assess the suitability of investment products in terms of protection of the real value of capital.
Purpose of the article: The research aims to indicate which groups (or subgroups) of open-ended investment funds (distinguished according to the investment policy) were suitable for an investor whose financial goal was to protect the real value of capital in the period of rising inflation and increased interest rates in Poland.
Research methods: Nominal and real HPY from funds managed by Polish investment fund companies (TFI) and foreign funds were examined in two investment horizons: one-year (1 May 2021 – 1 May 2022) and half-year (1 December 2021 – 1 May 2022). Two research hypotheses were formulated: 1) commodity funds were the suitable funds for the investor, whose aim was to protect the real value of capital in the analyzed period; 2) other types of funds (than commodity funds) were not suitable for an investor whose purpose was to protect the real value of capital. Two main criteria were used to assess the suitability of

the (sub)group of funds. For an investor aiming for complete protection of the real value of capital, these were: 1) the percentage of funds with non-negative real HPY and 2) the minimum value of real HPY in the (sub)group. For an investor who only needs partial real capital value protection, these were: the percentage of funds with a positive nominal HPY and the minimum value of the nominal HPY in the (sub)group.
Main findings: The first research hypothesis has been positively verified. If the investor's goal was total protection of the real value of capital in each researched horizon, the second research hypothesis can be considered positively verified. However, if the suitability criteria do not have to be met for each of the horizons studied, or if the investor's satisfactory objective was partial protection of the real value of capital, then the second hypothesis should be rejected.

Introduction

The order to assess the suitability and adequacy of financial instruments by producers and distributors of investment products was introduced with the first Markets in Financial Instruments Directive (MiFID).[1] This directive was then changed and transformed into the MiFID II[2] regulatory system, which (apart from the revised directive) included, *inter alia*, Markets in Financial Instruments Regulation (MiFIR)[3] and Commission Delegated Regulation (EU) 2017/565. One of the main goals of introducing the MiFID regulation was the legal protection of clients in European financial investment services markets against the risk of misselling.

Assessment of the suitability and appropriateness of investment products is also regulated by national legal acts – in Poland, e.g. Ordinance of the Minister of Finance (Rozporządzenie Ministra Finansów…). According to § 31 of this regulation, the target group of customers (i.e. customers for whom the product is suitable) is determined taking into account in particular: 1) the percentage of the loss that the target client is willing to incur, 2) the investment objectives and needs of the clients to be met by the financial instrument, whereby the client's objectives and needs can be refined by identifying specific aspects of the investment.

The assessment of the suitability of an investment product in market practice is carried out using the scoring method, based on a questionnaire filled in by the potential client, called the "suitability/adequacy test", etc. The questions in it relate to the investment objective, risk tolerance, financial situation, investment knowledge and experience. The result is a determination of the client's risk profile and an indication of the types of funds suitable for him/her. However, such a test may not work in all market conditions, e.g. high inflation. For example, analysing the model investment fund suitability test proposed by the Chamber of Fund and Asset Managers (IZFA, n.d.) and the guidelines for assessing its performance, it is stated that money market

[1] MiFID (2004/39/EC), implemented from 1 November 2007, the law relating to 30 countries of the European Economic Area. The MiFID directive came into force in Poland on June 17, 2010.

[2] Directive 2014/65/EU of the European Parliament and of the Council of May 15, 2014, on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU.

[3] Regulation (EU) No 600/2014 of the European Parliament and the Council of May 15, 2014, on markets in financial instruments and amending Regulation (EU) No 648/2012.

funds, debt funds and stable growth funds are recommended as suitable for investors whose aim is to protect the real value of capital. However, these recommendations have been shown to be unjustified in a high-inflation environment (Dittmann, 2022).

According to the report *Puls inwestora indywidualnego* (eToro, 2021), inflation has been the main cause of concern for Polish individual investors for sometime – 60% of them recognized it in October 2021 as the greatest threat to their investments. In a study conducted by the authors of the report, 51% of Polish individual investors admitted that they repositioned their investment portfolio due to growing concerns about inflation and the condition of the national economy. Precious metals were then seen (October 2021) as the best investment (according to 55% of respondents) in the next three months.

The research problem, protecting capital against loss of purchasing power, is essential and topical not only in the context of the Polish economy. Investors face this challenge in many foreign markets. In conditions of high inflation, it is justified to assess the suitability of investment products in terms of protection of the real value of capital.

Instruments tailored to protect the real value of capital in conditions of high inflation are inflation-indexed bonds. However, Attié and Roache (2009) note that although inflation-linked bonds have been developed to hedge the effects of inflation, their limited liquidity leads many investors to continue to rely on the indirect hedging properties of traditional asset classes. The more liquid financial instruments include, among other things, participation units in open-end investment funds.

The article aims to indicate which groups (or subgroups) of investment funds (distinguished by investment policy) were suitable for an investor whose financial goal was to protect the real value of capital in a period of rising inflation and increased interest rates in Poland. Taking into account that commodities are considered: 1) effective **short-run inflation hedges** (Attié & Roache, 2009); 2) useful hedges against **rising inflation** (Strongin & Petsch, 1996a), 3) effective asset class in **hostile markets** (Strongin & Petsch, 1996b), research hypotheses (formulated in the "Data and research method" section) take into account the particular importance of commodity funds in the study.

Literature review

Research into inflation hedging assets has been conducted for a longtime. Numerous studies have shown that commodities positively correlate with inflation and its changes, constituting good protection of capital against inflation. The first studies on inflation hedging properties of commodities were conducted in the late 1980s using simple methods (correlation analysis, regression analysis). Subsequent studies, conducted using more advanced methods (e.g. wavelet analysis), generally confirmed the effectiveness of the protection and provided more detailed results. The literature

review below contains the most relevant studies in terms of their relationship to the research carried out in this article.

First, the researchers found a positive correlation not only with expected inflation but also with unexpected inflation and/or changes in expected inflation (e.g. Gorton & Rouwenhorst, 2006; Ankrim & Hensel, 1993; Erb & Harvey, 2006; Kat & Oomen, 2006).

Secondly, Strongin and Petsch (1996a) found that commodities provide a useful hedge against rising inflation. Also, Levine et al. (2018) confirmed the strong performance of commodities in the high-inflation period. Strongin and Petsch (1996a) proved that commodities provide a valuable and systematic tool for offsetting macroeconomic risk in the portfolio. A significant result of their research was that commodities are an effective asset class in hostile markets (Strongin & Petsch, 1996b). They examined how much macro diversification several asset classes provide when the returns from a standard portfolio are at their worst, i.e. at their lowest 10%. Its idea was to understand how helpful an asset class is at helping a manager protect a portfolio against more macro risks by examining those periods in the past that have produced the worst overall returns and see which assets would have provided the most help in reducing losses for the overall portfolio. They found that commodities provided the most robust off setting positive returns in these hostile markets.

Conover et al. (2010) found that commodity futures' benefits could be greatly enhanced by utilizing a tactical allocation approach guided by shifts in Federal Reserve policy rates. They found that adding a commodity exposure enhances an equity portfolio's return only during periods when the Federal Reserve was increasing interest rates.

Some researchers have noticed the commodities sector's diversity and conducted research on subsectors of commodities or for single commodities. Greer (2000) proved that commodity prices are not highly correlated with each other. According to Erb and Harvey (2006), commodity futures are largely uncorrelated with one another, so thinking of them as a market of dissimilar individual assets is more meaningful than thinking of them as a homogeneous market of similar assets. They found differences in the formation of excess rates of return from individual commodities included in the GSCI. They also found that three sectors (energy, livestock and industrial metals) and three individual commodity futures (heating oil, cattle and copper) have significant unexpected inflation betas. In contrast, the precious metals sector has a statistically significant negative inflation beta, as do gold and silver. Kat and Oomen (2006) found that correlations between commodity groupings (such as metals, energy, etc.) are very low and mostly insignificant, whereas they tend to be much stronger within groups. They also found significant differences between the various commodities in terms of inflation hedging; energy, metals, cattle and sugar offered the best hedging potential. Adams et al. (2008) stated that the correlation with inflation is especially high for energy resources and industrial metals and lower for agriculture and precious metals. Also, Umar and Spierdijk (2013) stated that partic-

ularly commodity futures in the markets of energy, industrial metals and live cattle have favourable inflation hedging properties. Crawford et al. (2013) stated that various commodities performed very differently in different periods as inflation hedges. They also found that a diversified basket of energy commodities has performed well under historical inflation. Zaremba et al. (2019) showed that the inflation hedging properties of commodities in the UK have been evident for almost 750 years. The co-movement was strong at the aggregate level and for different commodity classes (energy, industrials, agricultural). However, it weakened in the 20th century. Zaremba et al. (2021) stated that the protection level of particular commodities differs over time and across countries and geographies. They stated that agricultural commodities offered high levels of protection against inflation until the beginning of the 19th century. Then energy and industrial commodities offered a greater protection level; energy commodities offered the most significant level of protection during the second half of the 20th century. Furthermore, Zaremba (2015) proved that the commodities retained their inflation hedging abilities in the financialized markets.

Research on Polish commodity funds is relatively poor. It was conducted, among others, by Krawiec (2012). He examined eight commodity funds in the period from January 2009 to December 2011. His research did not concern the possibility of protecting the real value of capital but the impact of changes in commodity prices on world markets on the prices of participation units of commodity funds. Results exhibit Granger causality between commodity returns and a majority of commodity fund returns. Gierałtowska (2016) showed, among other things, a considerable variation in the annual returns of commodity market-linked funds between 2010 and 2016. The study results indicate the validity of examining the performance of such funds in conjunction with the macroeconomic environment. Moskal and Zawadzka (2017) showed that from 2009 to 2016, most Polish commodity funds achieved negative nominal rates of return, irrespective of the existing trend on the stock market (bullish or bearish), which could have been caused by poor-quality portfolio management.

Furthermore, the study by Dittmann (2020) concerned debt funds real returns. It showed that from 2004 to 2019 (a low-inflation period), the investor's chances of obtaining positive real returns (for horizons from 1 to 10 years) were high. A more recent study by Dittmann (2022) covered a period of rising inflation in Poland (2021). This study showed that the highest percentage of funds with a positive real returns was characteristic of funds with SRRI = 6 and SRRI = 5. Moreover, the highest percentage of funds with a positive real returns was equity funds (70%), and the lowest – of debt funds (3%). Moskal et al. (2022) analysed factors determining the effectiveness of commodity funds operating in Poland. They stated that funds operating for a shorter period achieve better results.

Several studies on commodity investments may prove valuable for examining the suitability of commodity funds for the individual investor. The most recent are listed below.

According to numerous researchers, gold's ability to preserve wealth during inflation and protect investments in case of financial crises or market uncertainty are the main reasons for its selection for this hedging objective (Pattnaik et al., 2023). However, Carpantier (2021) found that a portfolio of commodities (energy, metals and agricultural products) offers investors more durable protection against inflation than gold. Adekoya et al. (2021) found that inflation risk can be hedged by at least one precious metal in every six examined countries. Similarly, Liu et al. (2023) proved that the inflation-hedging capacity of industrial metals exhibits substantial variation over time; most of the inflation hedging power occurred during the relatively more extended and common regimes (the Great Moderation, the post-subprime crisis and the periods after the outbreak of the COVID-19 pandemic). Zhang et al. (2018) stated that dynamic causality between commodity prices and inflation in China contributes to understanding the nature of economic fluctuations and to forecasting crises. Sekine and Tsuruga (2018) found that the effect of commodity price shocks on inflation is transitory. Su et al. (2020) have shown that geopolitical risks are an essential factor influencing oil prices, as reflected in inflation. Abbas and Lan (2020) found that the energy commodity drives the inflation process in advanced, emerging and also EU countries.

Some researchers have analysed the commodity market during the pandemic and Russia-Ukrainian war. The findings of Musa et al. (2020) showed that the COVID-19 pandemic had a long-term positive impact on the food price index and a negative effect on oil prices. Similarly stated by Dutta et al. (2020). The validity of investing in gold during the pandemic has been confirmed by, among others, Atri et al. (2021), Tanin et al. (2021), Ji et al. (2020) and Cui et al. (2023). Cui et al. (2023) analysed gold, silver and oil prices, and they recommend gold as a secure investment in uncertain and turbulent times.

Umar et al. (2022) stated that Russian-Ukrainian war significantly influenced gold, platinum, palladium, and nickel, they also found a significant increase in the abnormal returns associated with the renewable energy industry. Shahzad et al. (2023) found strong co-movement during the war between geopolitical risk and oil, gas, and silver returns. In contrast, gold appeared to be a stable asset and could serve as a haven against geopolitical risk and financial instability.

Data and research method

It was assumed that a potential client could expect from the investment:

– total protection of the real value of the capital and its growth (non-negative real rate of return on investment),

– at least partial protection of the real value of the capital (positive nominal rate of return on investment).

Two research hypotheses were formulated:

Hypothesis 1: Commodity funds were the suitable funds for the investor, whose aim was to protect the real value of capital in the analyzed period.

Hypothesis 2: Other types of funds (than commodity funds) were not suitable for an investor whose purpose was to protect the real value of capital.

It has been assumed that for the investor aiming for total protection of the real value of capital, the (sub)group of funds will be considered suitable if:

– the percentage of funds with a non-negative real rate of return in this (sub) group will be at least 75%[4] (1st criterion) and, at the same time,

– the minimum value of real rates of return in this (sub)group will be no lower than minus 10%[5] (2nd criterion).

It has been assumed that for the investor aiming for at least partial protection of the real value of capital, the (sub)group of funds will be considered suitable if:

– the percentage of funds with a positive nominal rate of return in this (sub)group will be at least 75% (1st criterion) and, at the same time,

– the minimum value of nominal rates of return in this (sub)group will be no lower than minus 10% (2nd criterion).

The first criterion reflects one of the three concepts of an inflation hedge, according to which "a security is called an inflation hedge if it eliminates or at least reduces the possibility that the real return on the security will fall below some specified floor value such as zero" (Arnold & Auer, 2015). The second criterion considers the "safety first" principle formulated by Roy (1952). The (sub)group of funds must, therefore, be appropriate in terms of the risk of not achieving the investment objective (1st criterion) and in terms of the maximum loss that an investor is willing to accept (2nd criterion).

The following research questions were formulated:

1. What percentage of funds with a non-negative real rate of return was characteristic of particular groups and subgroups of funds (distinguished due to the investment policy) in the analyzed period?

2. What percentage of funds with a positive nominal rate of return was characteristic of particular groups and subgroups of funds (distinguished due to the investment policy) in the analyzed period?

3. What were the minimum values of the rate of return (nominal and real) of the particular groups and subgroups of funds (distinguished due to the investment policy) in the analyzed period?

4. Which groups or subgroups of funds in the analyzed period best met the investor's expectations to protect the real value of capital?

The study was conducted for two scenarios.

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[4] It should be noted that the first criterion also indicates the sign (+ or -) of the percentiles of the HPY distribution. For example, if the percentage of funds with non-negative HPY in a given group is 78%, it means, among other things, positive values for all quartiles of the distribution (including medians), negative values for the 1st and 5th percentiles (VaR).

[5] It means that the worst fund in a given group will not bring a loss higher than 10%.

The first assumes that the investor has allocated capital to funds managed by Polish entities (TFIs). For the investor, this means, among other things, lower legal risk (the Act on Investment Funds and Management of Alternative Investment Funds applies) and usually a lower financial barrier to entry.

In the second scenario, the investor uses the offer of foreign entities managing foreign funds, which is available on the Polish market. This investment is characterized by higher legal risk, exchange rate risk, and usually, a higher financial barrier to entry, possibly also a psychological barrier to entry (resulting in the home bias phenomenon).

Research on the commodities market indicates the relevance of conducting analyses over different length investment horizons due to the sensitivity of prices to various dynamic sources of risk (including political and economic). This approach (considering different lengths of investment horizons) is also relevant in assessing funds' suitability for the investor. Therefore, this study includes two research periods, a longer (one-year) and a shorter (six-month) one. The longer horizon covers the period 1 May 2021 – 1 May 2022. It has been taken into account that in 2021, the inflation rate was 8.6%, the highest in the last 20 years. The chosen one-year period was characterised by an inflation rate of 12.3%. The second investment horizon covered the period 1 December 2021 – 1 May 2022 and was characterised by an inflation rate of 9.09%. This horizon allows us to consider the intensification of unfavourable market conditions for Polish investors, it reflects hostile market conditions. Polish investors had to confront their investments with unfavourable macroeconomic and financial market phenomena: five interest rate increases (from 1.25 to 4.5%), higher inflation rate, Polish zloty depreciation, higher declines in WSE indices (WIG20 dropped by 15.32%) and the numerous consequences of the war in Ukraine that started on 22 February 2022.

The research included all open-ended funds that operated in the adopted research periods, the quotations of which were posted on the biznesradar.pl. The research sample totalled 1,642 funds. Table 1 presents the number of individual groups of funds managed by TFI and the number of individual groups of foreign funds (managed by foreign entities).

Table 1. The number of individual groups of funds

Funds managed by TFI		Foreign funds	
Fund groups	Number of funds	Fund groups	Number of funds
Polishe quities	53	Equity	668
Balanced	43	Mixed	123
Stable growth	48	Debt securities	296
Debt securities	125	Money market	21
Cash funds	27	Capital protection	8
Commodity funds	17	Commodity funds	31
Foreign markets equities	114	Other	7
Other	61	Total	1,154
Total	488		

Source: Author's own study.

Nominal holding period yields (HPY) on funds for both investment horizons were obtained from the biznesradar.pl. The data on inflation (CPI values) in the analyzed period was obtained from the Central Statistical Office. In the first research period (annual horizon), inflation amounted to 12.3%. The second six-month research period was characterized by inflation at the level of 9.09%. On this basis, real HPY for both horizons was calculated for all funds. In the case of investments in funds whose participation units were denominated in a foreign currency, the change in the exchange rate during the analyzed periods was also taken into account. The percentage differences between the selling rate (on the investment start date) and the buying rate (on the investment completion date), calculated based on the average buying and selling rates (according to the National Bank of Poland), are presented in Table 2.

Table 2. Exchange rate differences included in the periods under examination (%)

Investment horizon	Percentage change in exchange rate							
	USD/PLN	AUD/PLN	EUR/PLN	HUF/PLN	CHF/PLN	GBP/PLN	JPY/PLN	SEK/PLN
12M	15.9	5.7	0.6%	-3.7	8.6	3.4	-3.3	-1.3
6 M	10.3	3.8	-0.5%	-4.6	3.8	-0.4	-4.3	-3.9

Source: Author's own study based on (NBP, n.d.).

The advantages of the methodology used include, firstly, conducting research according to two scenarios, i.e. taking into account both the investor interested in allocating capital in funds managed by TFIs and the investor willing to invest in funds managed by foreign entities (which, in a sense, can also be considered an alternative investment). Secondly, the study was conducted for two investment horizons, making it possible to check the possible differentiation of results depending on the adopted investment period. Thirdly, conducting research using both nominal and real HPY enables the verification of research hypotheses in terms of partial and total protection of the real value of capital.

The proposed methodology of the suitability assessment takes into account the criteria that were considered key due to the investment objective set (the protection of the real value of capital).[6] The suitability assessment can be extended, among other things, by considering additional criteria, e.g. SRRI, financial barrier to entry (minimum investment amount), and investment potential (measured using the upper partial moments of the HPY distribution).

[6] More possible criteria for assessing the suitability of investment funds for an investor proposes (Dittmann, 2019).

Results

Analysis of returns on funds managed by TFIs

The first step was to see what percentage of funds (in each group) had non-negative real HPY and positive nominal HPY (Table 3) and what minimum values of HPY characterized each group of funds (Table 4).

Table 3. Percentage of funds (by group) with real HPY ≥ 0 and nominal HPY > 0

Fund groups	HPY			
	NOM 12M	NOM 6M	REAL 12M	REAL 6M
Polish equities	6	4	0	4
Balanced	21	9	0	0
Stable growth	2	0	0	0
Debt securities	6	5	0	0
Cash funds	4	4	0	0
Commodity funds	89	100	33	35
Foreign markets equities	26	11	4	3
Other	12	13	0	2

NOM – nominal HPY; REAL – real HPY; 12M – annual horizon; 6M – half-year horizon

Source: Author's own study.

Table 4. Minimum HPY values in each fund group (%)

Fund groups	HPY			
	NOM 12M	NOM 6M	REAL 12M	REAL 6M
Polish equities	-70.7	-48.5	-73.9	-52.8
Balanced	-29.0	-27.8	-36.8	-33.8
Stable growth	-26.7	-25.7	-34.7	-31.9
Debt securities	-42.9	-41.9	-49.2	-46.8
Cash funds	-11.5	-9.8	-21.2	-17.3
Commodity funds	-1.10	4.50	-12	-4.0
Foreign markets equities	-52.9	-60.3	-58	-63.6
Other	-28.5	-26.4	-36.4	-32.5

Source: Author's own study.

The results allow us to conclude that, for both investment horizons, only commodity funds met both suitability criteria, but only in the case of an investor satisfied with partial real value capital protection. No group was suitable for the investor expecting total protection; for each group, the percentage of funds with non-negative real HPY was well below the set threshold value.

As it is possible to distinguish subgroups within each group,[7] the next step was to carry out an in-depth analysis (i.e. by subgroup) for selected groups considered

[7] Subgroups were adopted according to the classification used on biznesradar.pl.

to be the most "promising" in terms of the first criterion. The percentage of funds with non-negative HPY calculated for the subgroups of funds is shown in Table 5, while the minimum values of HPY in each subgroup of funds is shown in Table 6. Relevant scatter plots were also drawn (Figures 1–4). This helps assess the differences between subgroups deemed suitable (1st quadrant) and subgroups deemed unsuitable (other quadrants) according to the accepted thresholds of both criteria.

Table 5. Percentage of funds (in subgroups of selected fund groups) with real HPY ≥ 0 and nominal HPY > 0

Fund groups	Fund subgroups	NOM 6M	NOM 12M	REAL 6M	REAL 12M
Commodity	Precious metals	100	92	33	17
	Other	100	100	80	100
Balanced	Mixed Polish balanced	0	0	0	0
	Mixed Polish – other	33	33	0	0
	Mixed foreign balanced	13	50	0	0
	Mixed foreign – other	13	25	0	0
Foreign markets equities	US equities	8	33	0	0
	Asian equities excluding Japan	0	0	0	0
	European developer markets equities	19	38	0	0
	European emerging markets equities	25	38	25	25
	Global developed market equities	5	22	0	3
	Global emerging market equities	0	0	0	0
	Russian equities	0	0	0	0
	Turkish equities	100	100	100	50
	Foreign equities – other	19	29	0	5

Source: Author's own study.

Table 6. Minimum HPY values for subgroups of selected fund groups (%)

Fund groups	Fund subgroups	NOM 6M	NOM 12M	REAL 6M	REAL 12M
Commodity	Precious metals	4.5	-1.1	-4.3	-12.0
	Other	7.2	13.8	-1.7	1.3
Balanced	Mixed Polish balanced	-27.8	-27.2	-33.8	-35.2
	Mixed Polish – other	-8.9	-6.3	-16.5	-16.5
	Mixed foreign balanced	-15.4	-22.6	-22.4	-31.1
	Mixed foreign – other	-22.1	-29.0	-28.6	-36.8
Foreign markets equities	US equities	-41.4	-41.0	-46.3	-47.5
	Asian equities excluding Japan	-23.0	-32.8	-29.4	-40.1
	European developed markets equities	-30.9	-24.7	-36.7	-32.9
	European emerging markets equities	-50.4	-43.5	-54.5	-49.7
	Global developed market equities	-50.5	-37.9	-54.7	-44.7
	Global emerging market equities	-25.9	-25.6	-32.1	-33.8
	Russian equities	-60.3	-52.9	-60.3	-52.9
	Turkish equities	9.1	7.6	0.0	-4.1
	Foreign equities – other	-28.3	-27.7	-34.3	-35.6

Source: Author's own study.

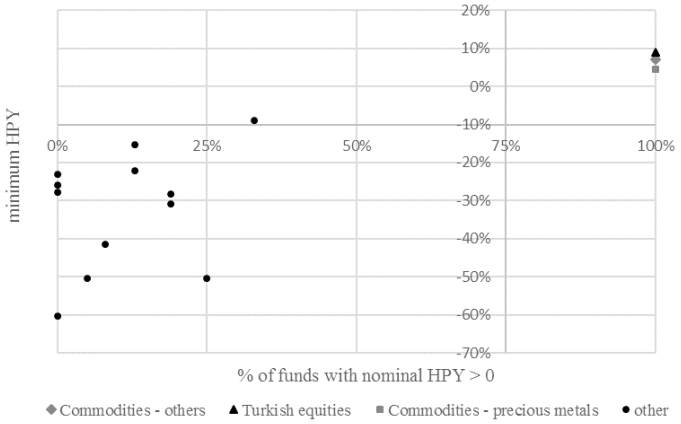

Figure 1. The groups of funds by the percentage of funds with nominal HPY > 0 and by the nominal HPY value (6M)

Source: Author's own study.

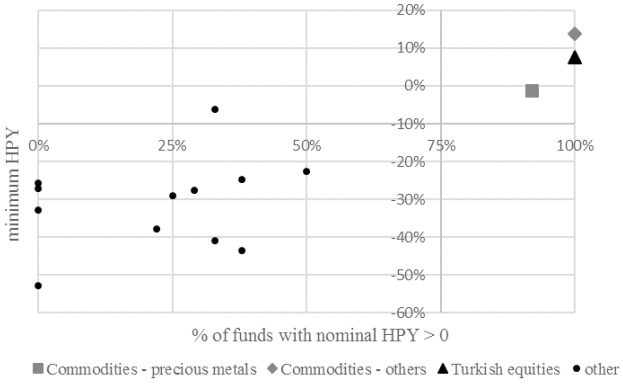

Figure 2. The groups of funds by the percentage of funds with nominal HPY > 0 and by the minimum nominal HPY value (12M)

Source: Author's own study.

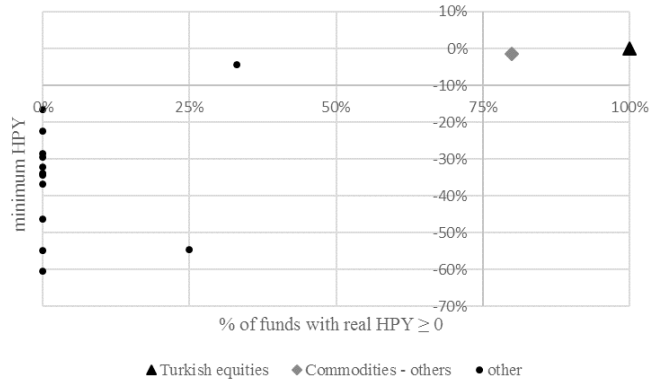

Figure 3. The groups of funds by the percentage of funds with real HPY ≥ 0 and by the minimum real HPY value (6M)

Source: Author's own study.

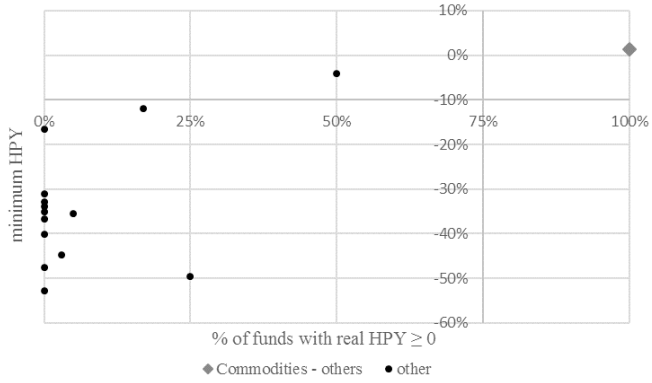

Figure 4. The groups of funds by the percentage of funds with real HPY ≥ 0 and by the minimum real HPY value (12M)

Source: Author's own study.

The results obtained indicate that the subgroup "other commodity funds" (i.e. after excluding precious metals funds) is the only one that can be considered suitable for both investment horizons and regardless of whether the investor is interested in partial or complete protection of the real value of capital. The second subgroup of the same group of funds ("precious metals") can be considered suitable only for an investor satisfied with partial capital's real value protection. Furthermore, Turkish equity funds met the suitability criteria for an investor aiming for complete protection of the capital's real value but only in the shorter horizon. In the longer horizon, they met the suitability criteria only for an investor satisfied with partial protection of the real value of capital.

The analysis of the scatter plots allows us to state that a significant reduction in the threshold value of the 1st criterion (to 50%) would allow Turkish equity funds to be considered suitable regardless of the investment horizon. In contrast, other subgroups of funds are characterised by very low values of both characteristics adopted as criteria for assessing suitability.

Analysis of returns on funds managed by foreign entities

The first step was to see what percentage of funds (in each group) had non-negative real HPY and positive nominal HPY (Table 7) and what minimum values of HPY characterized each group of funds (Table 8).

Table 7. Percentage of funds (in each group) with real HPY ≥ 0 and nominal HPY > 0

Fund groups	HPY			
	NOM 12M	NOM 6M	REAL 12M	REAL 6M
Equity	56	37	29	17
Mixed	56	37	15	7
Debt securities	42	30	5	3
Money market	67	43	38	33
Capital protection	13	0	0	0
Other	57	14	14	14
Commodity	84	90	45	61

Source: Author's own study.

Table 8. Minimum HPY values in each fund group (%)

Fund groups	HPY			
	NOM 12M	NOM 6M	REAL 12M	REAL 6M
Equity	-67.7	-56.5	-71.2	-60.1
Mixed	-28.7	-17.9	-36.5	-24.7
Debt securities	-19.9	-25.7	-28.7	-31.9
Money market	-11.2	-3.6	-20.9	-11.6
Capital protection	-11.3	-9.3	-21.1	-16.8
Other	-8.2	-8.3	-18.2	-16.0
Commodity	-34.5	-5.6	-41.7	-13.5

Source: Author's own study.

The results made it possible to conclude that only commodity funds met both criteria for the suitability assessment, but only for an investor satisfied with partial protection of the real value of capital and only for a six-month investment horizon. None of the other fund groups could be considered suitable.

The next step was to carry out an analysis for subgroups of funds. The percentage of funds with non-negative real HPY and positive nominal HPY calculated for the fund subgroups is shown in Table 9. The minimum values of HPY in each fund subgroup are shown in Table 10. Relevant scatter plots are shown in Figures 5–8.

Table 9. Percentage of funds (in subgroups of selected fund groups) with real HPY ≥ 0 and nominal HPY > 0

Groups	Subgroups	NOM 6M	NOM 12M	REAL 6M	REAL 12M
Equity	US equities	49	76	28	47
	Latin American equities	69	46	38	8
	Asian equities excluding Japan	39	47	13	30
	Middle Eastern and African equities	70	45	40	45
	BRIC equities	46	31	31	31
	European developed markets equities	32	65	8	25
	European developed markets equities SME	23	54	15	38
	European emerging markets equities	29	65	24	41
	Global developed markets equities SME	20	93	20	20
	Global emerging markets equities	24	33	10	25
	Chinese equities	28	22	22	22
	Indian equities	37	89	11	68
	Japanese equities	21	17	11	2
	Russian equities	14	14	0	14
	Foreign stocks in the energy sector	60	87	60	60
	Foreign equities in the real estate sector	47	82	12	53
	Foreign equities in the technology sector	0	18	0	0
	Foreign sector equities other (excluding commodities)	25	25	4	14
	Global developed markets equities	30	75	13	18
Mixed	Mixed foreign active allocation	32	56	6	12
	Mixed foreign stable growth	43	57	0	21
	Mixed foreign balanced	33	43	7	7
	Mixed foreign other	42	64	9	22
Debt securities	Asian debt universal	75	63	25	0
	Debt Emerging Markets universal	12	22	2	4
	European corporate debt	0	14	0	0
	European debt universal	0	12	0	0
	European debt other	18	24	0	6
	Global debt High Yield	50	58	0	13
	Global corporate debt	18	41	5	5
	Global debt universal	45	53	0	5
	Global debt others	33	42	0	6
	New Europe debt universal	33	0	0	0
	US debt universal	40	70	7	7
	Foreign debt others	27	36	9	9
Money market	Cash and money market EUR	0	0	0	0
	Cash and money foreign other	67	92	58	58
	Cash and money market USD	33	100	0	33
Capital protection	Capital protection foreign universal	0	13	0	0
Other	Absolute return universal	14	57	14	14
Commodity	Natural resources	100	100	100	100
	Other	86	77	45	23

Source: Author's own study.

Table 10. Minimum HPY values in each fund group (%)

Groups	Subgroups	NOM 6M	NOM 12M	REAL 6M	REAL 12M
Equity	US equities	-31.2	-19.4	-36.9	-28.2
	Latin American equities	-27.7	-35.2	-33.8	-42.3
	Asian equities excluding Japan	-18.3	-25.8	-25.1	-33.9
	Middle Eastern and African equities	-56.5	-67.7	-60.1	-71.2
	BRIC equities	-20.9	-20.1	-27.5	-28.9
	European developed market sequities	-23.0	-12.7	-29.4	-22.3
	European developed markets equities SME	-23.3	-17.9	-29.7	-26.9
	European emerging markets equities	-35.6	-22.5	-41.0	-31.0
	Global developed markets equities SME	-19.7	-7.0	-26.4	-17.2
	Global emerging markets equities	-46.4	-36.3	-50.9	-43.3
	Chinese equities	-30.9	-39.1	-36.6	-45.7
	Indian equities	-16.8	-3.8	-23.7	-14.4
	Japanese equities	-27.7	-28.4	-33.7	-36.2
	Russian equities	-35.8	-23.0	-41.2	-31.4
	Foreign stocks in the energy sector	-39.8	-30.6	-44.8	-38.2
	Foreign equities in the real estate sector	-13.6	-8.6	-20.8	-18.6
	Foreign equities in the technology sector	-32.7	-24.9	-38.3	-33.2
	Foreign sector equities other (excluding commodities)	-16.4	-22.1	-23.4	-30.6
	Global developed markets equities	-25.0	-16.0	-31.3	-25.2
Mixed	Mixed foreign active allocation	-16.5	-12.8	-23.4	-22.3
	Mixed foreign stable growth	-11.0	-7.1	-18.4	-17.3
	Mixed foreign balanced	-17.9	-28.7	-24.7	-36.5
	Mixed foreign other	-14.3	-12.4	-21.5	-22.0
Debt securities	Asian debt universal	-4.0	-4.7	-12.0	-15.1
	Debt Emerging Markets universal	-20.7	-19.9	-27.3	-28.7
	European corporate debt	-11.4	-10.5	-18.8	-20.3
	European debt universal	-11.8	-11.3	-19.2	-21.0
	European debt other	-10.2	-9.9	-17.7	-19.8
	Global debt High Yield	-9.6	-8.9	-17.1	-18.9
	Global corporate debt	-15.5	-12.2	-22.6	-21.8
	Global debt universal	-10.3	-10.2	-17.8	-20.0
	Global debt others	-25.7	-19.2	-31.9	-28.1
	New Europe debt universal	-7.9	-9.6	-15.5	-19.5
	US debt universal	-12.5	-11.5	-19.8	-21.2
	Foreign debt others	-15.6	-17.1	-22.7	-26.2
Money market	Cash and money market EUR	-3.1	-2.2	-11.1	-12.9
	Cash and money foreign other	-3.6	-11.2	-11.6	-20.9
	Cash and money market USD	-0.4	3.4	-8.7	-7.9
Capital protection	Capital protection foreign universal	-9.3	-11.3	-16.8	-21.1
Other	Absolute return universal	-8.3	-8.2	-16.0	-18.2
Commodity	Natural resources	23.9	36.3	13.6	21.3
	Other	-5.6	-34.5	-13.5	-41.7

Source: Author's own study.

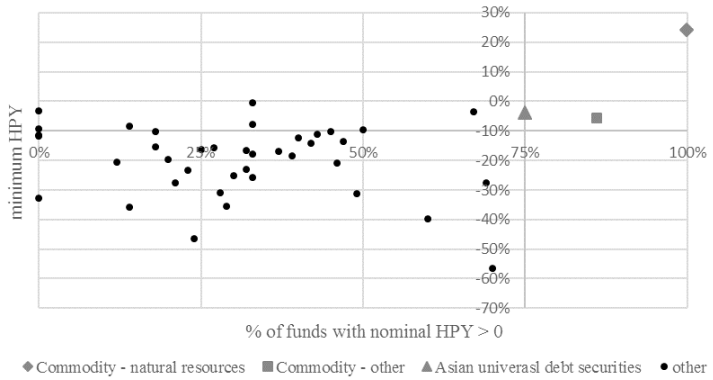

Figure 5. The groups of funds by the percentage of funds with nominal HPY > 0 and by the minimum nominal HPY value (6M)

Source: Author's own study.

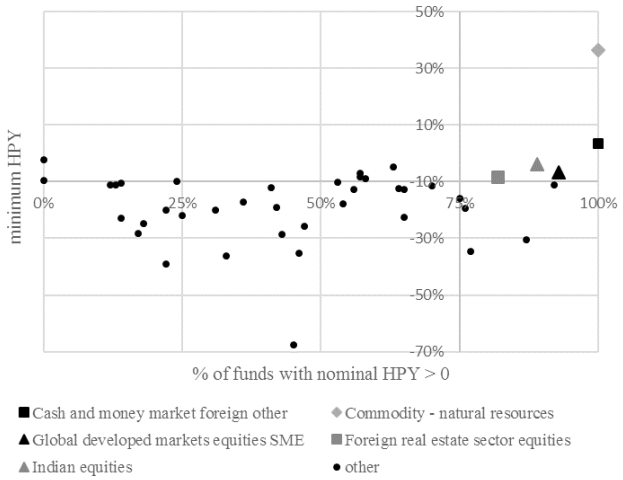

Figure 6. The groups of funds by the percentage of funds with nominal HPY > 0 and by the minimum nominal HPY value (12M)

Source: Author's own study.

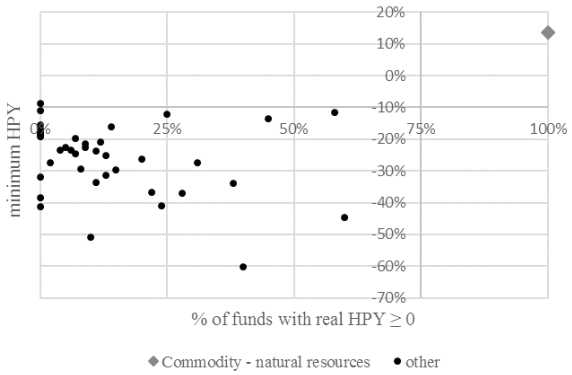

Figure 7. The groups of funds by the percentage of funds with real HPY ≥ 0 and by the minimum real HPY value (6M)

Source: Author's own study.

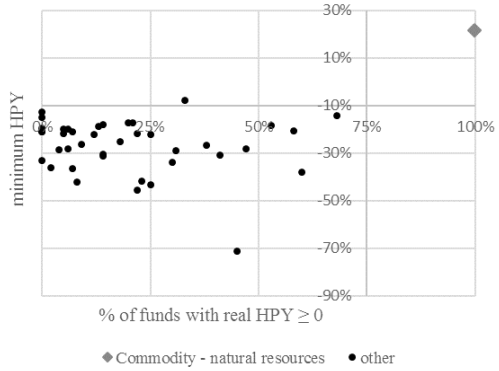

Figure 8. The groups of funds by the percentage of funds with real HPY ≥ 0 and by the minimum real HPY value (12M)

Source: Author's own study.

Based on the results obtained, the subgroup of natural resources funds can be considered suitable for an investor expecting complete protection of the real value of capital regardless of the investment horizon studied. It is worth noting that the positive minimum real HPY in this subgroup means that even the worst fund made it possible not only to secure the real value of capital but also to increase it.

The following subgroups of funds should be considered partially suitable (only for a one-year horizon and only for an investor satisfied by partial protection of the real value of capital): "Indian equities", "developed global markets equities SME", "foreign real estate equities", "cash and money market foreign other". Also, "other

commodity funds" and "Asian universal debt funds" should be considered partially suitable subgroups of funds (only for a six-month horizon and only for an investor satisfied with partial protection of the real value of capital).

An analysis of the scatter plots allows us to state that a relatively small reduction in the threshold value of the 1st criterion and (or) the 2nd criterion would also allow other subgroups of funds to be considered suitable. Table 11 summarises the results obtained.

Table 11. Subgroups of funds that met the suitability assessment criteria

Managing entity	NOM		REAL	
	6M	12M	6M	12M
TFI	– Other commodity funds (non-precious metal) – Commodity funds – precious metal – Turkish equities	– Other commodity funds (non-precious metal) – Commodity funds – precious metal – Turkish equities	– Other commodity funds (non-precious metal) – Turkish equities	– Other commodity funds (non-precious metal)
Foreign entity	– Commodity funds – natural resources – Other commodity funds – Asian universal debt funds	– Commodity funds – natural resources – Indian equities – Developed globed markets equities – Foreign real estate equities – Cash and Money market foreign other	– Commodity funds – natural resources	– Commodity funds – natural resources

Source: Author's own study.

The results obtained show that the first research hypothesis was verified positively. For an investor interested in the domestic fund market, which aimed to protect (totally or partially, in both horizons) the real value of capital, the subgroup "other commodity funds" (excluding precious metals funds) was suitable. For an investor interested in foreign funds which aimed to protect (totally or partially, in both horizons) the real value of capital, the natural resources subgroup of commodity funds was suitable.

The second research hypothesis can be considered positively verified if the investor's objective was the complete protection of the real value of capital for both horizons studied. However, if the suitability criteria do not have to be met for each of the horizons studied, or if the investor's satisfactory objective was partial protection of the real value of capital, then second hypothesis should be rejected.

The "natural resources" subgroup, belonging to the group of commodity funds managed by foreign entities, should be considered the best subgroup of funds (meeting the adopted suitability assessment criteria to the greatest extent). The subgroup of "other commodity funds" (i.e. after excluding precious metals funds) managed by TFIs performed slightly worse.

Discussion

Most of the research on commodities as an instrument to hedge capital against inflation has been conducted over a long investment horizon, using long time series. Commodities have been considered a potential portfolio component in long-term strategic asset allocation. This study adopted a dynamic (tactical) asset allocation assumption. The assumption that the investor actively manages the portfolio is consistent with the assumed short-term research horizons appropriate in hostile market conditions. Commodities funds were treated as a potential remedy for times of inflation, rising interest rates and the economic impact of a Russian-Ukrainian war on the Polish economy.

The conducted research is one of the Polish investment fund market forerunners. In the last 20 years, inflation in Poland has been relatively low. Before that (in the years of high inflation), the investment fund market was just being established. To the best of the author's knowledge, no one has conducted any research on the inflation hedging abilities of commodity funds for the Polish economy. The results presented in this article partly fill the research gap concerning the Polish inflation hedging securities market.

The results of the study presented in this article differ significantly from those of other researchers on the Polish market. The study conducted by Dittmann (2020) covered the years 2004 to 2019, a period of relatively low inflation. Hence, the results of her research, indicating the suitability of debt funds for an investor whose objective was to protect the real value of capital, differ from the results of the research presented in this paper. The results of the study presented in this paper show little agreement with the results of a more recent study by Dittmann (2022) covering 2021 (with inflation rate = 8.6%). Namely, the commodity funds considered suitable in this article tend to be characterised by SRRI = 5, 6 or 7. This result is consistent with Dittmann's (2022) conclusion that, in a rising inflation environment, suitable funds are those with SRRI = 5 or 6. However, in contrast to Dittmann's (2022) results, none of the equity or mixed funds subgroups was considered suitable in this study. The results differ due to a different research periods with different market conditions. The study's results are diametrically opposed to those obtained for the years 2009–2016 by Moskal and Zawadzka (2017). In contrast to Moskal and Zawadzka's results, Polish commodity funds generated a positive nominal and real rate of return during the research period adopted in this article.

It should be emphasized that the study considered the possibility of investing by a Polish investor (facing the Polish inflation rate) not only in funds managed by Polish TFIs but also in foreign funds. To the best of the author's knowledge, such an analysis has not been conducted before. This is an important contribution due to the increasing opportunities for Polish investors to invest in foreign investment funds. It is worth remembering as the depreciation of the zloty increases the rate of return on investment in foreign funds.

The results of the study presented in this article on the possibility of hedging the real value of capital using commodities investments confirm the results of earlier studies conducted in foreign markets (presented in the literature review).

Firstly, they confirm the existence of differences in the strength of inflation protection depending on the type of commodities. Polish non-precious metals funds ("other commodities" funds) and foreign "natural resources" funds provided better real value capital protection than other commodities funds (e.g. precious metals funds). Secondly, it has been confirmed that investment in the commodities market makes it possible to hedge the real value of capital at a time of rising inflation. Thirdly, the inflation hedging capacity of commodities in a hostile market has been confirmed. Fourthly, the effectiveness of commodity investments in a rising interest rate regime has been confirmed.

The contribution is also to assess the suitability of a (sub)group of investment funds for an investor aiming to secure the real value of capital. This was done innovatively. Based on a literature query, two criteria for assessing suitability were proposed, considered key due to the investment objective set (the protection of the real value of capital).

A discussion point of the methodology used may be subjectively adopted (to verify the research hypotheses) threshold values for both criteria of suitability assessment. The author's proposal to solve this problem is to use different threshold values depending on the attitude to risk characterising the investor for which the suitability assessment is made. The scatter plot analysis was a step in this direction. It made it possible to conclude that, in the case of funds managed by TFIs, only a significant reduction in the threshold values would allow other subgroups of funds to be considered suitable. In contrast, in the case of funds managed by foreign entities, a relatively small reduction in the threshold value of the 1st criterion and (or) the 2nd criterion would also allow other subgroups of funds to be considered suitable. This would imply a different result for verifying the second research hypothesis.

Conclusions

In an environment of rising inflation, a popular financial goal is to protect the real value of capital. For this reason, the suitability of investment products should be assessed in a way that allows to do it in this regard. As stated, standardly used in suitability/adequacy tests, the scoring method produces erroneous results in a high-inflation environment. Therefore, a better idea would be, for example, a hierarchical analytical process that should consider, among other things, the results of this study and similar ones.

The conducted research allows concluding that it is worth considering alternative investments, such as investments in commodity funds, in the conditions of rising inflation and increasing interest rates. Notably, among the funds managed by TFI,

only a subgroup of commodity funds protected capital well against inflation. It can be considered a "Noah's Ark" during the Flood.

The Polish investor should also consider investing in foreign funds. Foreign commodity funds (especially those investing in natural resources) were suitable for the Polish investor during the period examined. Moreover, they were better (in terms of both criteria adopted in assessing suitability) than their Polish counterparts. The phenomenon of home bias, which often features investors, can be a barrier to choosing the most suitable fund. However, it is worth overcoming it. The study results indicate that investment in foreign markets may not only secure the real value of capital but also significantly increase it. It is worth mentioning that currently, foreign funds are available to the Polish investor not only as part of asset management or wealth management services but also through investment platforms and fund supermarkets (e.g. mBank).

In summary, alternative investments in the form of commodity funds are not only a way to strategically diversify an investment portfolio over the long term but also a short-term "lifebuoy" that should be used when making dynamic tactical asset allocation and rebuilding a portfolio in hostile market conditions. This is important information for investment advisers and individual investors.

The present studies have been carried out for two different investment horizons during Poland's rapidly rising inflation rate and increased interest rates. It should be continued considering the subsequent period of ongoing hostile market conditions (including further increases in interest rates and inflation levels). When the inflation rate visibly falls, detailed ex-post studies should be carried out.

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