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# INFLATION AND REAL RETURNS ON LOCAL HOUSING MARKETS IN POLAND – EMPIRICAL RELATIONSHIP

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ABSTRACT

The common belief that real estate investments are an inflation hedge has been repeatedly challenged by scientific research. It was found that this issue requires in-depth research. Individual researchers have expanded their research to include various specific themes. However, there has been no research focused on the empirical relationship between the inflation rate and the real return on housing market investments. This study aimed to examine this relationship in detail within the framework of the five research questions formulated. Therefore, the article addresses this issue, considering different investment horizons (from 1 to 15 years) and 16 local housing markets in Poland. The research period covered was from 3Q 2006 to 4Q 2024. Based on hedonic price indices of 1m², the moving observation window method was used to obtain time series of real returns on local markets. Then, linear correlation and determination coefficients were calculated, and appropriate statistical tests were applied. It was found that: 1) the examined relationship was heterogenous, and dependent of the investment horizonas well as inflation regime; 2) the extent to which the CPI explained real return volatility was diverse; 3) it is not possible to identify a threshold (maximum) CPI for which real return remained non-negative; 4) for most investment horizons, the median CPI in periods when real return was positive did not differ significantly from the median CPI in periods when real return was negative; 5) for most local markets, the average real return in a high-inflation regime was significantly higher than in a low-inflation regime.

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## 1. Introduction

The common belief that real estate investments are an inflation hedge has been repeatedly challenged by scientific research. It was found that this issue requires in-depth research. Individual researchers have expanded their research to include various specific themes (see query in: Muckenhaupt et al., 2025; Dittmann, 2025; Nguyen, 2022; Ekemode, 2021; Lee, 2021; Yeap & Lean, 2017). However, there has been no research focused on the empirical relationship between the inflation rate and the real return on housing market investments. This issue is particularly relevant in the context of Bodie's definition of an inflation hedge instrument.

According to Bodie (1976), a financial instrument that protects capital against inflation can be defined as follows: "A security is an inflation hedge if it offers »protection« against inflation, which in turn means the elimination or at least the reduction of the possibility that the real rate of return on the security will fall below some specified »floor« value such as zero". If the investor's goal is to protect capital against loss of purchasing power, he/she will (considering this definition) seek investments likely to generate a positive real rate of return. For such an investor, the key issue is knowledge of the real rate of return on a given type of investment for different horizons and under different inflationary conditions. This knowledge is also important for investors operating in the housing market.

The aforementioned lack of research on the relationship between inflation and the real rate of return on the housing market does not mean that there is no related research. It is important to note the linkage between the research problem formulated in this study and research focused on the relationship between inflation and the nominal returns on the housing


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market. These issues actually share a common ground, stemming from the relationship between nominal returns and real returns as described by Fisher (1930).

Fisher's equation, adapted for the purposes of this article (Formula 1), describes the real holding period yield ($HPY_{real}$) as determined by two variables: the nominal holding period yield ($HPY_{nom}$) and the holding period inflation rate. A higher inflation rate results in a lower real rate of return, assuming a constant nominal rate of return (and vice versa). However, the nominal rate of return is not constant over time (it results from price volatility). It is therefore important to understand the relationship between these two variables (inflation and nominal return), their existence and nature.

$$HPY_{real} = \frac{1+HPY_{nom}}{1+inflation\ rate} - 1 \qquad (1)$$

Research into the relationship between inflation and nominal returns on housing markets has been ongoing for a long time, with numerous researchers contributing to the field. An overview of the most important ones is presented in the next section.

Given the lack of research on the relationship between the inflation rate and the real return on housing markets, the objective of this study was to investigate this relationship in detail across various investment horizons and different local housing markets in Poland.

Five research questions were formulated:

1. What was the empirical relationship between CPI and real HPY?
2. To what extent did the inflation rate determine real HPY?
3. Is it possible to identify a threshold (maximum) CPI for which real HPY remained non-negative?
4. What was the median inflation rate in periods when real HPY was positive compared to the median inflation rate in periods when real HPY was negative?

   For the fourth research question, the following hypotheses were formulated:

   *Null hypothesis*: the median CPI in periods when real HPY was positive did not differ significantly from the median CPI in periods when real HPY was negative.

   *Alternative hypothesis*: the median CPI in periods when real HPY was positive differed significantly from the median CPI in periods when real HPY was negative.
5. In conditions of higher inflation, did investing in the housing market protect capital better against inflation than in conditions of lower inflation?

For the fifth research question, the following hypotheses were formulated:

*Null hypothesis*: The average real HPY in a high inflation regime did not differ significantly from the average real HPY in a low inflation regime.

*Alternative hypothesis*: The average real HPY in a high inflation regime did not differ significantly from the average real HPY in a low inflation regime.

## 2. Literature review

Research into the relationship between nominal investment returns (or price indices) in the real estate market and the inflation rate has been ongoing for a long time and covered various local markets in both developed and developing countries. The literature review presented below has been organized as follows: 1) studies the results of which were most frequently repeated; 2) studies with results deviating from the "pattern"; 3) studies in which scientists emphasized the complexity of the issue and more detailed studies (in particular studies that demonstrate the time-varying long-term relationship of real estate and inflation); 4) relevant studies on the housing market in Poland.

Based on a literature review, the examined relationship was positive in the long run in many local markets; in the short run, the outcomes were more diverse.

Barkham et al. (1996) researched the UK property market in the years 1982-1994. Using causality analysis, they found that: 1) in the short run, changes in expected and actual inflation affect returns to direct property; 2) in the long run, property returns, and inflation are cointegrated. Similarly, Chu and Sing (2004) showed significant causality between inflation and real estate return in China between 1988 and 2002. Stevenson (2000) examined 11 local markets in the UK from 1968 to 1997 and, using OLS tests, stated little evidence of a consistent and stable relationship between the housing market and inflation, with large variations in the results between regions. Using cointegration analysis, he provided evidence that housing and inflation are cointegrated. Anari and Kolari (2002), examining house prices in the US from 1968 to 2000, using ARDL models, also found that property prices and inflation were cointegrated. Le Moigne and Viveiros (2008) studied the Canadian real estate market between 1973 and 2007. Using cointegration tests, they stated a positive long-term relationship between inflation and total return. Expanding research into sources of income, they found that appreciation return was positive and significantly correlated with inflation, and income return (generated by rental) was significantly but negatively correlated with inflation. Investigating the residential market in New Zealand, Gunasekarage et al. (2008) stated a long-term relationship between the housing returns and inflation during 1979 – 2003. Ma and Liu (2010) examined the short- and long-term relationships between property prices and CPI in Australia's eight largest cities between 1998 and 2008, using the ARDL and the ECM model. Their results did not prove that property price indices were correlated with CPI in the short term. However, long-term relationships between property price indices and CPI were detected for most cities. Inglesi-Lotz and Gupta (2013), using the ARDL model, found long-term cointegration between house prices in South Africa and the CPI between 1970 and 2011. As one of the few, Hong et al. (2013) studied the relationship between housing nominal and real returns and CPI in the US (in years 1975 - 2008), the UK (in years 1982 - 2008), and Korea (in years 1987 - 2008). For all countries, they found a positive correlation for nominal returns and a negative correlation for real returns. Wahab et al. (2018) stated a long-run relationship between house returns and Nigeria's inflation in 1999-2017, while the results for short periods were mixed. In a study conducted for the Paris housing market in 1998 – 2017, for 10-year investment horizons, Zouari and Nasreddine (2023) obtained the same results as Le Moigne and Viveiros. They noticed that total returns were significantly positively correlated with inflation. Deepening the research, the researchers stated significant positive correlations for capital returns (i.e. resulting from price volatility), and negative insignificant ones for income returns. Lee (2021) investigated residential markets in China, Russia (in the years 2003-2019) and India (2010 – 2019). The cointegration analysis results proved that inflation and the residential properties in these markets were cointegrated. Ekemode (2021) found that residential assets' returns in local markets in Nigeria were cointegrated with inflation in the long run (1999-2018). However, he obtained mixed results by employing the OLS regression technique to analyze the short-term relation. Ojo et al. (2022) conducted a causality analysis for the residential market in Nigeria in the years 2000 – 2019, showing that inflation affects property returns.

However, the results of some studies have provided opposite conclusions. Glascock et al. (2008) stated that residential property returns in Hong Kong during 1998-2006 were not cointegrated with inflation in the long term. Umeh and Oluwasore (2015) conducted a regression analysis for four local housing markets in Nigeria during 2002-2014, considering separately capital, income and total returns. The results were not statistically significant. Wu and Tidwell (2015) examined the relationship between housing price dynamics and inflation in 35 Chinese cities between 2000 and 2010. Causality tests led to statistically significant results for only one of the regions. Also, Tang and Qian (2019) analyzed the relationship between housing prices and inflation by employing housing price indices from 29 large Chinese cities in 2003–2013 based on the ARDL model. They found no long-run co-integration relationship between housing prices and inflation.

Conducting their research, scientists emphasised the complexity of the issue. The heterogeneity of the relationship between inflation and real estate returns was highlighted, among others, by Barkham et al. (1996). According to them, the size of the coefficients on the error correction term (obtained in research) indicated that the property adjustment to inflation (or vice versa) was very weak or slow. They concluded that. if the relationship between the two series becomes disturbed, some considerable time may elapse before equilibrium is re-established. The dynamics of the relationship between inflation and returns on real estate, including shifts over time and the need for separate analysis for the short and long term, are also highlighted by Hoesli et al. (1997).

Further researchers conducted more detailed studies. Chen and Foo (2006), when comparing residential property markets in London, Taipei, Tokyo, Singapore and Hong Kong during 1970. – 2003, considered different types of inflation: transient price shocks, permanent price shocks and long-term price shocks. They stated differences in correlation levels depending on the type and extent of inflation and the local market. According to Grimes et al. (2004), who analyzed 14 regions of New Zealand from 1981 to 2002, CPI was fully incorporated into house prices contemporaneously under prosperous market conditions; whilst under depressed market conditions, only three-quarters of CPI was contemporaneously embodied in prices. Wang et al. (2008) examined Taiwanese housing returns and inflation during 1991 – 2006 for low and high inflation levels. They concluded that when high inflation was negative or lower than 0.83% (monthly), the housing prices seemed unchangeable, whilst when expected inflation was higher than 0.83%, the capital flowed back to the real estate market, pushing up the prices. Katrakilidis and Trachanas (2012), when analyzing the housing market in Greece in the years 1999 – 2011, detected that, in the


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short run, house prices reacted more rapidly to a rising inflation rate (and achieving equilibrium nearly after 12 months), than to a falling inflation rate (with equilibrium achieved at the beginning of the 2nd year). They also found that a decrease in CPI had a greater impact on house prices in the long run than an increase. Hong et al. (2013) found that, in the US, UK and Korean housing markets, a positive inflation shock drove a negative correlation between real housing return and inflation, while a negative inflation shock drove a positive correlation. Secondly, they proved that the effect of the positive inflation shock on housing returns was dominantly stronger than that of the negative shock. Yeap and Lean (2017) examined the housing market in Malaysia from 1999 to 2015. They stated that house prices react more quickly to falling CPI than to rising CPI in the short run. They also detected a statistically significant positive relation between CPI and prices when CPI falls, and a negative relation between CPI and prices when CPI increases (but non-significant). In the long run, the results were non-significant. Aqsha and Mansur (2018) stated that house prices in Malaysia responded to the inflation rate asymmetrically in the long run from 1986 to 2018.

Recent studies also highlight that the correlation between inflation and asset returns (including real estate) may differ over time (Zouari & Nasreddine, 2023). Muckenhaupt et al. (2025) state that "the two series do not always move in tandem". Therefore, one option for examining this relationship is to analyze different subperiods using the rolling correlation coefficient, as Zouari and Nasreddine did. The researchers obtained correlation coefficient values from -0.14 to 0.62 in a cited study. Muckenhaupt et al. (2025), using data from 1990 to 2023 across six countries as well as a MS-VECM, demonstrated the time-varying long-term relationship of real estate and inflation. They compared a stable time regime to a regime of turbulent times, underlining the non-linear hedging capabilities of real estate over time.

Concerning the Polish housing market, Melnychenko et al. (2022), using regression analysis, demonstrated that, in the years 2009 - 2021, the real estate prices in most of the biggest housing markets in Poland were positively related to the CPI. Wolski (2022), using aggregated hedonic price indices, achieved the same results for the same period. The cointegration analysis used by Wolski (2023) allowed him to conclude that, in the years 2009-2021, residential property prices in the biggest housing markets and inflation rates were not cointegrated. However, in subsequent studies, Wolski and Karp (2025) applied threshold cointegration techniques to identify high and low inflation regimes and assess the long-term and short-term relationships between housing property prices and inflation during 2006 – 2024. They proved that dividing the HICP data improved the model's parameters. They stated that the long-run elasticities of house prices concerning the personal consumption deflator significantly differed in periods of high (above 2.3%) and low inflation (however, they indicated a positive relationship between variables).

The presented query shows that the relationship between nominal returns and inflation in the real estate market is time-varying, investment horizon dependent (long run versus short run), and inflation regime dependent. It can be assumed that the relationship between inflation and real return is also inconsistent.

## 3. Material and methods

The study was conducted for the 16 provincial cities in Poland, i.e.: Warszawa (Warsaw)[1], Trójmiasto (Tri-City), Kraków (Cracow), Wrocław (Wroclaw), Poznań (Poznan), Łódź (Lodz), Białystok, Bydgoszcz, Katowice, Kielce, Lublin, Olsztyn, Rzeszów, Szczecin, Zielona Góra, and Opole.

Quarterly data from the National Bank of Poland (nbp.pl) was used: (1) hedonic price indices of 1m$^2$ of flats on the secondary market[2]; (2) the quarterly (QoQ) overall consumer price index (CPI)[3] was used as a proxy for actual inflation[4]. Study period adopted: 3Q2006 - 4Q2024.

Investment horizons from 1 to 15 years (extended by one year, 15 in total) were used.

Firstly, time series of hypothetical nominal investment yields (HPY, holding period yields) were constructed for each local market using a moving observation window method with overlapping sub-

[1] In the case of cities for which English equivalents are in common use, these are given in brackets. The Tri-City is a polycentric metropolitan center comprising three connected cities: Gdańsk, Sopot and Gdynia.

[2] Retrieved from NBP database (available at: nbp.pl/publikacje/cykliczne-materialy-analityczne-nbp/rynek-nieruchomosci/).

[3] Retrieved from NBP database (available at: nbp.pl/statystyka-i-sprawozdawczosc/inflacja-bazowa/)

[4] The CPI is the most adopted in such studies; see Arnold and Auer (2015).

periods (overlapping with quarterly steps). A total of 240 time series of nominal HPY (16 cities,15 horizons) were constructed. Secondly, 15 time series of holding period inflation rate (one series for each investment horizon) were constructed similarly (using a moving observation window method with overlapping sub-periods). Thirdly, the nominal HPY series were transformed into a real HPY series using the Fisher equation.

To answer the 1 - 3 research questions, 240 scatterplots were constructed (for each local market and each investment horizon), and linear correlation and determination coefficients were calculated. To answer the 4th research question, Mann-Whitney's nonparametric test was performed, and box plots were prepared (for selected cities and horizons). To answer the 5th. research question, the Kolmogorov-Smirnov nonparametric test[5] was performed (for selected horizons). The tests were performed using the Statistica package, and p-value = 0.05 was assumed.

## 4. Results

### 4.1. Empirical relationship between CPI and real HPY

Based on the scatterplots[6] (Fig. A.1 – A.3), it was found that the relationship between the CPI and real HPY varies:

1) for different investment horizons,
2) for low and high CPI values.

The relationship examined was particularly interesting in the case of shorter investment horizons, for which noticeable differences in its development were found depending on the inflation rate. Namely, no relationship between inflation and real rate of return was observed for lower inflation rates, while for higher inflation rates, such a relationship was observed.

For this reason, to deepen the analysis, in the case of shorter investment horizons, linear correlation coefficients were calculated: 1) for CPI values altogether, 2) separately for lower CPI and higher CPI (for horizons 1 – 11 years, for which it was possible to make a division based on the relationship shown in the graph)[7].

Based on the calculations, it was concluded that for horizons from 1 to 7 years, the division into high and low inflation was most justified (therefore, the results for these horizons are presented separately in Tables 1 and 2). In contrast, for investment horizons exceeding 7 years, statistically significant linear correlation coefficients dominated calculations made for the entire CPI range (only these results are presented in Table 3).

In the case of short investment horizons (1Y – 5Y) and average annual inflation (AVACPI) above the set thresholds (i.e. above 3.2% – 5%) (Table 1), a statistically significant negative relationship between the inflation rate and real HPY was found for almost all local markets. In most cases, this relationship was quite strong, but in some cases, it was moderate or very strong. The calculated determination coefficients show that CPI explains the volatility of real HPY to a relatively large extent (and in some cases to a very large extent). In the case of 6-year and 7-year horizons, this relationship was characteristic of only a few local markets.

In the case of short investment horizons (1Y – 7Y) and AVACPI indicators below the set thresholds (below 3.2% – 5%) (Table 2), in most cases, no statistically significant relationship was found. The calculated determination coefficients were very low, which means that, in the case of low CPI values, this variable explains the volatility of real HPY to a negligible extent.

**Table 1**

Correlation coefficients (CC) and determination coefficients ($R^2$) calculated for investment horizons (IH) up to 7 years and AVACPI above threshold value

| local market | IH = 1Y | | IH= 2Y | | IH =3Y | | IH=4Y | | IH =5Y | | IH =6Y | | IH =7Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **AVACPI >5%** | | **AVACPI > 4.9%** | | **AVACPI > 4.5%** | | **AVACPI > 4.4%** | | **AVACPI > 3.9%** | | **AVACPI > 3.2%** | | **AVACPI > 4.3%** | |
| | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ |
| Białystok | **-0.74** | 0.55 | **-0.84** | 0.71 | **-0.98** | 0.97 | **-0.90** | 0.81 | **-0.90** | 0.80 | -0.55 | 0.31 | -0.16 | 0.03 |
| Bydgoszcz | **-0.70** | 0.49 | **-0.94** | 0.88 | **-0.91** | 0.82 | **-0.97** | 0.93 | **-0.95** | 0.90 | **-0.88** | 0.78 | **-0.75** | 0.57 |
| Trójmiasto | **-0.73** | 0.53 | **-0.88** | 0.78 | **-0.80** | 0.63 | **-0.89** | 0.79 | **-0.95** | 0.91 | **-0.94** | 0.88 | **-0.83** | 0.69 |
| Katowice | **-0.85** | 0.72 | **-0.94** | 0.88 | **-0.91** | 0.84 | **-0.96** | 0.92 | **-0.91** | 0.82 | **-0.72** | 0.51 | 0.04 | 0.00 |

[5] Kolmogorov-Smirnow nonparametric test can be used to compare 2 groups in terms of the mean value of a given variable (https://www.statsoft.pl/textbook/stathome_stat.html?https%3A%2F%2Fwww.statsoft.pl%2Ftextbook%2Fstnonpar.html)

[6] The selected ones are included in the paper.

[7] The issue of the ambiguous inflation threshold (i.e. defining inflation as high or low) was raised in the "Discussion" section.


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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kielce | -0.47 | 0.22 | **-0.83** | 0.69 | **-0.89** | 0.80 | **-0.79** | 0.63 | -0.50 | 0.25 | 0.22 | 0.05 | 0.47 | 0.22 |
| Kraków | **-0.86** | 0.74 | **-0.85** | 0.72 | **-0.81** | 0.66 | **-0.91** | 0.83 | -0.20 | 0.04 | -0.02 | 0.00 | 0.08 | 0.01 |
| Lublin | **-0.79** | 0.62 | **-0.91** | 0.82 | **-0.96** | 0.93 | **-0.98** | 0.96 | **-0.87** | 0.77 | -0.36 | 0.13 | -0.16 | 0.03 |
| Łódź | -0.42 | 0.18 | **-0.75** | 0.56 | **-0.89** | 0.79 | **-0.95** | 0.90 | **-0.97** | 0.94 | **-0.92** | 0.84 | **-0.72** | 0.52 |
| Olsztyn | **-0.76** | 0.58 | **-0.87** | 0.76 | **-0.96** | 0.92 | **-0.97** | 0.94 | **-0.98** | 0.95 | **-0.86** | 0.75 | -0.28 | 0.08 |
| Poznań | **-0.86** | 0.74 | **-0.92** | 0.85 | **-0.69** | 0.48 | **-0.73** | 0.54 | **-0.74** | 0.55 | -0.24 | 0.06 | 0.08 | 0.01 |
| Rzeszów | **-0.85** | 0.72 | **-0.78** | 0.61 | -0.55 | 0.30 | -0.47 | 0.22 | -0.41 | 0.17 | 0.05 | 0.00 | 0.23 | 0.05 |
| Szczecin | -0.54 | 0.29 | **-0.70** | 0.49 | **-0.91** | 0.82 | **-0.97** | 0.94 | **-0.96** | 0.93 | **-0.90** | 0.81 | **-0.72** | 0.52 |
| Warszawa | **-0.93** | 0.86 | **-0.98** | 0.95 | **-0.87** | 0.75 | **-0.86** | 0.74 | **-0.80** | 0.63 | -0.45 | 0.21 | -0.08 | 0.01 |
| Wrocław | **-0.86** | 0.74 | **-0.89** | 0.79 | **-0.94** | 0.89 | **-0.75** | 0.56 | **-0.66** | 0.44 | **-0.70** | 0.50 | -0.06 | 0.00 |
| Zielona Góra | **-0.79** | 0.62 | -0.53 | 0.28 | **-0.80** | 0.65 | **-0.62** | 0.39 | **-0.62** | 0.39 | -0.30 | 0.09 | -0.20 | 0.04 |
| Opole | **-0.75** | 0.56 | **-0.93** | 0.87 | **-0.80** | 0.63 | **-0.92** | 0.84 | -0.40 | 0.16 | -0.14 | 0.02 | -0.19 | 0.03 |

*Bold correlation coefficients are statistically significant.*

*Source*: own calculation.

**Table 2**

Correlation coefficients (CC) and determination coefficients ($R^2$) calculated for investment horizons (IH) up to 7 years and AVACPI below threshold value

| local market | IH= 1Y | | IH= 2Y | | IH =3Y | | IH =4Y | | IH =5Y | | IH =6Y | | IH =7Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **AVACPI ≤ 5%** | | **AVACPI ≤ 4.9%** | | **AVACPI ≤ 4.5%** | | **AVACPI ≤ 4.4%** | | **AVACPI ≤ 3.9%** | | **AVACPI ≤ 3.2%** | | **AVACPI ≤ 4.3%** | |
| | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ |
| Białystok | -0.01 | 0.00 | -0.04 | 0.00 | -0.10 | 0.01 | -0.12 | 0.01 | -0.18 | 0.03 | -0.22 | 0.05 | -0.16 | 0.02 |
| Bydgoszcz | -0.07 | 0.00 | -0.10 | 0.01 | -0.14 | 0.02 | -0.16 | 0.02 | -0.21 | 0.05 | -0.28 | 0.08 | -0.22 | 0.05 |
| Trójmiasto | -0.18 | 0.03 | **-0.35** | 0.12 | **-0.43** | 0.18 | **-0.43** | 0.19 | **-0.45** | 0.20 | **-0.51** | 0.26 | **-0.43** | 0.18 |
| Katowice | -0.01 | 0.00 | -0.01 | 0.00 | -0.11 | 0.01 | -0.12 | 0.01 | -0.18 | 0.03 | -0.25 | 0.06 | -0.19 | 0.04 |
| Kielce | 0.18 | 0.03 | **0.27** | 0.07 | **0.33** | 0.11 | **0.35** | 0.12 | **0.36** | 0.13 | 0.32 | 0.10 | **0.37** | 0.14 |
| Kraków | -0.13 | 0.02 | -0.19 | 0.04 | -0.21 | 0.04 | -0.22 | 0.05 | -0.30 | 0.09 | **-0.39** | 0.15 | **-0.37** | 0.14 |
| Lublin | 0.12 | 0.01 | 0.15 | 0.02 | 0.15 | 0.02 | 0.16 | 0.03 | 0.15 | 0.02 | 0.09 | 0.01 | 0.14 | 0.02 |
| Łódź | 0.00 | 0.00 | 0.03 | 0.00 | 0.01 | 0.00 | -0.03 | 0.00 | -0.08 | 0.01 | -0.15 | 0.02 | -0.12 | 0.02 |
| Olsztyn | -0.01 | 0.00 | -0.07 | 0.01 | -0.09 | 0.01 | -0.11 | 0.01 | -0.19 | 0.03 | -0.28 | 0.08 | -0.21 | 0.05 |
| Poznań | -0.07 | 0.00 | -0.16 | 0.03 | -0.27 | 0.07 | -0.29 | 0.08 | **-0.33** | 0.11 | **-0.36** | 0.13 | -0.28 | 0.08 |
| Rzeszów | 0.03 | 0.00 | -0.01 | 0.00 | -0.03 | 0.00 | -0.05 | 0.00 | -0.11 | 0.01 | -0.13 | 0.02 | -0.15 | 0.02 |
| Szczecin | -0.06 | 0.00 | -0.12 | 0.01 | -0.19 | 0.04 | -0.22 | 0.05 | -0.27 | 0.07 | -0.31 | 0.10 | -0.26 | 0.07 |
| Warszawa | -0.10 | 0.01 | -0.21 | 0.05 | **-0.29** | 0.08 | **-0.30** | 0.09 | **-0.34** | 0.11 | **-0.40** | 0.16 | -0.32 | 0.10 |
| Wrocław | -0.16 | 0.03 | -0.25 | 0.06 | **-0.29** | 0.08 | -0.25 | 0.06 | **-0.31** | 0.10 | **-0.41** | 0.17 | **-0.35** | 0.12 |
| Zielona Góra | 0.07 | 0.00 | 0.04 | 0.00 | 0.00 | 0.00 | -0.01 | 0.00 | -0.08 | 0.01 | -0.18 | 0.03 | -0.17 | 0.03 |
| Opole | -0.04 | 0.00 | -0.10 | 0.01 | -0.20 | 0.04 | -0.24 | 0.06 | -0.24 | 0.06 | **-0.37** | 0.14 | -0.29 | 0.09 |

*Bold correlation coefficients are statistically significant.*

*Source*: own calculation.

The relationship examined was also inconsistent in the case of longer investment horizons (Table 3). For investment horizons of 8 to 12 years, a statistically significant moderate positive relationship between the variables examined was found for most markets. The values of the determination coefficients were predominantly relatively low, indicating that, for these investment horizons, the CPI explains the volatility of real HPY to a relatively low degree (in some cases, this degree was moderate). However, in the case of a 15-year horizon, a statistically significant, relatively strong or moderate negative correlation was found for most markets. The calculated determination coefficients most often showed a moderate extent to which the CPI explained real HPY volatility, rarely a small or large extent.

**Table 3**

Correlation coefficients (CC) and determination coefficients ($R^2$) calculated for investment horizons (IH) over 7 years

| local market | IH = 8Y | | IH =9Y | | IH =10Y | | IH =11Y | | IH =12Y | | IH=13Y | | IH =14Y | | IH =15Y | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ | CC | $R^2$ |
| Białystok | **0.52** | 0.27 | **0.62** | 0.38 | **0.71** | 0.50 | **0.78** | 0.61 | **0.65** | 0.43 | 0.37 | 0.14 | -0.15 | 0.02 | **-0.71** | 0.50 |
| Bydgoszcz | 0.23 | 0.05 | **0.42** | 0.17 | **0.57** | 0.32 | **0.58** | 0.34 | 0.04 | 0.00 | -0.40 | 0.16 | **-0.63** | 0.40 | **-0.89** | 0.79 |
| Trójmiasto | 0.27 | 0.07 | **0.47** | 0.22 | **0.72** | 0.52 | **0.83** | 0.69 | **0.65** | 0.42 | 0.29 | 0.08 | -0.16 | 0.03 | **-0.67** | 0.46 |
| Katowice | **0.36** | 0.13 | **0.46** | 0.22 | **0.62** | 0.38 | **0.70** | 0.50 | **0.45** | 0.20 | 0.01 | 0.00 | -0.43 | 0.18 | **-0.76** | 0.57 |
| Kielce | **0.71** | 0.50 | **0.69** | 0.48 | **0.75** | 0.56 | **0.73** | 0.53 | **0.47** | 0.22 | 0.09 | 0.01 | -0.33 | 0.11 | **-0.81** | 0.66 |
| Kraków | **0.51** | 0.26 | **0.65** | 0.42 | **0.75** | 0.56 | **0.76** | 0.57 | **0.66** | 0.44 | **0.70** | 0.49 | **0.80** | 0.65 | 0.25 | 0.06 |
| Lublin | **0.51** | 0.26 | **0.62** | 0.39 | **0.70** | 0.50 | **0.65** | 0.42 | 0.16 | 0.02 | -0.38 | 0.14 | **-0.69** | 0.47 | **-0.92** | 0.85 |
| Łódź | **0.46** | 0.21 | **0.55** | 0.30 | **0.66** | 0.43 | **0.65** | 0.42 | 0.26 | 0.07 | -0.11 | 0.01 | -0.40 | 0.16 | **-0.81** | 0.66 |
| Olsztyn | **0.41** | 0.17 | **0.53** | 0.28 | **0.66** | 0.43 | **0.72** | 0.52 | **0.57** | 0.32 | 0.07 | 0.00 | -0.29 | 0.09 | **-0.74** | 0.55 |

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Poznań | **0.40** | 0.16 | **0.56** | 0.32 | **0.69** | 0.47 | **0.74** | 0.55 | **0.50** | 0.25 | 0.28 | 0.08 | -0.12 | 0.01 | **-0.64** | 0.41 |
| Rzeszów | 0.01 | 0.00 | 0.07 | 0.01 | 0.08 | 0.01 | -0.01 | 0.00 | -0.30 | 0.09 | -0.38 | 0.15 | -0.47 | 0.22 | **-0.67** | 0.44 |
| Szczecin | **0.46** | 0.22 | **0.60** | 0.36 | **0.71** | 0.51 | **0.85** | 0.71 | **0.76** | 0.57 | **0.43** | 0.18 | -0.19 | 0.04 | **-0.78** | 0.61 |
| Warszawa | **0.37** | 0.14 | **0.54** | 0.29 | **0.69** | 0.47 | **0.74** | 0.54 | **0.58** | 0.34 | 0.29 | 0.09 | -0.07 | 0.00 | **-0.56** | 0.31 |
| Wrocław | **0.53** | 0.28 | **0.67** | 0.45 | **0.82** | 0.68 | **0.86** | 0.73 | **0.73** | 0.54 | **0.70** | 0.48 | **0.75** | 0.56 | 0.15 | 0.02 |
| Zielona Góra | **0.58** | 0.33 | **0.66** | 0.44 | **0.72** | 0.51 | **0.72** | 0.52 | **0.64** | 0.41 | **0.46** | 0.21 | 0.23 | 0.05 | -0.51 | 0.26 |
| Opole | **0.37** | 0.13 | **0.49** | 0.24 | **0.57** | 0.33 | **0.58** | 0.33 | **0.46** | 0.22 | 0.25 | 0.06 | 0.00 | 0.00 | -0.38 | 0.15 |

*Bold correlation coefficients are statistically significant.*

*Source*: own calculation.

Based on a visual assessment of the graphs and the results of the correlation analysis, it was also concluded that it is impossible to identify a threshold (maximum) CPI for which real HPY remained non-negative (third research question).

### 4.2. Inflation rate level in periods when real HPY was positive compared to periods when real HPY was negative

Based on the results of the Mann–Whitney test conducted for 16 local markets (Table 4), it was concluded that the fourth research question cannot be answered unambiguously.

In most cases (78%), the test results were statistically non-significant, meaning there were no grounds for rejecting the null hypothesis. This implies that the median inflation rate (CPI) in periods when real HPY was positive did not differ significantly from the median inflation rate (CPI) in periods when real HPY was negative.

However, in 22% of cases, the test results were statistically significant. When conducting a more detailed analysis (i.e. considering different investment horizons), the null hypothesis was rejected for the shortest investment horizons for most local markets. It was found that the median CPI for which real HPY was negative was significantly higher than the median CPI for which real HPY was positive. Moreover, the null hypothesis was rejected only for a few local markets in the case of longer horizons. However, in these rare cases, it was found conversely that the median CPI for which real HPY was negative was significantly lower than the median CPI for which real HPY was positive.

Additionally, box plots for the six largest housing markets were prepared showing the main characteristics of the distributions of CPI values for which HPY values were negative compared with those of the distributions of CPI values for which HPY values were positive (Figures 1-3). Visual assessment of the graphs allows differences in individual characteristics of the distributions to be recognized.

**Table 4**

Mann – Whitney test results

| Investment horizon (in years) | Number of statistically significant results | | Number of statistically non-significant results |
|---|---|---|---|
| | meN>meP | meP>meN | |
| 1 | 9 | 1 | 6 |
| 2 | 9 | 1 | 6 |
| 3 | 6 | 1 | 9 |
| 4 | 2 | 2 | 12 |
| 5 | 0 | 2 | 14 |
| 6 | 0 | 2 | 14 |
| 7 | 0 | 2 | 14 |
| 8 | 0 | 2 | 14 |
| 9 | 0 | 2 | 14 |
| 10 | 0 | 3 | 13 |
| 11 | 0 | 5 | 11 |
| 12 | 0 | 2 | 14 |
| 13 | 0 | 1 | 15 |
| 14 | 0 | 0 | 16 |
| 15 | 0 | 0 | 16 |
| ***Total*** | ***26*** | ***26*** | ***188*** |
| ***Percentage*** | ***11%*** | ***11%*** | ***78%*** |

*meN - median CPI for which real HPYs were negative*
*meP - median CPI for which real HPYs were positive*

*Source*: own calculation.

For 1-year horizons (Fig. 1), the values of almost all quartiles of CPI distributions (Q1, Q2, Q3) for which HPY values were negative were higher than the values of their counterparts in CPI distributions for which HPY values were positive. The same can be observed in the case of extreme values. This can be interpreted to mean that, in the case of these six cities, negative real HPYs were generally associated with higher inflation, while positive real HPYs were associated with lower inflation.

However, for the 5-year (Fig. 2) and 10-year (Fig. 3) horizons, the results are markedly different. The median, upper quartile and maximum values of CPI distributions for which HPY values were negative were generally lower than the values of their counterparts in CPI distributions for which HPY values were positive. This can be interpreted to mean that, for longer investment horizons (especially 5 years and 10 years), negative real HPYs were generally associated with lower inflation. In contrast, positive real HPYs were associated with higher inflation.

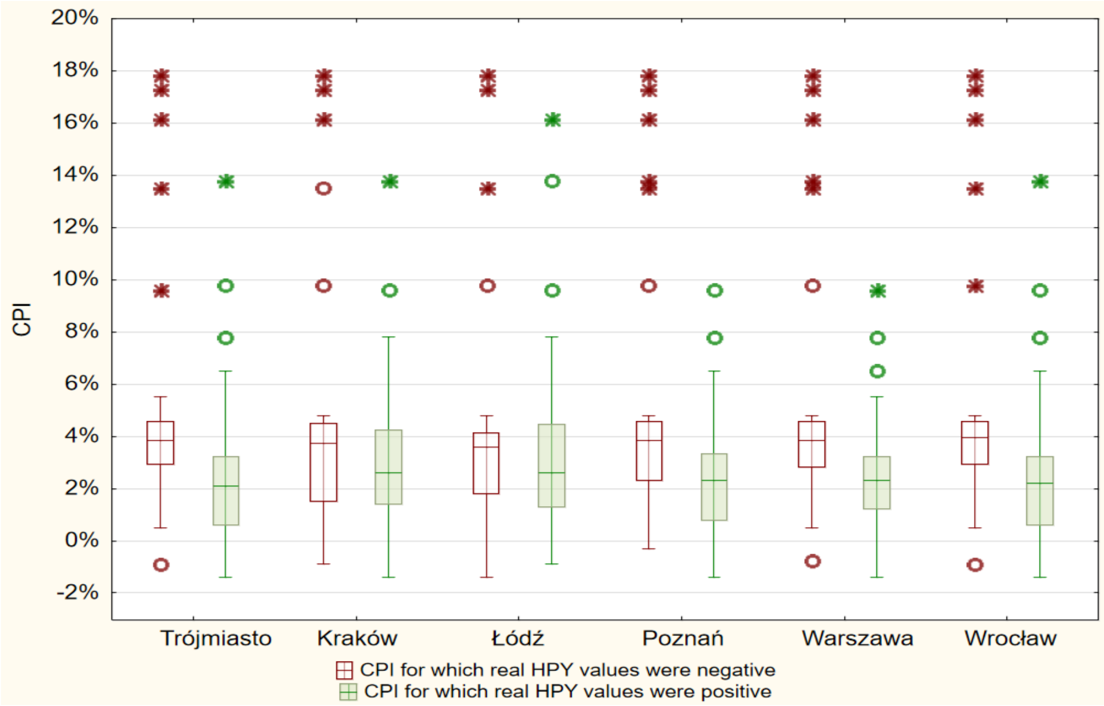


**Fig. 1.** CPI values for which HPY values were negative compared with CPI values for which HPY values were positive; for 1-year investment horizon. *Source:* own elaboration.

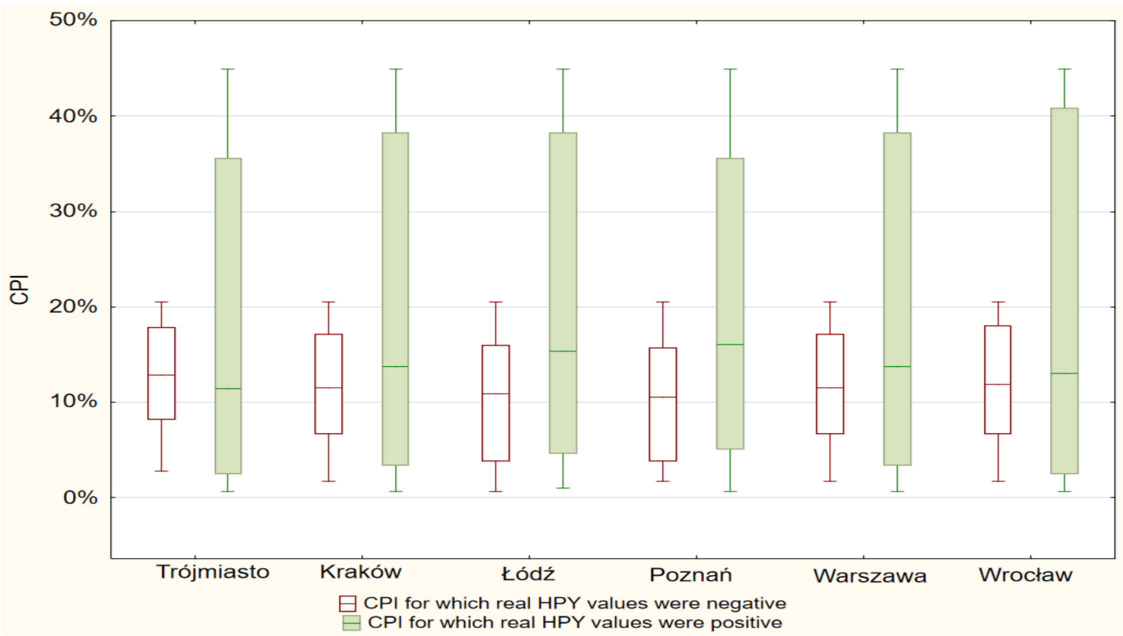


**Fig. 2.** CPI values for which HPY values were negative compared with CPI values for which HPY values were positive; for 5-year investment horizon. *Source:* own elaboration.

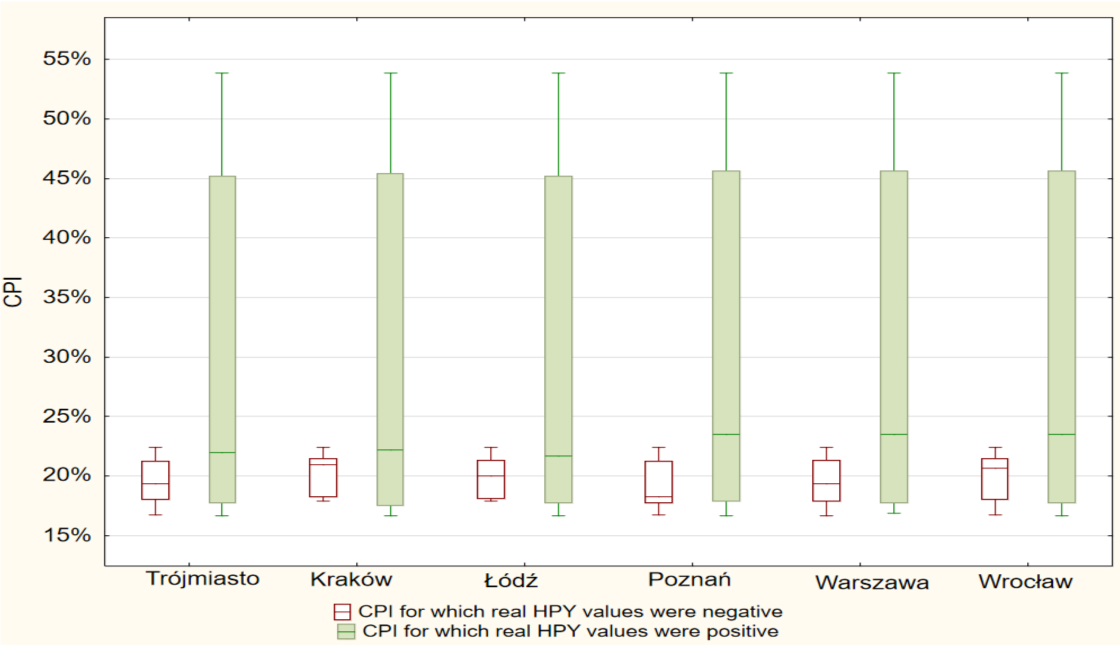


**Fig. 3.** CPI values for which HPY values were negative compared with CPI values for which HPY values were positive; for 10-year investment horizon. *Source:* own elaboration

### 4.3. The average real HPY in a high inflation regime compared with the average real HPY in a low inflation regime

Based on the Kolmogorov–Smirnov test conducted for 16 local markets and investment horizons 1 year – 11 years (Table 5), it was concluded that the results depended on the investment horizon.

**Table 5**

Kolmogorov–Smirnov test results

| Investment horizon (in years) | Number of statistically significant results | | Number of statistically non-significant results |
|---|---|---|---|
| | H>L | L>H | |
| 1 | 0 | 2 | 14 |
| 2 | 1 | 2 | 13 |
| 3 | 3 | 3 | 10 |
| 4 | 11 | 1 | 4 |
| 5 | 14 | 0 | 2 |
| 6 | 15 | 0 | 1 |
| 7 | 15 | 0 | 1 |
| 8 | 15 | 0 | 1 |
| 9 | 15 | 0 | 1 |
| 10 | 15 | 0 | 1 |
| 11 | 15 | 0 | 1 |

*H>L – the average real HPY in a high inflation regime > the average real HPY in a low inflation regime*
*L>H – the average real HPY in a low inflation regime > the average real HPY in a high inflation regime*
*Source*: own calculation.

In the case of the shortest horizons (1–3 years), for the vast majority of local markets (10 – 14), no grounds were found to reject the null hypothesis (the average real HPY in a high inflation regime did not differ significantly from the average real HPY in a low inflation regime). In conditions of higher inflation, investing in the housing market did not protect capital better against inflation than in conditions of lower inflation. The results are entirely different for investment horizons from 4 to 11 years. For the large majority of local markets, the null hypothesis was rejected. It was found that the average real HPY in a high inflation regime was significantly higher than the average real HPY in a low inflation regime. It can be assumed that investing in the housing market in a high inflation regime protects capital better than in conditions of a low inflation regime.

## 5. Discussion

Almost all studies to date have focused on the relationship between inflation and the rate of return on real estate in nominal terms. To the author's knowledge, only Hong et al. (2013) have found a negative relationship between inflation and the real rate of return. This study sought answers to research questions concerning the empirical relationship between the inflation rate and the real rate of return on investment across different investment horizons and local housing markets in Poland. The proposed approach is more functional in assessing the adequacy of an investment for an investor whose goal is to protect the purchasing power of their capital.

Previous studies have demonstrated that the relationship between nominal returns and inflation in the real estate market is time-varying (among others:

Zouari & Nasreddine, 2023; Muckenhaupt et al., 2025; Hoesli et al., 1997), investment horizon dependent (among others: Ekemode, 2021; Wahab et al., 2018; Ma & Liu, 2010; Barkham et al., 1996), and inflation regime dependent (among others: Wolski & Karp, 2025; Aqsha & Mansur, 2018; Yeap & Lean, 2017; Hong et al., 2013; Katrakilidis & Trachanas, 2012; Wang et al., 2008; Chen & Foo, 2006; Grimes et al., 2004). As expected, the heterogeneity of the relationship between CPI and nominal returns on the housing market, as demonstrated by other researchers, was reflected in the heterogeneous relationship between CPI and real returns presented in this study. The results obtained for low inflation rates usually differed from those obtained for high inflation rates. Similarly, the results obtained for shorter investment horizons differed from those obtained for longer investment horizons. The results of the study therefore confirmed the need to conduct research at an appropriate level of detail, considering different inflation regimes and investment horizons.

Referring to conducting research for various inflation regimes, it should be noted that the threshold level of inflation, defining it as high or low, is not clear-cut in the literature on the subject. Khan and Senhadji (2001) examined the relationship between inflation and economic growth in 140 countries, and identified the threshold level of inflation above which inflation significantly slows growth as 1-3% for industrial countries and 7-11% for developing countries. Dholakia et al. (2025) examined countries from 1995 to 2018. They confirmed higher threshold inflation in emerging market economies than in advanced economies, but their estimates were higher than those of Khan and Senhadji. Regarding the Taiwan housing market, Wang et al. (2008) proposed a high inflation regime and a low inflation regime with a threshold inflation of 10.43%. Regarding research concerning the Polish housing market, Wolski and Karp (2025) estimated the inflation threshold at 2.3%. The present paper assumes a variable threshold inflation level ranging from 2.2% to 5% p.a. (depending on the investment horizon), which is a non-standard approach and results from the research method adopted. i.e. visual assessment of scatter plots showing the correlation between CPI and real HPY. Considering the possibility of adopting a different inflation threshold, it is worth noting that the answer to the 5$^{th}$ question could be different.

Furthermore, Hill et al. (2024) highlight delays in recording transactions by notaries and transferring and transcribing these transactions by national Land Registries, so data from the NBP database (used in this paper) may also be shifted over time. Therefore, caution should be exercised when drawing conclusions. It should also be noted that the prices on the residential market and consequently, the results of the study, may have been influenced by government aid programmes such as Rodzina na swoim (Family on its own), Mieszkanie dla Młodych (Housing for Young People), or Bezpieczny Kredyt 2% (Secure Loan 2%).

It should also be noted that when calculating the real return, as in the case of most similar studies, only capital gains were considered, and potential income was not factored in. Researchers who conducted studies distinguishing between capital appreciation and income obtained varying results regarding the relationship with inflation (Le Moigne & Viveiros, 2008; Umeh & Oluwasore, 2015; Zouari & Nasreddine, 2023).

## 6. Conclusions

The research questions formulated in this article aimed to deepen the knowledge of potential investors who seek to protect the purchasing power of their capital through direct investments in the housing market. The research conducted allowed to draw several conclusions.

Firstly, it was found that the relationship between real returns from investment in housing markets and inflation in Poland was heterogeneous. For shorter investment horizons (up to 7 years), no statistically significant relationship was found between the variables in the low regime; however, a negative linear relationship was identified in the high regime. For investment horizons of 8 to 12 years, the relationship was positive for most local markets, whereas for the longest horizon, it was negative.

The heterogeneity of the results obtained is due to the aforementioned heterogeneity of the relationship between inflation and the nominal rate of return. The varying values of the determination coefficients confirm this. The calculated determination coefficients indicate the varying extent to which the CPI explained real HPY volatility. In some cases, inflation was the dominant determinant of real HPY volatility, while in others, it was the nominal return, i.e., price volatility. To conclude, the relationship between real return and inflation may change over time and depend on other market conditions.

The answer to the third research question also points to the complexity of this relationship. Namely, it was found that it is not possible to identify a threshold (maximum) CPI for which real HPY remained non-negative.

The next result obtained may also come as a surprise to investors. Namely, for the vast majority of investment horizons (except for the shortest ones), it was found that the median CPI in periods when real HPY was positive did not differ significantly from the median CPI in periods when real HPY was negative. However, for the majority of local markets, it was found that the average real HPY in a high-inflation regime was significantly higher than the average real HPY in a low-inflation regime. Considering the last result, we can cautiously assume that investing in the housing market during a high-inflation regime may offer more effective capital protection than in a low-inflation regime.

Attempting to identify "cluster markets" (similar markets) and those that stand out from the general observations, the author concludes that identifying markets that diverge from the majority is challenging due to dependence on the type of research conducted and, sometimes, the investment horizon.

In the study on the empirical relationship between the CPI and real HPY, Rzeszów, Kielce, and Trójmiasto were the most frequently identified as outlier markets. Less frequently, these were Wrocław, Kraków, Bydgoszcz, Łódź, Szczecin and Zielona Góra, and least frequently: Warszawa, Opole and Lublin. When considering the level of the inflation rate in periods when real HPY was positive compared to periods when real HPY was negative, Kielce and Lublin were the most frequent outliers. When comparing the average real HPY in a high-inflation regime with the average real HPY in a low-inflation regime, Rzeszów and Kielce were the most frequently identified outlier markets. Considering that Białystok, Katowice, Olsztyn, and Poznań were never classified as outliers, we can identify these markets as the most typical, while Rzeszów and Kielce are the least typical.

To summarize the results obtained, it can be concluded that they do not provide straightforward answers for investors who consider housing market investments as an inflation hedge.

### References

Anari, A., Kolari, J. (2002). House prices and inflation, *Real Estate Economics, 30*(1), 67–84. https://doi.org/10.1111/1540-6229.00030

Aqsha, N.S., Mansur, M. (2018). Is residential property the ultimate hedge against inflation? New evidence from Malaysia based on ARDL and nonlinear ARDL. *MPRA Paper* No. 91508

Arnold, S., & Auer, B. R. (2015). What do scientists know about inflation hedging? *The North American Journal of Economics and Finance, 34*, 187–214. https://doi.org/10.1016/j.najef.2015.08.005

Barkham, R. J., Ward, C. W. R., & Henry, O. T. (1996). The inflation hedging characteristics of U.K. property. *Journal of Property Finance, 7*(1), 62–76. https://doi.org/10.1108/09588689610111629

Bodie, Z. (1976). Common stocks as a hedge against inflation. *The Journal of Finance, 31*(2), 459–470. https://doi.org/10.1111/j.1540-6261.1976.tb01899.x

Chen, M. C., & Foo, T. (2006). Common structural time series components in inflation and residential property prices. *Journal of Real Estate Portfolio Management, 12*(1), 23–36. https://doi.org/10.1080/10835547.2006.12089737

Chu, Y., & Sing, T. F. (2004). Inflation Hedging characteristics of the Chinese real estate market. *Journal of Real Estate Portfolio Management, 10*(2), 145–154. https://doi.org/10.1080/10835547.2004.12089697

Dholakia, R. H., Chander, J., Padhi, I., & Pratap, B. (2021). *Threshold level of inflation – Concept and measurement*. Available at SSRN: https://ssrn.com/abstract=3899374 or https://doi.org/10.2139/ssrn.3899374

Dittmann, I. (2025). *Ocena stopnia zabezpieczenia kapitału przed inflacją na rynku inwestycji mieszkaniowych w Polsce [Assessment of the degree of capital protection against inflation in the residential investment market in Poland]*. Wydawnictwo Uniwersytetu Ekonomicznego we Wrocławiu, Wrocław

Ekemode, B. G. (2021). A fresh look at the inflation-hedging attributes of residential property investments in emerging markets: Evidence from Nigeria. *Property Management, 39*(3), 419–438. https://doi.org/10.1108/PM-03-2020-0020

Essafi Zouari, Y., & Nasreddine, A. (2024). Housing in the greater Paris area as an inflation hedge? [February]. *International Journal of Housing Markets and Analysis, 17*(3), 837–858. https://doi.org/10.1108/IJHMA-08-2022-0118

Fisher, I. (1930). *The Theory of Interest*. A. M. Kelly.

Glascock, J. L., Feng, L., Fan, L., & Bao, H. X. H. (2008). *Inflation hedging characteristics of real estate assets in Hong Kong*. Available at SSRN: https://ssrn.com/abstract=1180658 https://doi.org/10.2139/ssrn.1180658

Grimes, A., Aitken, A., & Kerr, S. (2004). House price efficiency: Expectations, sales, symmetry. *Motu Economic and Public Policy Research*. Working Paper 04-02

Gunasekarage, A., Power, D. M., & Ting Zhou, T. (2008). The long-term inflation hedging effectiveness of real estate and financial assets: A New Zealand investigation. *Studies in Economics and Finance, 25*(4), 267–278. https://doi.org/10.1108/10867370810918155

Hill, R., Pfeifer, N., Steurer, M., & Trojanek, R. (2024). Warning: Some transaction prices can be detrimental to your house price index. *Review of Income and Wealth, 70*(2), 320–344. https://doi.org/10.1111/roiw.12652

Hoesli, M., MacGregor, B. D., Matysiak, G., & Nanthakumaran, N. (1997). The short-term inflation-hedging characteristics of U.K. real estate. *The Journal of Real Estate Finance and Economics, 15*(1), 27–57. https://doi.org/10.1023/A:1007797221329

Hong, G., Khil, J., & Lee, B. S. (2013). Stock returns, housing returns and inflation: Is there an inflation illusion? *Asia-Pacific Journal of Financial Studies, 42*, 511–562. https://doi.org/10.1111/ajfs.12023

Inglesi-Lotz, R., & Gupta, R. (2013). The long-run relationship between house prices and inflation in South Africa: An ARDL approach. *International Journal of Strategic Property Management, 17*(2), 188–198. https://doi.org/10.3846/1648715X.2013.807400

Karp, P., & Wolski, R. (2025). Housing investment in Poland as inflation hedge in low and high inflation. Threshold cointegration analysis. *Real Estate Management and Valuation, 33*(2), 23–38. https://doi.org/10.2478/remav-2025-0013

Katrakilidis, C., & Trachanas, E. (2012). What drives housing price dynamics in Greece: New evidence from asymmetric ARDL cointegration. *Economic Modelling, 29*, 1064–1069. https://doi.org/10.1016/j.econmod.2012.03.029

Khan, M. S., & Ssnhadji, A. S. (2001). Threshold effects in the relationship between inflation and growth. *IMF Staff Papers, 48*(1), 1–21. https://doi.org/10.2307/4621658

Le Moigne, C., & Viveiros, E. (2008). The inflation-hedging ability of Canadian direct real estate return and its components, income, and appreciation. *Journal of Real Estate Portfolio Management, 14*(2), 141–154. https://doi.org/10.1080/10835547.2008.12089802

Lee, H. K. N. (2021). The inflation hedging effectiveness of residential property-evidence from three emerging Asian markets. *International Real Estate Review, 24*(2), 221–251. https://doi.org/10.53383/100321

Ma, L., & Liu, C. (2010). Can investors hedge residential price dynamics of Australia's capital cities? *International Real Estate Review, 13*(1), 30–45. https://doi.org/10.53383/100118

Melnychenko, O., Osadcha, T., Kovalyov, A., & Matskul, V. (2022). Dependence of housing real estate prices on inflation as one of the most important factors: Poland's case. *Real Estate Management and Valuation, 30*(4), 25–41. https://doi.org/10.2478/remav-2022-0027

Muckenhaupt, J., Hoesli, M., & Zhu, B. (2025). Real estate as an inflation hedge: New evidence from an international analysis. *The North American Journal of Economics and Finance, 80*, 102488. Nbp.pl/publikacje/cykliczne-materialy-analityczne-nbp/rynek-nieruchomosci/Nbp.pl/statystyka-i-sprawozdawczosc/inflacja-bazowa/ https://doi.org/10.1016/j.najef.2025.102488

Nguyen, B. T. T. (2023). Can housing investment hedge against inflation? *International Journal of Housing Markets and Analysis, 16*(6), 1071–1088. https://doi.org/10.1108/IJHMA-06-2022-0084

Ojo, O., Dabara, D. I., & Ajayi, M. T. A. (2022). Performance of commercial and residential real estate investments in Ibadan property market, Nigeria. *Property Management, 40*(2), 169–191. https://doi.org/10.1108/PM-07-2020-0046

Stevenson, S. (2000). A long-term analysis of regional housing markets and inflation. *Journal of Housing Economics, 9*(1–2), 24–39. https://doi.org/10.1006/jhec.2000.0258

Tang, J., Ye, K., & Qian, Y. (2019). Rethinking the relationship between housing prices and inflation: New evidence from 29 large cities in China. *International Journal of Strategic Property Management, 23*(3), 142–155. https://doi.org/10.3846/ijspm.2019.7800

Umeh, O. L. & Oluwasore, O. A. (2015). Inflation hedging abilities of residential properties in selected areas of Ibadan Metropolis, Nigeria. *ATBU Journal of Environmental Technology*, 8(2), 93-106.

Wahab, M. B., Ola, O. S., Sule, A. İ., Adepoju, A. S., & Dodo, Z. U. (2018). Inflationary hedging capacity of house price returns in emerging economy of Nigeria. *LAÜ Sosyal Bilimler Dergisi, 9*(2), 152–166.

Wang, K-M., Lee, Y-M., & Nguyen, T. T. B. (2008). Asymmetric inflation hedge of housing return: A non-linear vector error correction approach. *International Real Estate Review, 11*(1), 65–82. https://doi.org/10.53383/100090

Wolski, R. (2023). Residential real estate as a potential hedge of capital against inflation. *Real Estate Management and Valuation, 31*(1), 36–42. https://doi.org/10.2478/remav-2023-0004

Wu, Y., & Tidwell, A. (2015). Inflation-hedging properties of regional Chinese real estate market: Evidence from 35 cities in China. *Applied Economics, 47*(60), 6580–6598. https://doi.org/10.1080/00036846.2015.1080811

Yeap, G. P., & Lean, H. H. (2017). Asymmetric inflation hedge properties of housing in Malaysia: New evidence from nonlinear ARDL approach. *Habitat International, 62*, 11–21. https://doi.org/10.1016/j.habitatint.2017.02.006

## Appendices

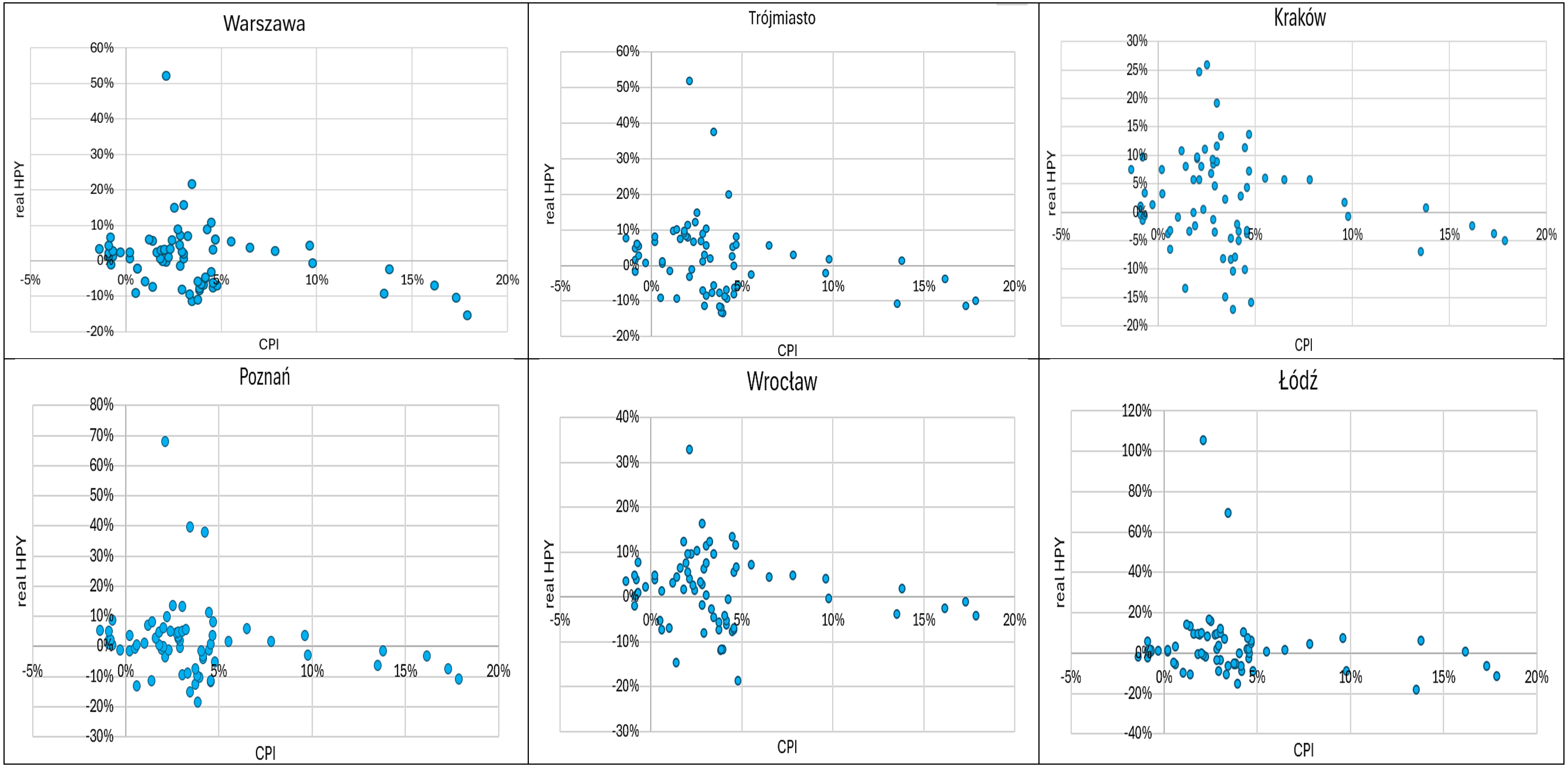


**Fig. A.1**. Relationship between CPI and HPY for a 1-year investment horizon, for the six largest residential markets in Poland. *Source:* own elaboration

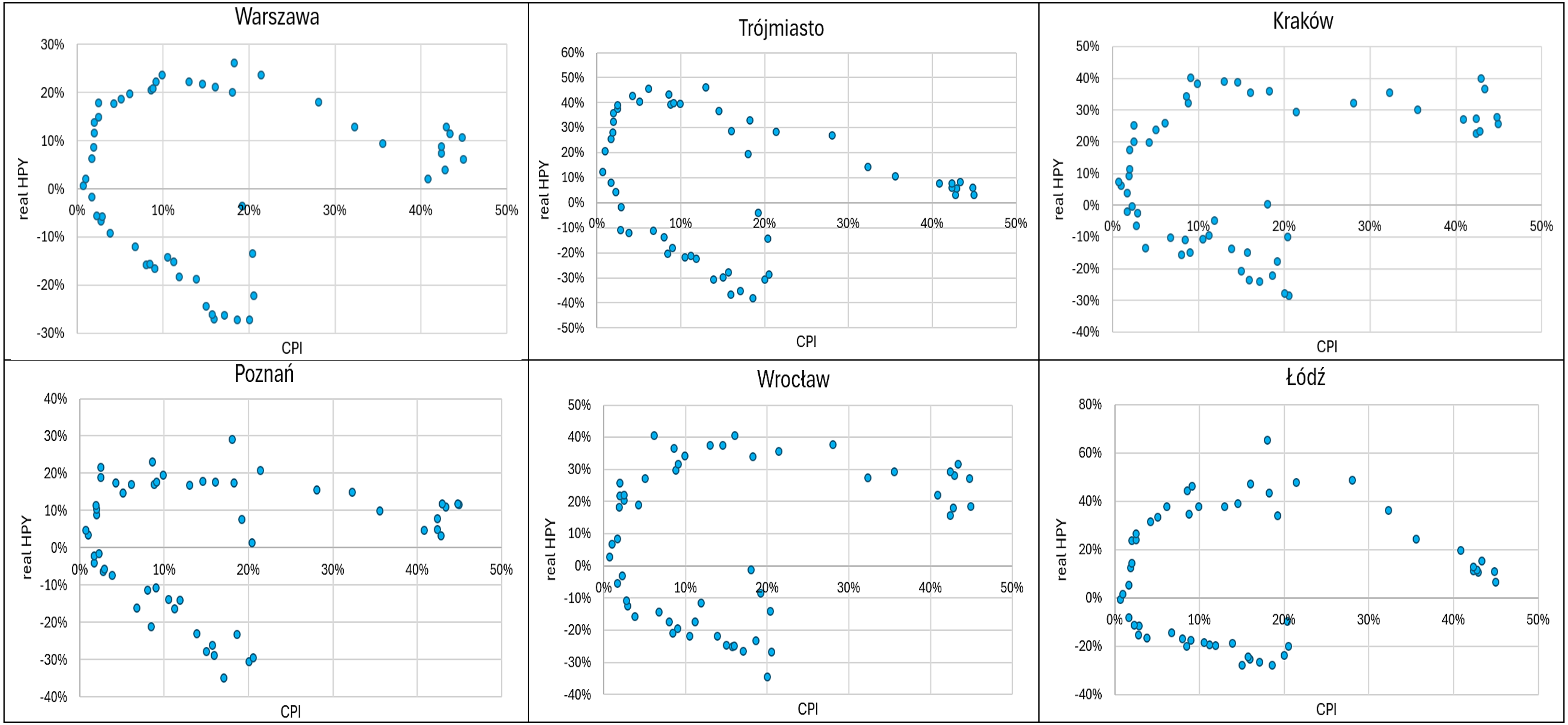


**Fig. A.2**. Relationship between CPI and HPY for a 5-year investment horizon, for the six largest residential markets in Poland. *Source:* own elaboration


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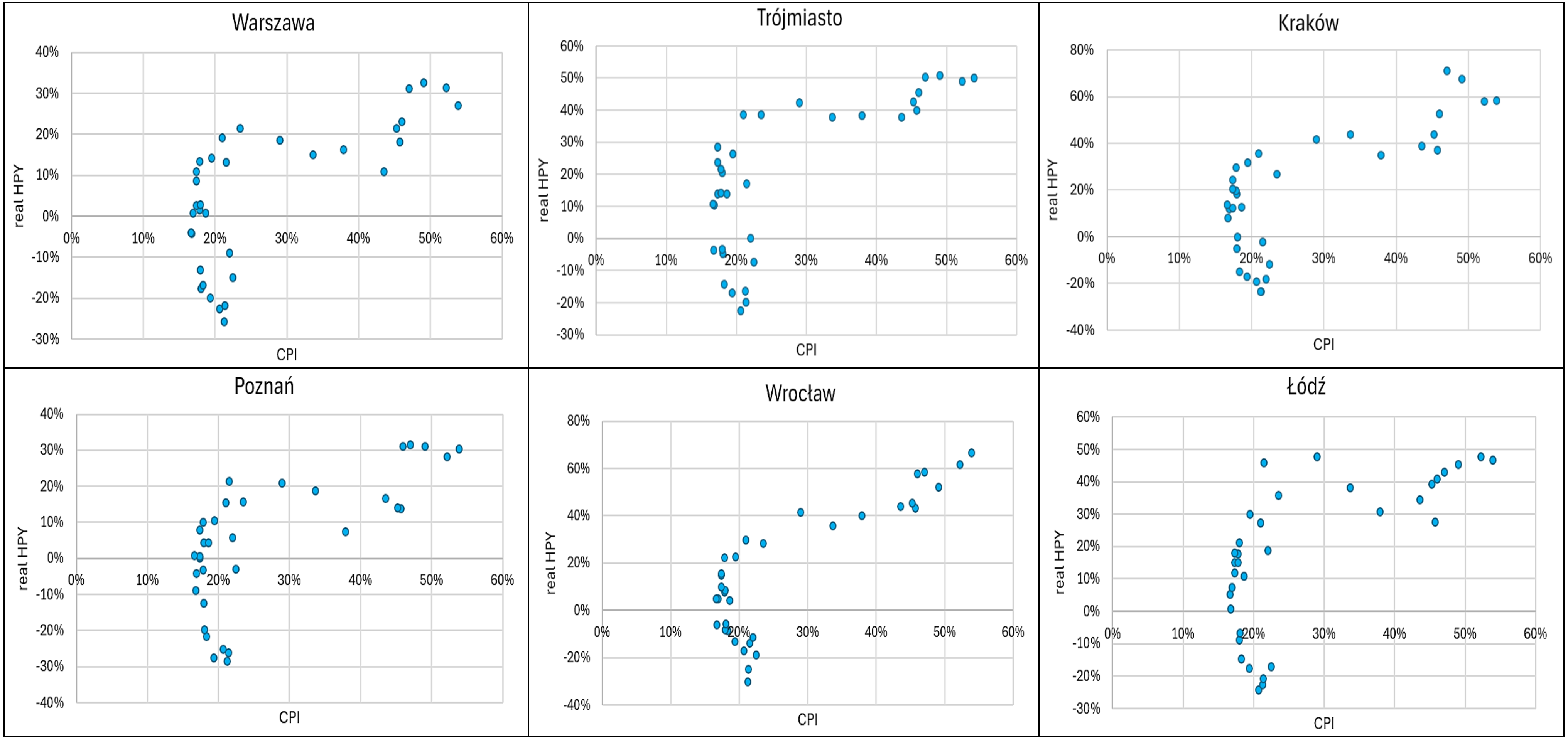


**Fig. A.3**. Relationship between CPI and HPY for a 10-year investment horizon, for the six largest residential markets in Poland. *Source:* own elaboration