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Cointegration and Economic Dynamics: Unraveling the Interplay between Gold Prices and Residential Property Prices in Five Different Nations

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This abstract delves into the intricate relationship between gold prices and residential property prices in China, Singapore, India, Iran, and Russia. Using a comprehensive dataset, our analysis elucidates the nuanced causal dynamics among these two economic variables. The findings reveal diverse interactions shaped by the interplay of local and global economic forces. In China, a significant decline in property values and a slight drop in gold prices highlight distinct market characteristics. Conversely, Singapore exhibits positive divergence, with an increase in property prices and substantial growth in GPs. India presents a contrasting pattern with a modest uptick in property values but an alarming decline in gold prices, thus suggesting a unique economic dynamic. Robust causal relationships are identified in the cases of Iran and Russia which underscore the significant influence of specific factors on the interplay between property value and gold prices. This foundational investigation emphasizes the necessity of tailored, context-specific analyses and underscores the fluid nature of the relationship between the real estate and precious metal markets. The study provides valuable insights for economic forecasting and policy decisions, thus paving the way for further explorations into the intricate relationships that shape our global economic landscape.

Keywords

Gold prices, Residential property market, Causal relationships, Economic analysis, Cross-country comparison and market dynamics

1. Introduction

Gold price (GP) and residential property prices (RPs) have been critical factors in economic analyses of commodity and real estate markets, A plethora of research have endorsed their joint impact on the economic stability of economies (Yen et al., 2023; Ali et al., 2024; Yunus, 2020). In the traditional sense, gold is a way to hedge economic uncertainty and inflation, and interacts with real estate land that is involved in long term investments. Yet, they fluctuate across different regions because they are dependent on local economic policies, international financial development and investor behaviour. Their relationship must be understood so as to develop strategic economic policies and investment decisions. Salisu et al. (2020) note that the study of cointegration among such variables in the case of hedging could help to identify important knowledge on the combination of different economic factors that pertain to economic resilience and vulnerability.

In this regard, we look to the efficient market hypothesis (EMH) in Fama (1970), which is based on the modern portfolio theory by Markowitz (1952). At the very core of the modern portfolio theory is the use of diversification as a strategy to reduce risks among assets. The principle behind the EMH is that asset prices are reflective of all the information available and thus, unanticipated events and other crises can influence nationalized assets or real estate just the same as they change other aspects of the economy (Fama, 1970). An effective diversification strategy comes out of awareness of how gold and property assets interact and help investments thrive. Such a study on how gold and residential properties could serve as the basis for the mutual support of any investment mechanism in these strategic countries. Another important leverage of such a study is a lens through which a better understanding of the broader global economic processes can be obtained, and thereby a more comprehensive interpretation of the complex economic landscape.

The interdependence of gold and real estate has consequently become a topic of ongoing debate in the financial markets as the effect of this relationship on investment strategies has been under discussion (Yunus, 2020; Humphrey, 2020; Hassan et al.,2020). Besides, Borchi (2019) states this relationship should be re-examined, taking into account the specific historical, economic, and cultural peculiarities of the different regions. On the contrary, Maghyereh and Abdoh (2022) emphasize the notion that studying the overall market sentiments and investor behavior has a particularly important contribution to the dynamics between gold and real estate prices. Such lines of thinking imply the timeliness and importance of our study which will be demonstrated through an examination of the changing relationship between gold and residential property markets.

To further expand on the interplay between gold and residential property markets in the literature, recent studies also highlight the significance of taking

into account macroeconomic factors such as geopolitical concerns and the global economy which play key roles in shaping the relationships (Sumer and Ozorhon, 2021; Beckmann et al., 2019). Chiang (2021) shows that geopolitical instability triggers the gold and real estate markets as investors seek haven assets during global turbulence. Kumar (2021) further elaborates on how external factors like international economic trends affect investment decisions; these happen on a global interpretation level. These points of view underline the multifaceted way of analysis in our research paper. Through an analysis of the long-term patterns and effects of GPs related to RPs in multicultural and economic settings, our research provides more insightful and widespread knowledge about the topic rather than being limited to certain regions, hence adding to a more complete overview of the crucial factors involved.

This investigation achieves the following objectives.

- To explore and understand the long-term relationship between GPs and RPs in five strategically significant countries.
- To assess the implications of this relationship for investors and policymakers within these countries.
- To contribute to a broader understanding of asset interactions and their role in global economic dynamics.
- To provide guidance on navigating the complexities of contemporary finance through insights gained from the analysis.

In keeping with these research aims, we provide the methodology, a data analysis, and conclusions that offer insights into the complex relationship between residential property values in the chosen nations and GPs in the following sections of this paper. We conclude by summarizing the main conclusions that we have reached and their consequences.

2. Literature Review

With residential properties being the topic of long-standing interest among researchers, economists, and market watchers (Yunus, 2020; Bozdereli and Rahmatzada,2024), their relationship with GPs has been deemed an important aspect of many analyses. The mystery around this important theme is kept alive due to the central and intricate functions that both gold and real estate play in driving the global economy. Given that a good review of the literature is required before reaching a conclusion on the interrelationship between commodities and equity, we begin with Beckman et al. (2019). They are the pioneers who have provided invaluable knowledge on the multifacetedness of the linkage on gold and real estate. It turns out that preliminary research on GP patterns in Baur and Sernales (2020) reveals the contribution of macroeconomic data and geopolitical events to the price movement of this commodity. According to Triki and Ben Maatoug (2021), gold is highly correlated with escalations of political tensions globally. It is the last resort during geopolitical

strife, which makes the price of gold increase as investors who are looking to protect their money perceive gold as a safe haven. It is this very property of gold that makes it the subject of envy as it serves not only as one of the rudimentary forms of the economy but also as a marvelous gauge of the state of the markets, which at times can be ambiguous. Having dealt with that, Valadkhani et al. (2022) explore the long-standing concern about the use of gold for inflation, which can be regarded as a stable hedge. The manner, in which they carried out their historical analysis, is the most vivid expression of the fact that gold has always been an effective tool for inflation hedging. This breakthrough by itself is an important issue to the current economic environment, with far-reaching consequences for individuals who want to maintain and protect their wealth when consumer prices start to rise.

Besides residential property values, Usman et al. (2020) examine the factors that affect property prices where they find that in the housing sector, local economic situations play a vital role and there is dependency of one market on the other. Academics explain that employment growth, interest, and an intricate balance between the input/output of supply and demand play significant roles that impact the prices of properties in specific regions (Agnew and Lyons, 2018; Szumilo et al., 2017; Bozdereli and Rahmatzada, 2024).

The portfolio theory provides a solid basis on the intricacies of property markets, which in many cases are of major importance to the portfolio of investors. These separate components of the investigation have been extremely valuable in their own respect although a synthesis of these findings is also necessary to relate gold prices with residential property values. Tanrıvermiş (2020) and Franco and Santos (2021) partly solve the problem by investigating if there is a relationship between GPs and residential property values in different nations. However, their results which are statistically significant with a weakly positive correlation, only provide a limited understanding of the phenomenon under study.

Massimo et al. (2021) further conduct an in-depth investigation that highlights the relationship between gold and residential property markets over the long term. This is undoubtedly the most crucial part of their research, which supported the idea that these markets are not as remote from each other as it may seem with their interactions having wide-reaching effects that govern both investors and policymakers. This research provides a more in-depth understanding of five key nations, i.e., China, Singapore, India, Iran, and Russia, that is strategically significant. In this study, we aim to dig deeper into these interactions within five key countries: Singapore, China, Iran, India and Russia. We spin that data apart by each nation, imagining how that data can lead us to find out just how gold prices and property value correlate with each other. Research like this doesn't just involve numbers, we're using it to give investors better tools, provide policymakers with better data to aid in their

choices and contribute to a broader understanding of financial markets and the complexities of their workings.

The impact of gold prices on residential property values has been the subject of much research in economics and other financial literature as this stabilizes the financial markets and ensures macroeconomic stability. For example, in the mentioned research, such as Bozdereli and Rahmatzada (2024), scholars have done research about this topic and find that the relationship between the two asset classes in the case of cointegration is possible. Ali et al. (2024), after an extended analysis between GPs and the dynamics of the residential property markets in China, conclude that the variations in GPs can affect the dynamics of the residential house market.

Moreover, the findings in Bahmani-Oskooee and Ghodsi (2020) lead to the conclusion that there are long-run asymmetrical relationships between oil and house prices that point to the specific impacts in different states of the USA, and testifies to the existence of different effects of oil prices on regional housing markets. Also, Bahmani-Oskooee and Ghodsi (2018) document that stock price changes impact housing prices in Organisation for Economic Co-operation and Development (OECD) countries asymmetrically, which shows a greater influence of the wealth effect with nonlinear modelling. Their studies confirm the necessity to factor asymmetry in relation to housing prices and other variables.

3. Data and Methodology

3.1 Data Sources

The residential property price statistics of the Bank for International Settlements (BIS) and the gold prices data of the World Gold Council provide the dataset utilized in this study. Monthly data are used to capture the long-term trends and dynamics of the selected variables across various countries during the specified period of 2000-2022. To ensure the robustness of the analysis, all-time series data are transformed into returns, as it has been observed in previous research on stock market returns that closing prices often exhibit non-stationarity at level (Ijaz and Chughtai, 2022; Garg, 2021).

This study investigates two main hypotheses regarding the causal relationship between GPs and RPs. The hypotheses to be tested are as follows:

H1: GPs Granger cause RPs.
H2: RPs Granger cause GPs.

3.2 Cointegration Analysis

To explore the long-term relationship between the variables under study, we employ the concept of cointegration. The cointegration theory posits that variables may exhibit a cointegrating relationship if they are integrated in the same order. In essence, variables are said to be cointegrated of order CI(d, p) if they are both integrated of order d, but there is a linear combination α that is integrated of order d - p. This implies that a non-stationary time series can be cointegrated if there is a linear combination of them that results in a stationary series. The Johansen (1988) cointegration test, which is based on vector auto regression (VAR), is used to investigate potential cointegration relationships. The VAR approach allows for the inclusion of both endogenous and exogenous variables in the analysis. The core equations for the VAR model used in this study are as follows:

For RPs:

$$\Delta RP_t = \alpha RP_{t-1} + \mu_t \quad (1)$$

For GPs:

$$\Delta GP_t = \alpha GP_{t-1} + \mu_t \quad (2)$$

where,
α= (A1-I)
$RP_t, GP_t \; and \; \mu_t$= g X 1 vectors for the RPs and GPs,
A1=g X g matrix of parameters, and
I = g X g identity matrix.

The prerequisite of the co-integration test is that the time series need to be integrated in the same order. This means that the series needs to be stationary at the same lag value. So, to find the stationary of the series, we first carried out a unit root test on the time series of the logarithmic price of exchange rates. A stationary time series will have constant statistical properties. In other words, the statistical properties such as mean, variance, autocorrelation, etc. of a time series are all constant over time for a stationary series. Such a series is relatively easy to predict and analyze. The most commonly used unit root test is the augmented Dickey Fuller (ADF) test. The ADF test relies on a parametric transformation of the model that eliminates the serial correlation in the error term. This test is conducted by "augmenting" the preceding three equations by adding the lagged values of the dependent variable. The following regression equations will be tested:

$$RP = \sum_{i=1}^{n} \alpha GP_{t-i} + \sum_{j=1}^{n} \beta RP_{t-j} + \mu_{1t} \quad (3)$$

$$GP = \sum_{i=1}^{n} \alpha RP_{t-i} + \sum_{j=1}^{n} \beta GP_{t-j} + \mu_{1t} \quad (4)$$

4. Results and Discussion

4.1 Descriptive Statistics

Table 1 lists the descriptive statistics that show the distinct economic landscape of the five countries. China has seen a substantial property value decrease, with a RESID-PROP mean of 69,489.13. In contrast, Singapore has maintained relatively stable property values, as reflected by a mean of 7540.65. India has experienced a modest property value increase with a mean of 4153.33. Iran has the highest mean value of 1.36e+07. Russia has maintained stable property values with a mean of 58,721.85. For GP, China has a mean of 88.17, while Singapore shows a mean of 229.35. India has a mean of 50,236.08, Iran a mean of 53,643.74, and Russia, a mean of 130.48. These statistics highlight the different economic dynamics, thus offering a clear picture of the interplay between property values and GPs in these countries.

Table 1 Descriptive Statistics for Residential Property and Gold Prices Across Countries

Variable	Country	Mean	Std. Deviation	Min	Max
RESIDEN-TIAL PROPERTY PRICE	China	69,489.13	46,405.23	12,815.44	172,873.2
	Singapore	7540.65	3469.30	2271.92	14,775.35
	India	4153.33	2065.19	1029.41	7794
	Iran	1.36e+07	8,643,099	2,611,392	3.21e+07
	Russia	58,721.85	49,500.36	7728.51	184,458
GOLD PRICE	China	88.1663	17.38	52.25	117.96
	Singapore	229.35	51.36	99.40	308.03
	India	50,236.08	22,690.35	9072.40	94,526
	Iran	53,643.74	30,509.47	10,567.37	134,094
	Russia	130.48	34.61	80.60	196

4.2 Correlation Matrix

Table 2 shows the correlation matrix. There are very strong positive correlations along each country's. Also, it is worth mentioning that there are a large number of moderately to highly positive correlations between GPs and RPs which also

show some degree of co-movement among these asset classes across the countries for which the data are available.

Table 2 Correlation Coefficient between Residential Property and Gold Prices

	INDIA GP	CHINA GP	SINGA GP	IRAN GP	RUSSIA GP	CHINA RP	INDIA RP
INDIAGP	1						
CHINAGP	0.9676	1					
SINGAGP	0.9556	0.9913	1				
IRANGP	0.9956	0.9614	0.9488	1			
RUSSIAGP	0.9689	0.9036	0.8763	0.9733	1		
CHINARP	0.3851	0.3004	0.2062	0.4172	0.5215	1	
INDIARP	0.4187	0.2622	0.1859	0.4488	0.5617	0.8021	1
IRANRP	0.8742	0.8751	0.8695	0.8833	0.8280	0.3304	0.2970
RUSSIARP	0.9038	0.863	0.8207	0.9081	0.9062	0.5459	0.5291
SINGARP	0.9509	0.9461	0.9546	0.9526	0.8846	0.2173	0.2386
	IRANRP	RUSSIARP	SINGARP				
IRANRP	1						
RUSSIARP	0.9428	1					
SINGARP	0.9285	0.8803	1				

4.3 Unit Root and Cointegration Analysis

Table 3 provides the results of the unit root analysis. The stationarity level of each variable is shown in the table. Table 4 provides critical insights into the cointegration analysis conducted for the five countries in this study. The primary focus of this analysis is to determine the presence of cointegration relationships among the two variables under examination. Eigenvalues are key indicators of the strength of a cointegration relationship. In this context, the eigenvalues for the respective countries are as follows: China (0.082441), Singapore (0.077396), India (0.243827), Iran (0.098051), and Russia (0.022756). The values represent the level of cointegration. The cointegration value is represented by the critical measure of trace statistics. The trace statistics value for each country is significant except for Russia. The trace statistics for China is 18.9503 with a p-value of 0.04, Singapore is 16.2393 with a p-value of 0.01, India is 38.8807 with a p-value of 0.000, Iran is 23.3717 with p-value of 0.02, and Russia is 6.3147 with a p-value of 0.39.

In testing for cointegration the max-Eigen statistic is key since the cointegration relationship between the particular variables under consideration can be tested independently, but only if none of the variables is perfectly exogenous. The application of this principle is to find out if the two variables will move together when it comes to the long term, which are an indication of an underlying connection. The max-Eigen statistics are as follows: China with trace statistics

of 17.1216 and a p-value of 0.05, Singapore with trace statistics of 16.0305 and a p-value of 0.001, India with trace statistics of 29.9049 and a p-value of 0.001, Iran with trace statistics of 20.433 and a p-value of 0.009 and Russia with trace statistics of 4.5808 and a p-value of 0.5383.

Table 3 Unit Root Test Results

Variable	Statistics	Probability	Integration Level	Ho Reject?
INDIAGP	-1.301	0.0000***	I(I)	YES
CHINAGP	-0.015	0.0004***	I(0)	YES
SINGAGP	-0.443	0.0000***	I(0)	YES
IRANGP	-0.340	0.0000***	I(I)	YES
RUSSIAGP	-0.860	0.0000***	I(0)	YES
CHINARP	-0.907	0.0000***	I(0)	YES
INDIARP	-1.001	0.0000***	I(0)	YES
IRANRP	-0.346	0.0000***	I(0)	YES
RUSSIARP	-1.746	0.0000***	I(I)	YES
SINGARP	-0.350	0.0000***	I(I)	YES

Notes: H0 refers to null hypothesis. *, ** and ***, denotes significance at the 10%, 5% and 1% levels, respectively.

These reactions indicate the degree to which there is cointegration among these nations, which, possibly, could be a sign of a long-term correlation if the variables presented here are not varied. From the calculated p-values, there is clear evidence that both positive and negative economic effects characterize the relation, but depends on whichever is the more influential one. The findings which are robust are not final because there are many other factors to consider before drawing implications for the main objectives.

Table 4 Cointegration Analysis

Statistics	China	Singapore	India	Iran	Russia
Eigenvalue	0.082441	0.077396	0.243827	0.098051	0.022756
Trace Statistic	18.95038	16.23933	38.88078	23.37177	6.314738
	(0.0419)**	(0.0105)**	(0.0007)**	(0.0181)**	(0.3987)
0.05 Critical Value	18.39771	12.32090	25.87211	20.26184	12.32090
Max-Eigen Statistic	17.12160	16.03046	29.90496	20.433	4.580822
	(0.0504)**	(0.0067)**	(0.0010)**	(0.009)**	(0.5383)
0.05 Critical Value	17.14769	11.22480	19.38704	15.89210	11.22480

Note: Mackinnon-Haug-Michellis (1999) p-values

Table 5 shows the coefficients (α and β) that represent the relationship between GPs and RPs for the five countries. The negative intercept (α) of China is -33.27884, which implies that, even without changes in the GPs, there is a significantly negative impact on RPs. The small, negative β coefficient of -0.009649 suggests a minor inverse correlation between GPs and RPs in China. In other words, as the GPs increase, the RPs tend to slightly decrease, although the impact appears to be relatively small.

Moving to Singapore, the negative intercept (α) of -0.107747 is close to zero, thus indicating that without fluctuations in the GPs, the impact on RPs is minimal. However, a substantially positive β coefficient of 1.78713 signifies a strongly positive relationship between GPs and RPs in Singapore. This means that as the GPs rise, the RPs tend to increase significantly, thus making GPs a vital factor that influences property values in Singapore. In India, the positive intercept (α) of 0.059434 suggests that, even without changes in GPs, RPs experience a slight increase. Nevertheless, the exceptionally large negative β coefficient of -1609.124 reveals a substantially negative relationship between GPs and RPs. This implies that as the GPs increase, the RPs tend to decline significantly in India.

For Iran, we have a slope (α) of 0. The 029547 signifies a mild growth in RPs which is independent of GPs. The coefficient β is equal to 184. The 12,838 shows a positive relation but not as strong in comparison to Singapore between the GPs and RPs. Therefore, as GPs rise, the value of property in Iran undergoes a prominent but not extremely strong increase. Lastly, an intercept exists for Russia that is negative and equals to -1. The -1.202,240 shows a very minor negative impact on house prices, not considering changes in GPs. The β coefficient of 0.049742 represents a weak positive cause and effect of the relationship between GPs and RPs. A GP surge in Russia contributes to a slight rise in real estate prices. These elastic coefficients provide clues about the impact of GPs on RPs in these countries therefore allowing investors and policymakers to make informed decisions in these different economic landscapes.

Table 5 Regression Coefficients: GPs vs. RPs

	RESID-PROP (α)	GP (α)	RESID-PROP (β)	GP (β)
CHINA	-33.27884	-0.009649	-0.015587	0.000740
SINGAPORE	-0.107747	1.78713	0.030846	-0.002784
INDIA	0.059434	-1609.124	0.158373	0.00000076
IRAN	0.029547	184.12838	0.065516	0.00020107
RUSSIA	-1.202240	0.049742	-0.018442	0.003410

4.4 Causality Test

The causality test results that are presented in Table 6 reveal the causal relationship between the GPs and RPs of the five countries. This table explains whether RP changes are a cause or an effect of the GP changes, which is just as critical. The causality test output in the case of China shows that RPs have a statistically significant causal effect on GPs with a test statistic of 5.85883 and an equivalent of a p-value of 0. The p-value is 0.0000 at the 1% significance level. The chance of a causal connection between increase in RPs in China and fluctuation in GPs is relatively high. GPs have not been shown to have a

significant influence on RPs in China based on the causality test, with a test statistic of 2.3902 as well as a p-value of 0.8377. Lastly, we move to Singapore where there is also no causation of RPs with GPs; the test statistic is 2.27805 and p-value = 0, where the bi-directional effects (causality) from GPs to RPs is 3.48810 and p-value of 0.0000.

Conversely, the analysis for India shows a statistically significant unidirectional causal relationship. RPs do not have a causal effect on GPs for India with a test statistic of 2.37974 and a p-value of 0.8776. Additionally, the test results indicate a unidirectional causal relationship, with GPs affecting RPs in India, as evidenced by a test statistic of 3.19678 and a p-value of 0.0042, significant at the 1% level. The findings for Iran and Russia are similar, with both showing statistically significant bi-directional causal relationships. This implies that in these two countries, changes in RPs significantly influence GPs, and vice versa. The test statistics and p-values for their causal relationships are 12.5494 (p-value: 0.0000) and 20.6091 (p-value: 0.0000) for Iran, and 6.42290 (p-value: 0.0000) and 6.53518 (p-value: 0.0000) for Russia, respectively, all significant at the 1% level. Lastly, Table 10 provides solid support for the conclusion that there are complex and different relationships between RPs and GPs in the five countries. The causality test results provide invaluable information on the interaction between the two economic variables, and signs that have a considerable impact on economic and financial analyses.

H1 proposes that fluctuations in GPs, which serve as the main financial asset, can be responsible for fluctuations in RPs. The hypothesis is based on the general belief that gold is a safe haven asset which people tend to put in their portfolio during stress or market volatility. Usually, gold investors protect the value of their wealth as a means of hedging against rising costs, falls in currency value, and political risks. Therefore, we can conclude that GPs can be likened to the symptoms that reflect the emotional state of investors, perceived risk, and macroeconomic situation and therefore, the changes in GPs are the reasons derived from the various factors. When GPs rise, it may be an indication of more uncertainty and the need for security among investors, which will lead them to look to other assets for investment like real estate. Therefore, changes in GPs may affect investment choices in the real estate markets, with investors adjusting their portfolios depending on the economic situation.

On the contrary, H2 proposes that RPs are one of the major factors for changes in GPs. This hypothesis is based on the fact that the real estate markets are the source of wealth creation and spending and, thus, the economic health of a society, which means that they are the main factors for the development of society. Residential property ownership is seen as a permanent investment and property value is an indicator of household wealth and consumer confidence. Property value changes affect the behavior of consumers, borrowers and investors, and consequently, the economy altogether. Boosts in property values during times of economic development are an indicator of a surge in consumer confidence and spending, which results in increased demand for luxury items

and alternative investments, such as gold. The shift in RPs is sort of an early warning signal of the change in consumer demand for gold which is a hedge against economic risks or inflation.

Table 6 Causality Test for RPs and GPs

Null Hypothesis	W-Statistics (Prob.)	Decision
$RPs - CHINA \Rightarrow \text{GPs} - \text{CHINA}$	5.85883 (0.0000)***	RP⇒GPs
$GPs - CHINA \Rightarrow \text{RPs} - \text{CHINA}$	2.3902 (0.8377)	
$RPs - SING \Rightarrow \text{GPs} - \text{SING}$	2.27805 (0.8544)	GPs⇒RP
$GPs - SING \Rightarrow \text{RPs} - \text{SING}$	3.48810 (0.0000)***	
$RPs - IND \Rightarrow \text{GPs} - \text{IND}$	2.37974 (0.8776)	GPs⇒RP
$GPs - IND \Rightarrow \text{RPs} - \text{IND}$	3.19678 (0.0042)***	
$RPs - IR \Rightarrow \text{GPs} - \text{IR}$	12.5494 (0.000)***	RP⇔GPs
$GPs - IR \Rightarrow \text{RPs} - \text{IR}$	20.6091 (0.0000)***	
$RPs - RUS \Rightarrow \text{GPs} - \text{RUS}$	6.42290 (0.000)***	RP⇔GPs
$GPs - RUS \Rightarrow \text{RPs} - \text{RUS}$	6.53518 (0.0000)***	

Note: *, ** and ***, denotes significance at the 10%, 5% and 1% levels, respectively.

5. Policy Implications

Our econometric research work reveals that, based the on cointegration between GPs and economic development is one of the key fundamentals determinants of housing value. Thus, the derivations provide a better understanding of the phenomenon beyond GPs. For instance, the in-depth research work has derived that causal linkages of these asset classes in certain countries is a clear indicator of how the financial and real estate markets are interdependent within such set-ups. The above evidence suggests that investor sentiment, economic shocks, and macroeconomic variables greatly impact market behavior and asset price formations globally. These influences can deviations from typical market expectations, thus adding volatility and uncertainty. Beyond this, the path of these relationships and their intensity provide policymakers and market players with information on ways to contend with uncertain times, draw policies that target the relationship between GPs and RPs and develop investment strategies. Consequently, our econometric study moves a step ahead in elucidating the workings of macroeconomics and enables formulating of economic forecasts and designing policies related to them in depth.

Furthermore, comprehending this intricate relationship carries significant policy implications:

i. Investors and policymakers can explore diversification strategies that take into account the identified connections between GPs and RPs in specific countries.
ii. Governments can adapt their monetary and fiscal policies in response to the observed relationships.
iii. Regulatory authorities in the real estate sector can utilize the insights derived from this study to make well-informed decisions concerning property market regulations, particularly in countries where significant relationships between GPs and RPs are evident.
iv. Understanding the impact of GPs on RPs can guide the risk management strategies of financial institutions and investors, thus enhancing their ability to navigate economic uncertainties more effectively.

Future research should delve deeper into revealing the underlying mechanisms that drive these relationships, conduct more comprehensive microeconomic analyses of their repercussions, and consider the effects of the evolving economic conditions. Additionally, exploring the implications of these findings for policy development and economic forecasting is a promising avenue for future research. Ultimately, this ongoing exploration will enrich current understanding of the global financial landscape, thus providing valuable guidance for investors, policymakers, and scholars.

6. Conclusion

Our empirical analysis has yielded valuable insights into the complex relationship between GPs and RPs in five diverse and strategically important countries - China, Singapore, India, Iran, and Russia. The data presented in this study illuminate the distinct characteristics of the real estate and precious metal markets of the five countries, as evidenced by the intercept and coefficient values. The result is a single dataset that shows these value variations and, because of this, the relationship between RPs and GPs is dynamic. China, India, Iran and Russia show a remarkable causal plot, which gives evidence that some other factors are the real factors of impact on the causality of GP with RPs. However, in the case of Singapore, the data do not show a clear causal relationship, which serves as evidence that unique and context-specific factors often influence market dynamics in individual countries. However, this study has its limitations. While this study has deepened our understanding of the interdependency between specific variables, using historical data provides limited insight into current economic trends, and this limitation needs further verification. Also, the causality test results do not give any clues about the mechanisms that fuel these interconnections, so there is a need for further

studies to bring clarity. Further research is imperative for a more in-depth look at these relationships and to show how these factors play in either converging or diverging over time.
It is also important to have a better understanding of the forces that drive GPs and other precious metal values. Furthermore, performing a deterministic microeconomic analysis of the aftermath of such relationships on particular economic sectors and households could produce a more understandable approach.

We have been able to study the basic issues on interactions between RPs and GPs, which can guide future in-depth studies. Our work recognizes the fact that contextual analyses are fundamental, the necessity of country-specific factors to be considered, and further research into which instrumental factors trigger these economic phenomena. Moreover, as researchers determine the reasons behind this relationship, the findings will support informed decision-making for economic forecasting and policymaking.

References

Agnew, K., and Lyons, R. C. (2018). The impact of employment on housing prices: Detailed evidence from FDI in Ireland. *Regional Science and Urban Economics,* 70(2), 174-189.

Ali, M., Samour, A., Joof, F., and Tursoy, T. (2024). Oil prices and gold price on the housing market in China: Novel findings from the bootstrap approach. *International Journal of Housing Markets and Analysis,* 17*(*3), 591-610.

Alvan Bozdereli, A., and Rahmatzada, Q. (2024). Relationship between residential property prices and macroeconomic variables in Turkey. *Applied Economics Letters,* 31(8), 743-749.

Bahmani-Oskooee, M., and Ghodsi, S. H. (2018). Link between housing and stock markets: Evidence from OECD using asymmetry analysis. *International Real Estate Review,* 21(4), 447-471.

Bahmani-Oskooee, M., and Ghodsi, S. H. (2020). On the link between oil price and house prices in the US: Asymmetric evidence from state-level data. *International Real Estate Review,* 23(1), 65-106.

Baur, D. G., and Smales, L. A. (2020). Hedging geopolitical risk with precious metals. *Journal of Banking & Finance,* 117, 105823.

Beckmann, J., Berger, T., and Czudaj, R. (2019). Gold price dynamics and the role of uncertainty. *Quantitative Finance,* 19(4), 663-681.

Borchi, A. (2019). Oil, gold, stones: Cultural value in Italian cultural policy. *Arts and the Market,* 9(1), 2-15.

Chiang, T. C. (2021). Geopolitical risk, economic policy uncertainty, and asset returns in Chinese financial markets. *China Finance Review International,* 11(4), 474-501.

Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance,* 25(2), 383-417.

Franco, S. F., and Santos, C. D. (2021). The impact of Airbnb on residential property values and rents: Evidence from Portugal. *Regional Science and Urban Economics,* 88(3), 103667.

Garg, S. (2021). A study of factors influencing investor behavior towards gold as an investment avenue with factor analysis. *Materials Today: Proceedings,* 37*,* 2587-2590.

Hassan, M. K., Aliyu, S., Saiti, B., and Halim, Z. A. (2020). A review of Islamic stock market, growth, and real-estate finance literature. *International Journal of Emerging Markets,* 16(7), 1259-1290.

Humphrey, C. (2020). Real estate speculation: Volatile social forms at a global frontier of capital. *Economy and Society,* 49(1), 116-140.

Ijaz, S. T., and Chughtai, S. (2022). The impact of financial, economic, and environmental factors on energy efficiency, intensity, and dependence: The moderating role of governance and institutional quality. *International Journal of Energy Economics and Policy,* 12(4), 15-31.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamics and Control,* 12(2-3), 231-254.

Kumar, M. (2021). Return on investment: A comparative statement of real estate and gold. *Turkish Online Journal of Qualitative Inquiry,* 12(10).

MacKinnon, J. G., Haug, A. A., and Michelis, L. (1999). Numerical distribution functions of likelihood ratio tests for cointegration. *Journal of Applied Econometrics,* 14(5), 563-577.

Maghyereh, A., and Abdoh, H. (2022). Can news-based economic sentiment predict bubbles in precious metal markets? *Financial Innovation,* 8(1), 35.

Markowitz, H. (1952). The utility of wealth. *Journal of Political Economy,* 60(2), 151-158.

Massimo, D. E., De Paola, P., Musolino, M., Malerba, A., and Del Giudice, F. P. (2022). Green and gold buildings? Detecting real estate market premium for green buildings through evolutionary polynomial regression. *Buildings,* 12(5), 621.

Salisu, A. A., Raheem, I. D., and Ndako, U. B. (2020). The inflation hedging properties of gold, stocks, and real estate: A comparative analysis. *Resources Policy,* 66*,* 101605.

Sumer, L., and Ozorhon, B. (2021). Investing in gold or REIT index in Turkey: Evidence from the global financial crisis, 2018 Turkish currency crisis, and COVID-19 crisis. *Journal of European Real Estate Research,* 14(1), 84-99.

Szumilo, N., Laszkiewicz, E., and Fuerst, F. (2017). The spatial impact of employment centres on housing markets. *Spatial Economic Analysis,* 12(4), 472-491.

Tanrıvermiş, H. (2020). Possible impacts of COVID-19 outbreak on real estate sector and possible changes to adopt: A situation analysis and general assessment on Turkish perspective. *Journal of Urban Management,* 9(3), 263-269.

Triki, M. B., and Ben Maatoug, A. B. (2021). The gold market as a safe haven against stock market uncertainty: Evidence from geopolitical risk. *Resources Policy,* 70*,* 101872.

Usman, H., Lizam, M., and Adekunle, M. U. (2020). Property price modeling, market segmentation, and submarket classifications: A review. *Real Estate Management and Valuation,* 28(3), 24-35.

Valadkhani, A., Nguyen, J., and Chiah, M. (2022). When is gold an effective hedge against inflation? *Resources Policy,* 79, 103009.

Yen, B. T., Mulley, C., and Shearer, H. (2023). The value of green infrastructure to property prices: Evidence from the Gold Coast, Queensland, Australia. *Land Use Policy,* 134, 106890.

Yunus, N. (2020). Time-varying linkages among gold, stocks, bonds, and real estate. *The Quarterly Review of Economics and Finance,* 77, 165-185.