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# Relationship Between Precious metal, Real Estate and Stocks During Covid-19


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## Abstract

This study will help us in investigating the relationship among stock, real estate and precious metal. To get the result for this study, two markets is analysed which is Pakistan and India. These emerging countries stocks helped us explain the impact of emerging markets on precious metal and real estate. To study the relationship, the stocks are taken from India and Pakistan market, precious metal data has been taken from MSCI world whereas real estate data has been taken from REITS data, all the above data series have been taken from data stream. The dataset of all these variables consists of the closing daily prices of Pakistan and India for stocks.

The time period for which data has been selected is past 12 years, from 2010 to 2022 all the data closing prices were converted into returns and then further methodology is applied. The data result has been tested by NARDL method. First the data is tested for stationarity then applied ARDL Auto Regressive Distributed Lag and finally it is being tested using the NARDL method Non Linear Auto Regressive Distributed Lag.

The result of this studies shows that in the long run stock had insignificant impact on precious metal and real estate in both countries, however in the short run the result were significant for Indian stock market do effect precious metal and real estate in the short run. Whereas in Pakistan the result showed no significance.

# Chapter 1

This section of the study focuses on the literature of the topic. Aim of this section is to fully understand the introduction of our variables. Intro of the study is as follow

## 1.1 Introduction

As the research has been growing in many fields different studies has been published that has claimed adding real estate properties in a portfolio can hedge and helped in risk- return portfolio because of their low correlation with stocks and other financial assets such as commodities and bonds (Chan et al., 2011) However, in some studies it has been resulted that real estate turned out to have strong connection with stocks at the time of crisis whether negative or positive, as one of the example is the bubble burst which happened in the 1990s and another crisis which happened in 2008 also impacted the stocks markets.

The year 2008, after the crisis, when the bubble busted the real estate faced a decline as the houses prices fell radically in united states, but not only real estate prices fell, the stocks were also effected as n they saw a decline which was in the most low level. Many economies especially United States economy went into recession but not only this country was impacted, this impact spread towards whole of the world as global economy got impacted by this, the global market prices fell real estate price fell drastically.

This showed that real estate has a relation stock as they collapsed all over the world stock also faced the impact , this fast destruction didn't gave a chance to investors to hedge themselves form the risk, resulting in the deep concern for investors on how to reduce in the long run. (Crowe et al., 2013)

In March year 2020 the world was hit by the covid 19 which had a really dramatic impact on the stock exchange as the stock market crashed. The reaction of government to covid made many stock crash. Covid 19 a disease in December 2019 which was originated in china in the city of Wuhan and later spread to the whole world causing a pandemic. As the virus is highly contagious the government and authorities had to take strict action in order stop the spread. Some of the decision to stop the spread was shutting down of business activities which resulted in unemployment rate getting high, stock markets crash, businesses making loss and shutdown.

Covid 19 had a massive impact on economy as well. Since many business couldn't operate fully as government imposed quarantine, so to adjust themselves companies laid off many employees they cut off cost labour cost. During covid 19 some industries didn't faced that much drastic changes as some faced. However, most sectors suffered and their stock prices crash. (Mazur et al., 2021)

However covid gave rise to the uncertainty level. This impacted the industry, investment markets such as stocks market and substantial transferring of risk between financial and commodity markets, subsequently many researchers have been studying about the uncertainty indicators. This market uncertainty made investor to think about the how to make investment in safe haven assets. They started searching for assets which were less risky which was not impacted by the uncertainty in order to add them in the portfolio.

As (Choudhry et al., 2015), stated that during such uncertain times the risky assets priced decreased which resulted in being spread to different markets. In pandemic when uncertainty roused the investor become risk averse the as they started investing in assets which were safe haven, such as precious metal as the demand increased the prices for precious metal also increased. This pandemic raised uncertainty in the market and investment in risk in the financial market in such situation investors tends to go assets which are risk free or less risky assets. During pandemic investor shifted to invest in asset which can provide hedge to their portfolio.

Similarly (Corbet et al., 2020) also focused on the impact which was done by covid 19 and how investor turned towards safe haven assets. His study examined some of the assets don't act as the hedging asset and they neither did hedge against other asset during covid. Contrarily, they show evidence that these assets showed negative response.

In literature, Markowitz (1959) paper diversification as a portfolio strategy has helped many investor in making the perfect diversified portfolio which help them give return for the given level of risk, this theory is one of the main theories in the literature for investors when making any decision during the crisis period or when in uncertainty.(Goetzmann et al., 2002).

Precious metal are known to be asset who can provide hedging effectiveness against risk, a lot of researchers have already studies this and showed that precious metal acts as strong diversifier and providing safe havens properties during such crisis. (Agyei-Ampomah et al., 2014)

As per the study (Agyei-Ampomah et al., 2014) of shows that the hedging asset precious metal are an important commodity asset against vulnerable financial markets especially stock market which are affected a lot and may lead towards losses. Precious metal are being considered as one of the important asset while making the portfolio, investors has started choosing this asset due to its diversifying properties and because of their hedging properties. As we have seen this covid crisis in such crisis investors tend to add these precious metals more in the portfolio.

As we have already seen that during pandemic precious metal were one of the asset which was bought in order to hedge against risk, they are now considered as significant components on investments. Precious metal are asset which are famous for their abilities for hedge, against different financial markets which have been facing quite a losses in recent time. Precious metal has now been used for diversifier and for portfolio diversification.(Agyei-Ampomah et al., 2014) this paper explained that the interest in precious metal is increasing especially during covid crisis as it was a global outbreak. (Lahiani et al., 2021)

As we have learned investor invest in assets, which provides more return and less risk, but you never know when the market can become uncertain and give a drastically decrease in the stocks prices, so to safe themselves from these uncertainties investor tend to invest in other assets as well which can provide a hedge or can save themselves from losses. There are many other assets which provides hedge, which we will study real estate and precious metal, as we have already seen real estate is an asset which have always been rising except for the bubble bust period, in emerging countries such as Pakistan real estate have been rising in the country and never have faced any decline, so investors tends to invest in real estate so their investment can be safe from risk and more return can be achieved. Same is the result of precious metal investors have been investing in precious metal to protect them from the risk.

In this pandemic these two assets saw a boom as many investors took their money out of stocks in order to put their money in assets which provide hedge. As when this type of uncertainty spreads the risky assets prices also fell, same is the case when people tend toward investing in assets providing hedge such as precious metal, then the prices of precious metal increases due to increase in demand.(Agyei-Ampomah et al., 2014)

Similarly (Corbet et al., 2020) also focused on the impact which was done by covid 19 and how investor turned towards safe haven assets. His study examined some of the assets don't act as the hedging asset and they neither did hedge against other asset during covid. Contrarily, they show evidence that these assets showed negative response.

Stock and precious metals are known to be an attractive investment in financial market, as this study says that money never sleeps and investors in looking for any indicator which can help them in predicting the stock or precious metal markets. Stock markets presents, maker capitalization and the market of precious metals tells us about the demands of scarce recourses on globe.

As (Sharif et al., 2020) stated in his study during covid pandemic every commodity saw a decline, one of the main investing asset stock was impacted the most, as many stocks indices crashed due to sever effects of covid 19, many investor faces losses and started acting aggressively by taking all the money out of stock which led to stock market crash.

As theory of portfolio says that investors can optimise their risk and return if they invest in asset which can diversify their portfolios, in this way they can get return for the given level of risk and not completely face risk losses. This theory can help in uncertain conditions such as financial market crisis. (Symitsi & Chalvatzis, 2019)

In such situations as this paper shows that the gold, silver and precious metal can act a hedge asset when the economy is facing sever crisis. This study also resulted in saying that precious metal and gold can also prove the properties of safe haven asset when impacted by any uncertain condition. (Baur & Lucey, 2010).

Some more result on the interactions among stock and precious metals has been showed in the time of crisis such as dot bubble crisis and financial crisis. However, the research paper studied uniqueness of the pandemic, the study was done in order to see how precious metal and stock interacted in this pandemic and what result it showed. (Văn & Bảo, 2022)

Almost for all the past times which have been studied by the researchers, it has showed that gold is best diversifier and act as a hedge asset especially in the time of financial distress. Whenever the market faced any uncertainty and was impacted by it gold always retained its value and never devalued. It's hedging effectiveness acts as a hedge and safe haven which has been confirmed by many studies (Baur & Lucey, 2010a)

However, (Baur & Lucey, 2010b) papers stated that the hedging potential of gold can be influenced by investor behaviour showed that investor behaviour tend to change in some time periods as investor tends to invest in precious metal because of its hedging properties. (Klein, 2017) research paper studied the whether precious metal acted as hedge asset, by using the dynamic conditional correlation in European countries.

However as we have seen investor investing in real estate assets due to its less risky properties, as the development of real estate has been on the rise the real estate prices have been going up as well, we have seen in some years real estate is an asset which has been extended from time to time, due to these reason many investors have been investing in real estate to diversify its portfolio. (Hinkelmann & Swidler, 2008)

Even after the decline in real-estate prices when faced with crisis it is one of the main asset where people invest in the emerging markets, the fluctuation in the prices may impact other assets but it is still one of the main choice on investors for investing assets. (Reinhart and Rogoff, 2008).

### 1.1.1 Research Gap

This research paper adds to the literature in many ways. As this paper will conduct broad investigation among the connection between real estate, stock & precious metal. Considering precious metal an asset where people tend to invest more, this research accompaniments the study by analysing the hedging effectiveness of precious metal, real estate against stocks in emerging countries such as Pakistan and India.

However precious metal are known to be asset providing diversification and hedging properties, so considering this fact our research study will also explore how precious metal will provide hedging when studied with stocks, and we will also see the hedging effectiveness of real estate which is also used to hedge portfolio with stocks.

Real estate is another market which flourished during crisis , people invested more so it flourished, my study will help us in understanding how real estate performed in the pandemic and how precious metal stock were related to each other.

As past literature has showed many studies have already been done to analyse the relation between stock and precious metal but real estate is an area which is still untouched. This study will help in the literature of real estate.

This study tends to look at the relationship between real state stock exchange and precious metal and the impact of covid 19 crisis, this research study will examine the relationship of investment in real estate and precious metal and stock of India and Pakistan.

### 1.1.2 Research Objective

To analyse the relationship among real estate, stock and precious metal in the course of the period of Covid 19 in Pakistan. One of the main objective is to analyse how precious metal and real estate will act when studied with stock in the emerging countries, whether it shows negative or positive results if it is impacted from crisis, or in an unstable economy. This research paper will contribute in this way that the majority of the paper will analyse precious metal real estate stock.

# Chapter 2

## 2.1 Literature Review

This section highlights the key components of this paper real estate, precious metals and also explains the relationship between them and how covid 19 made an impact on these variables. Before explaining the relationship between variables it is important to know about the variables. The literature of our study is as follows,

How real estate, precious metal can be a less risky asset during crisis when compared with stocks, this study will help in answering this question for the emerging countries such as India and Pakistan.

As we know this pandemic had a huge effect on the economy of the world it had enormously damaged everything. The disturbance caused by covid impacted industries also include governments financial markets and capital financing. (Goodell, 2020). And this spread has spread globally on geographical it has spread beyond boarders.

It has also impacted financial sector very badly as well as stock markets. The challenges face in this covid 19 outbreak was the financial market challenges which was affected by uncertainty, unforeseen losses, regardless of the simplifying policies. (Zhang et al., 2020)

This covid 19 resulted in massive influence on the stock markets, as it crashed many time, it performed very under the point. (Salisu et al., 2021) study also explored the results of covid 19, how investors turned toward is different assets in order to diversify their portfolio. Investor shifted towards other assets because stock was the most effected asset due to over pricing or under-pricing of market. (Borgards et al., 2021). (Burdekin and Tao, 2021), studied the previous global financial crisis. And he showed that the previous relation among stock and precious metals remain an attention-grabbing field during such crisis whether be it financial or health crisis.

However when searching for diversifying assets mostly investor tend towards asset which provides hedge to the portfolio during crisis such as precious metal. Many researchers have done in order to study the hedging asset which can help in portfolio diversification and also helps in crisis one of the study is done by when in search for diversifying assets people (Ciner et al., n.d.) has done a comprehensive study on stock bond gold oil and currency to check the hedging asset the result of

the study showed that where the results of the study showed the characteristics of precious metals, using wavelet methodology. (Bredin et al., 2015). As before people used to invest in gold but during this crisis gold was also impacted and was unsuccessful to preserve the role, as safe haven asset so people shifted towards other assets.

Basically from the different studies we have known that the precious metal have the hedging properties and can act as a safe haven asset when compared to stock. While when we study the stocks market it is mostly acknowledged with different conditions such the construction of portfolio, selection of markets, and many other external factors. The results answers, however most important is experimental findings which leads us to know whether they act as a hedging instrument or not, the study results shows during the pandemic the role of precious metal didn't changed, it remain same which stated that it provides hedging. However indication showed that despite precious metal being providing hedging effectiveness, gold was still stronger asset in this pandemic especially in the early stages of covid (Ji et al., 2020)

Hillier et al. (2006a,b) studied about the prices change and the result showed a good portfolio properties which consist of silver and platinum, however the result showed that when the two assets were compare to stocks it showed negative results. (Agyei-Ampomah et al., 2014) study also gave the same results that platinum and palladium had negative correlation with stocks.

Then another reading done by (Morales & Andreosso-O'Callaghan, 2011), States in the global crisis precious metal were not affected that much as other assets were impacted, the result of the study also showed two other asset which protected the wealth of the investors, those assets were gold and silver.

(Lucey & Li, 2015) They examined precious metal properties which included platinum, palladium, gold and silver, using the time varying manner, the result showed precious metal was a safe haven asset when gold devalued, however it also resulted that precious metal act as a hedge asset in the United States.

(Mensi et al., 2013) however investigated the relation which was between precious metals, global stocks including regionals stocks in the Asian countries. Their study result showed that the making precious metal part of the portfolio will provide diversification and it was not impacted in the global financial crisis, making it adds advantages to investor's portfolio.

(Ji et al., 2020) Studied the emerging market such as brazil India china and south Africa, the precious metal in these markets did had a long term relation.

(Peng, 2020) used method of DCC dynamic Conditional Correlation model to explain the hedging properties of precious metal against financial market. The findings as per the research of the study was that precious metal do act the hedge instruments and a diversifier.

(Uddin et al., 2020) examined dependency among the stock, gold, silver, and platinum of United States markets. The result showed a symmetric dependency among the stocks markets of United States. However there have been number of studies done after this study to establish the relation of precious metal during crisis and after crisis, how it can provide hedging effectiveness for investors.

(Salisu et al., 2021) paper used the Varma GARCH model to assess the hedging effectiveness of gold the studied showed significant resulting gold act as hedge asset when studied with oil prices, whereas this study also highlighted that precious metal also acted as a hedging asset providing diversification to the investor's portfolio.

(Umar & Gubareva, 2021) Paper studied the assets such as aluminium, copper, lead, nickel, tin, and zinc and precious metals against oils stocks, the objective of the study was to study the relation of these variables, the result reported a time-varying nature and the volatility increased during the pandemic outbreak.

(Jain & Biswal, 2016) Released a paper in the year 2016 which explored the commodity prices, how they behave, the paper studied how commodity precis can behave as a financial asset. So the paper studied the nonlinearity between these two assets, the study used ANRDL methodology and showed the result in long run and short run. The precious metal and stocks was studied using NARDL method, which also tells the stationarity and non-stationarity of the assets

# Chapter 3

## 3.1 Data & Methodology

### 3.1.1 Data

This study will explore the relationship between real estate, stock and precious metal. The data was taken from data stream for stock the data set has been selected from NIFTY 500 for India and for Pakistan KSE 100 data has been taken, whereas for real-estate world REITS data series will be used. Precious metal data has been taken from MSCI precious metal. The dataset consists of the closing daily prices of KSE 100, NIFTY 500 of Pakistan and India for stocks,

The data taken for this is study is the daily prices closing prices of the stock from 2010 to 2022 whose return are calculated and then further methodology is applied. The data result has been mentioned below in the study

In this study we will inspect if precious metal act as a hedging instrument and whether there is a relationship between real estate stock and precious metal, in these emerging markets which are basically Pakistan and India. However, these type analysis needs an investigation of the change which is impacting, be it positive or negative, and how this change will impact the data. For my research study we will see how stock impacts precious metal and real estate or whether they act as a hedging asset which can be useful for investor when they make decision for diversifying their portfolio in the emerging countries such as Pakistan and India.

As the NARDL model also known as Non-Linear Autoregressive Distributed Lag help us in calculating the probability of asymmetric properties and if positive or negative shows any valuable information with the help of this test.

For this purpose, we will use Nonlinear ARDL model which will help us in inspect the relationship between stocks precious metal and real estate and how they impact each other and whether they act as a hedging asset or not, but before applying NARDL some test which will help in studying the data are also applied such as unit root of data, correlation matrix, descriptive statistics to get a brief knowledge about the dataset being used in the study.

### 3.1.2 Methodology

**Descriptive Statistics:**

Descriptive statistic provides a report of all variables feature with the help of a summary which is generated by running the descriptive test it is a measure of all the population of data, helping us o identifying the measure of central tendency, measure of spread, skewness is measure by the negative and positive values which is shown in the summary mean while kurtosis helps in identifying the curve is fat, at peak or at which level.

Skewness value, if negative indicates that the curve is on the negative side and if it is on the positive value that means the tail is on the positive side.

Kurtosis describes the relative peakness of data and comparing it with normal distribution .Positive kurtosis indicates a relatively peaked distribution whereas negative kurtosis point to flatness of data.

#### 3.1.2.1 Correlation Matrix

This method helps us in identifying the relation amongst variables. It helps us in to understand multiple variables relationship. We use correlation matrix as it is a simple form to summarise the correlation between all the variables in the data set. The most adequate method for correlation is to use the Pearson correlation, which is a measure of the linear relationship.

Correlation matrix shows value -1 to +1, where -1 point toward a perfectly negative linear correlation between two variables, and the correlation with 0 indicates no linear correlation between two variables and correlation of one between variables means a perfectly positive linear correlation between two variables.

### 3.1.2.3 ARDL Distributed Lag Auto Regressive Model:

In recent years of research study Auto Regressive distributed Lag also known as ARDL method is getting a common choice of approach to check the co-integration between variables and check long-run and short- run influence on variable. This study will also use ARDL model as to apply NARDL model auto regressive distributed lag method should be applied before, so to get the best result ARDL model will be applied with other test such as unit root test and then NARDL model will be applied which will further explain the relation of the data series. So before going for NARDL, ARDL method will be used to check the linearity of data.

To check the linearity ARDL will be applied to detect symmetric relationship of real estate, precious metal and stock and then NARDL method will be applied to detect to see behaviour of the data series and their behaviour how they are moving or whether any asset is acting as a hedge asset and whether it provides hedging effectiveness or not.

### 3.1.2.2 Unit root test

Unit root test is used to check the stationary of the data. It must be necessary that the data should be stationery. To make data stationary we will be using ADF Test which is Augmented Dickey fuller (ADF), this method is used to check the stationary of data this method was invented by Dickey and fuller (1979). Before the application of methodology this unit root test will be performed and this method will be performed on the data according to the pre-conditions of an autoregressive distributed lag mode, ARDL model. And then further test will be applied after knowing whether the data is stationary or non-stationary, the result of unit root test are mentioned below in the study which indicates from the unit root test can be seen from the results of the unit root test in Table mentioned below, all sequences are I(1), which indicates that the characteristics of all sequences meet the requirements of the NARDL model for data stationarity, so NARDL model can be applied to check the short run and long run impacts of the data series.

### 3.1.2.4 NARDL:

The NARDL model will help us analyse the short -run and long-run influence of variables among each other. As we are studding the relationship between real estate stocks and precious metal NARDL model will help us in this result, to start with NARDL model we have to check the stationarity and non-stationarity of the variables, for which unit root test will be applied after that NARDL model will be performed. The best thing about using NARDL model is it gives the result of negative and positive shock which the variables have

(Pesaran et al., 2001) NARDL model helps us in the co integration analysis which is what our study will be doing in order to get desired results, because the data may have non linearity in the time series so to get correct data results NARDL methods should be used, The NARDL model, therefore, makes it possible to distinguish between linear co-integration, nonlinear/asymmetric co-integration and lack of co-integration (Shahzad et al., 2017).The following NARDL representation is used to check the relationship between stock, real estate, and precious metal the results giving us the information about the long run to test the asymmetric relationship between them the short run.

NARDL model helps in know about the data series is nonlinear or linear and whether it has co integration or not, the positive and negative sums helps us in studying the shocks of variables. Furthermore, it produces short- and long-run coefficient estimates. The NARDL model is characterized by freedom from residual correlation.

### 3.1.2.5 Bounds test for co-integration

Bound test basically means that whether there is a relation or not in data series it is test by the bound test with the criteria is it uses F and t- statistics to test the significance of the lagged levels

### 3.1.2.7 Co-Integrating Relationship

As we have seen the Covid impacted whole of the world even before that many financial crisis have taken place in the world, so these event may have impact somehow to today prices of variables. These past event can influence today data, so it is possible that the data has become non-linear so to test this nonlinear data we will be using NARDL model

If we use ARDL model it will be useless it will not capture the non-linearity of the data so that's why NARDL model will be applied, NARDL method will help us explain the result in more detail , as the co integration of the result will help us explain the short run and long run of the data series,

The NARDL test gives result for the co integration which consist not long run and short run shocks which can impact the variables, basically telling us who negative value of a variable have a negative or positive impact on the explanatory variable. (Pesaran et al., 2001) suggest to test for co-integration in the NARDL model using the coefficient values and p values.

It is suggested by (Pesaran et al., 2001) states that unlike other methods who need lags to length to estimate its data, it's not a compulsory method in NARDL however there can be different no of lags for each variables, after taking the lags NARDL is applied and through that co integration is applied where we get the short run and long run results.

(Pesaran et al., 2001) suggest to test for co-integration in the criteria toc heck the shocks coefficients and p value and t value helps us in understanding the result of the co integration test.

Whereas bound test is further test toc confirm the long run integration it has criteria if the value lies in between or higher than the criteria it is said that the result are significant but if the value lies low then the result is known as insignificant

# Chapter 4

## 4.1 Result and Analysis

This chapter will study the results of the study and these results will give us the answer for our study of the relationship between stocks, real estate and precious metal have e relationship against each other or not.

### 4.1.1 Descriptive statistics:

| | KSE | NIFTY | PM | WORLD |
|---|---|---|---|---|
| **Mean** | 37660.99 | 8951.626 | 1711.127 | 3063.127 |
| **Median** | 39614.76 | 8752.450 | 1614.050 | 3009.150 |
| **Maximum** | 52875.46 | 16002.95 | 2406.610 | 4004.770 |
| **Minimum** | 17871.15 | 4046.700 | 1285.130 | 2125.210 |
| **Std. Dev.** | 7465.734 | 3096.545 | 259.6043 | 316.2511 |
| **Skewness** | -0.524552 | 0.701168 | 0.638093 | 0.681875 |
| **Kurtosis** | 2.561871 | 2.643051 | 2.138105 | 3.152527 |
| | | | | |
| **Jarque-Bera** | 137.0671 | 222.0468 | 251.4794 | 199.6850 |
| **Probability** | 0.000000 | 0.000000 | 0.000000 | 0.000000 |
| | | | | |
| **Sum** | 95847213 | 22781888 | 4354819. | 7795659. |
| **Sum Sq. Dev.** | 1.42E+11 | 2.44E+10 | 1.71E+08 | 2.54E+08 |

Descriptive statistics tells us about the basic of the data set for instance we can say it gives us the summary of the data set that describes the data sample and how it is measured. Through the results of real estate and stock returns and precious metal for this method, after first differencing the series. It shows precious metal has the average return which is the lowest but the stock and world returns are the highest whereas stocks return are the highest of all, and standard deviation of stock is also higher than others.

In addition, standard deviation indicating high value for stock returns ore then real estate, whereas precious metal results states the least risk, providing stocks are more risky assets then real estate or precious metal. While kurtosis shows that value in the range of two's only real estate has value of three and the criteria of normal kurtosis is lies in the range of 3, only the real estate data lies in the range if the it is positive it is at peak indication meaning higher value more average, whereas Skewness is used to identify they asymmetrical effect on the series, the value having normal skewness shows the value of 0 indicating series is symmetric however the kse value of skewness is negative.

**Correlation:**

Correlation is a tool or method helping us in knowing the relation between variables, how they are related to each other it's a statistical method which help us in a possible linear association between two or more variables. Basically correlation results are define as how closely two variables are related, the relationship of variables between each other can be positive or can be negative, and this depends upon how they are related to each other.

We can understand the relationship by looking at the value of variable in the correlation matrix. If it has -1 correlation it means negative correlation to +1 positive correlation. The value of the correlation is positive which means that both the variables will move together in the same direction, value of a correlation is negative or it is zero 0 it means that they are negatively related to each other and the will travel in the opposed direction. If correlation is equal to 1 it mean it has perfect correlation.

The results of Correlation matrix shows the value of real estate, stock and precious metal by studying the table we can whether they have a relation or not, so the result shows that

The correlation between Pakistan stock and precious metal shows that they are 0.26 which shows that the weakly positive correlation, whereas when look at the Pakistan stock relation with India stock it shows that they have strong positive relation. When comparing Pakistan stocks with the real estate shows moderately positive relation. The India stocks relation with real estate moderate positive, whereas when we compare the Indian stocks with precious metal it shows it also have the same relation of moderate positively related. Precious metal relation with real estate shows that weakly positive meaning that if the move together it has a weak relation which will not have a great impact.

| | KSE | PM | NIFTY | WORLD |
|---|---|---|---|---|
| **KSE** | 1.000000 | 0.266818 | 0.709004 | 0.579312 |
| **PM** | 0.266818 | 1.000000 | 0.639675 | 0.495543 |
| **NIFTY** | 0.709004 | 0.639675 | 1.000000 | 0.767045 |
| **WORLD** | 0.579312 | 0.495543 | 0.767045 | 1.000000 |

### 4.1.2 Unit root Test:

To Apply ARDL model or NARDL model or any method for that matter, the first step is to test the data of stationarity and non-stationarity. By stationary and non-stationary we mean that the data a data is said to be non-stationary the data is when the variance and all other statistical properties keeps on changing with time and such data is said to be stationary data and when the time series whose statistical properties keep on changing with time is called as on non-stationary data, hence it means that the data has trend or seasonality and is non stationary in nature to make data for which we apply the unit root test, the use of unit root to determine the stationarity of the series. To criteria to check the data is stationary or not unit root test is applied, if the data's P value is more than 0.05 it is said that the data is non stationary.

The method ARDL and NARDL can only be applied if the data is at I(o) or a $1^{st}$ difference (1), if the data is at I(2) non-linear auto regressive distributed lag cannot be applied.

The Augmented Dicky-Fuller is used at the level and first difference. Results indicate that all the variables have Unit Root meaning that the data series is non-stationary at level so to make it non stationary we will take first difference of the data however, first difference of the series that are logarithmic transformed are stationary. If the p value is > 0.05 we accept the null hypothesis which states that the data has unit root which means if there is unit root, the results says that the data is non stationary and all the t-values corresponding with the model parameters are higher than two.

| | T Value | P Value | T Value | P Value |
|---|---|---|---|---|
| Precious Metal | -1.8103 | 0.3758 | -52.3618 | 0.0001 |
| Real estate | -2.7528 | 0.0654 | -24.8664 | 0.0000 |
| India Stock | 0.01813 | 0.9577 | -48.2535 | 0.0001 |
| Pakistan Stock | -2.6535 | 0.0825 | -44.6049 | 0.0001 |

### 4.1.3 NARDL

Non-linear methodology helps us acknowledge the past perspective as well, whether the past prices are impacting the current while will we see the in the following study. Non Linear ARDL model is a model to check the asymmetry with respect negative and positive changes in the explanatory variables, this study will use NARDL mode to implement the NARDL test we will check the lags which are done by AIC method

first we have to check the lags which should be given to each data set, According to NARDL bound test different lags can be given to different variables, to check the nonlinearity of the model first we will check the Stationarity and then bound test which will shows whether there is co integration among the variables in the long run to check the co integration in the short run we will apply nardl co integration methodology. However in the initial steps of check lag length we will choose ACI method which be implemented by the VAR method. VAR model is a model which is widely used, through VAR model we select the lag values in which AIC akaike information criteria.

If a lag is selected which is much higher in the order then it may give wrong results such as, high mean square or may generate auto correlated errors. So the lag is selected through which we get the least critical value in the data, the lag of this data series was seven selected by the akaike information criteria.

### 4.1.4 NARDL Co- integration:

#### 4.1.4.1 Pakistan Stock & Precious metal

Cointegrating Form

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(KSE(-1)) | 0.114177 | 0.019786 | 5.770450 | 0.0000 |
| D(PM_POS) | -0.738943 | 0.753864 | -0.980208 | 0.3271 |
| D(PM_POS(-1)) | -0.516529 | 1.063357 | -0.485753 | 0.6272 |
| D(PM_POS(-2)) | -1.477403 | 0.761067 | -1.941225 | 0.0523 |
| D(PM_NEG) | 1.474398 | 0.677329 | 2.176781 | 0.0296 |
| D(PM_NEG(-1)) | -0.041688 | 0.956356 | -0.043590 | 0.9652 |
| D(PM_NEG(-2)) | -0.595214 | 0.927561 | -0.641698 | 0.5211 |
| D(PM_NEG(-3)) | 0.062946 | 0.895204 | 0.070315 | 0.9439 |
| D(PM_NEG(-4)) | 0.091988 | 0.895553 | 0.102716 | 0.9182 |
| D(PM_NEG(-5)) | 1.010747 | 0.634693 | 1.592499 | 0.1114 |
| CointEq(-1) | -0.004040 | 0.001642 | -2.460045 | 0.0140 |

Cointeq = KSE - (34.0405*PM_POS + 34.6460*PM_NEG + 72222.6131 )

Long Run Coefficients

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| PM_POS | 34.040518 | 21.165749 | 1.608283 | 0.1079 |
| PM_NEG | 34.646023 | 22.255666 | 1.556728 | 0.1197 |
| C | 72222.61307 | 7 23044.858220 | 3.134001 | 0.0017 |

The result show the long and short run telling us about the long and short run of the data series of Pakistan stock and precious metal as per the results the data shows for short run is that the coefficients of co-integration shows value of -0.004 and p value shows the value of 0.01 which is less than 1 hence we can say that the relation is significant but when we see the positive and negative impact in the short run it shows that they are not impacting the Pakistan stock exchange so we can say that Pakistan stock exchange does not affect precious metal in the short run, so precious metal provides hedging effectiveness in the portfolio in the short run if invested with stock.

Where as in the long run the result shows, relationship is insignificant and Pakistan stock has no impact on precious metal even in the long run so precious metal provides hedging in the long run too.

### 4.1.4.2 Pakistan Stock & Real Estate

Cointegrating Form

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(KSE(-1)) | 0.115716 | 0.019854 | 5.828410 | 0.0000 |
| D(KSE(-2)) | -0.034820 | 0.019881 | -1.751433 | 0.0800 |
| D(WORLD_POS) | -0.879587 | 0.531008 | -1.656449 | 0.0978 |
| D(WORLD_POS(-1)) | 1.269500 | 0.787952 | 1.611139 | 0.1073 |
| D(WORLD_POS(-2)) | -1.302447 | 0.787807 | -1.653257 | 0.0984 |
| D(WORLD_POS(-3)) | 1.092204 | 0.527732 | 2.069619 | 0.0386 |
| D(WORLD_NEG) | 2.592534 | 0.433704 | 5.977652 | 0.0000 |
| D(WORLD_NEG(-1)) | -1.188661 | 0.651814 | -1.823619 | 0.0683 |
| D(WORLD_NEG(-2)) | 1.008549 | 0.650358 | 1.550759 | 0.1211 |
| D(WORLD_NEG(-3)) | -0.274380 | 0.623743 | -0.439893 | 0.6601 |
| D(WORLD_NEG(-4)) | -0.536382 | 0.593051 | -0.904444 | 0.3658 |
| D(WORLD_NEG(-5)) | 0.937338 | 0.408441 | 2.294915 | 0.0218 |
| CointEq(-1) | -0.004687 | 0.001439 | -3.255870 | 0.0011 |

Cointeq = KSE - (-2.0605*WORLD_POS -2.9434*WORLD_NEG + 39454.1714 )

Long Run Coefficients

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| WORLD_POS | -2.060519 | 7.327799 | -0.281192 | 0.7786 |
| WORLD_NEG | -2.943362 | 7.586760 | -0.387960 | 0.6981 |
| C | 39454.171355 | 4141.488918 | 9.526567 | 0.0000 |

The NARDL method is run to investigate the result of real estate and Pakistan stocks, if any negative or positive shocks of Pakistan stock impacts real estate value or not, result showed in long run and short run, for the short run the result shows that world real estate data have negative impact of real estate has no significant impact on the stock, whereas positive shock of real estate also don't have any impact on the stock of Pakistan, while the long run relation of stock and real estate it is clearly shown that the result are insignificant and they have no long run impact on the stock as well so real estate has no impact if anything happens in the stock. So it can be assumed through this result if investors in Pakistan wants to invest in real estate in order to hedge themselves from uncertainty risk they can do so by making real estate assets a part of their portfolio.

### 4.1.4.3 Indian Stock & Precious Metal:

Cointegrating Form

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(NIFTY(-1)) | 0.041463 | 0.019847 | 2.089173 | 0.0368 |
| D(NIFTY(-2)) | -0.000161 | 0.019851 | -0.008126 | 0.9935 |
| D(NIFTY(-3)) | -0.009810 | 0.019913 | -0.492643 | 0.6223 |
| D(NIFTY(-4)) | 0.028803 | 0.019925 | 1.445545 | 0.1484 |
| D(NIFTY(-5)) | 0.070643 | 0.019905 | 3.548997 | 0.0004 |
| D(PM_POS) | -0.278638 | 0.184296 | -1.511905 | 0.1307 |
| D(PM_POS(-1)) | 0.390500 | 0.244668 | 1.596043 | 0.1106 |
| D(PM_POS(-2)) | -0.083807 | 0.244889 | -0.342225 | 0.7322 |
| D(PM_POS(-3)) | 0.621587 | 0.244194 | 2.545467 | 0.0110 |
| D(PM_POS(-4)) | -0.444617 | 0.176269 | -2.522382 | 0.0117 |
| D(PM_NEG) | 0.428773 | 0.165537 | 2.590197 | 0.0096 |
| CointEq(-1) | -0.005499 | 0.001939 | -2.836852 | 0.0046 |

Cointeq = NIFTY - (3.3513*PM_POS + 2.7023*PM_NEG + 6385.5744 )

Long Run Coefficients

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| PM_POS | 3.351330 | 2.325854 | 1.440903 | 0.1497 |
| PM_NEG | 2.702266 | 2.416710 | 1.118159 | 0.2636 |
| C | 6385.574412 | 2061.879315 | 3.096968 | 0.0020 |

The result of Indian stock and precious metal shows that in the long run it is insignificant meaning it has no impact, it can act as a hedge asset if in a portfolio, however in the short run it shows that the values has an impact as it shows significant results. Impact whereas in the long run we can say from the result that it had no impact on the stocks and in the long run it can be used as a hedging asset in the portfolio. Investor can get benefits, if they want to use precious metal in the long run for investment purpose, they can get the hedging benefit in the long run.

### 4.1.4.4 Indian Stock & Real Estate

Cointegrating Form

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(NIFTY(-1)) | -0.014381 | 0.019652 | -0.731806 | 0.4644 |
| D(NIFTY(-2)) | -0.051554 | 0.019442 | -2.651701 | 0.0081 |
| D(NIFTY(-3)) | -0.054109 | 0.019464 | -2.779960 | 0.0055 |
| D(WORLD_POS) | 0.619831 | 0.120265 | 5.153860 | 0.0000 |
| D(WORLD_POS(-1)) | 0.993712 | 0.120810 | 8.225445 | 0.0000 |
| D(WORLD_NEG) | 1.216118 | 0.097244 | 12.505829 | 0.0000 |
| D(WORLD_NEG(-1)) | 0.201035 | 0.144945 | 1.386977 | 0.1656 |
| D(WORLD_NEG(-2)) | -0.376192 | 0.140315 | -2.681057 | 0.0074 |
| D(WORLD_NEG(-3)) | 0.484411 | 0.135090 | 3.585830 | 0.0003 |
| D(WORLD_NEG(-4)) | -0.396911 | 0.135023 | -2.939584 | 0.0033 |
| D(WORLD_NEG(-5)) | 0.388448 | 0.091814 | 4.230800 | 0.0000 |
| CointEq(-1) | -0.006114 | 0.002007 | -3.046715 | 0.0023 |

Cointeq = NIFTY - (0.8769*WORLD_POS + 0.3344*WORLD_NEG + 5378.0642 )

Long Run Coefficients

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| WORLD_POS | 0.876873 | 1.346910 | 0.651026 | 0.5151 |
| WORLD_NEG | 0.334442 | 1.410886 | 0.237044 | 0.8126 |
| C | 5378.064221 | 605.213369 | 8.886228 | 0.0000 |

The result of Indian stock and the real estate data shows that in the long run if investment is made in real estate it will provide hedge to the portfolio but when invested for short term period it has significant relation. that the negative and positive shocks of real estate do have an impact on the Indian stock as the p value is less than 0.05 but when looking at the coefficient it says, if the value is in – it means if x increase by some percentage then other value will decrease, and if the coefficient value shows positive values then it means that when x increase the value of Indian stocks will also increase, that they don't have significant impact and the impact is insignificant.

So we can say that they have insignificant impact on the stock.

### 4.1.4.5 Bound test

**Bound test criteria**

Critical Value Bounds

| Significance | I0 Bound | I1 Bound |
|---|---|---|
| 10% | 3.17 | 4.14 |
| 5% | 3.79 | 4.85 |
| 2.5% | 4.41 | 5.52 |
| 1% | 5.15 | 6.36 |

**Bound Test Result**

| | |
|---|---|
| Pakistan Stocks with Precious metal | **7.39** |
| Pakistan Stocks with Real estate | **3.93** |
| India Stocks with Precious metal | **3.67** |
| India Stocks with Real estate | **5.30** |

# Chapter 5

## 5.1 Conclusion

The study investigates the relationship between real estate, stock and precious metal. In this study the data was taken from data stream for stock the data set has been selected from NIFTY 500 for India and for Pakistan KSE 100 data has been take, whereas for real estate world REITS data series will be used. Precious metal data has been taken from MSCI precious metal. The dataset consists of the closing daily prices of KSE 100, NIFTY 500 of Pakistan and India for stocks,

The data taken for this is study is daily prices closing prices of the stock from 2010 to 2022 whose return are calculated and then further methodology is applied. The data result has been mentioned below in the study

In this study we will inspect if precious metal act as a hedging instrument and whether there is a relationship between real estate stock and precious metal, in these emerging markets. We run the ARDL model and then NARDL model to check the co integration of the data series, checking whether it has an impact in the long run or in the short run, the result showed that it had insignificant impact on the stock of emerging countries such as India and Pakistan as mentioned in this study. The result is studied through NARDL methodology which shows the conintegration, the long run and short run results, which showed that in the long run precious metal and real estate both can act as a hedging asset when studied against stocks, whereas in the short run they don't provide hedging effectiveness as they negative and positive impact of both long run and short run shows significant results, it had no impact on both the asset. Hence we can say adding real estate asset and precious metal in the long run can hedge in portfolio and also help if the portfolio is diversified so if any crisis arise such as covid happened to protect from these losses if the portfolio is diversified and has precious metal and real estate investor can save them from the risk of losses.

As per for the further studies we can say that in the further studies we can study these asset with different emerging and developed countries which will help in investor in making the right decision for around the globe.

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