VARIABILITY ANALYSIS OF GOLD PRICES INSELECTED ASIAN COUNTRIES

Dr.M.Mohanasundari
Associate Professor, Department of Management Studies,
Kongu Engineering College, Perundurai - 638060, Erode, Tamil Nadu, India.
mohanasundari.mba@kongu.edu
Dr. P.Sundharesalingam
Associate Professor, Department of Management Studies,
Kongu Engineering College, Perundurai - 638060, Erode, Tamil Nadu, India.
sundaresalingam.mba@kongu.edu
Dr.S. Sathyakala
Assistant Professor, Department of Management Studies
Sona College of Technology, Salem 637005, Tamil Nadu, India.
sathyakala@sonamgmt.org
Dr. P.Vidhya Priya
Professor, Department of Management Studies,
Kongu Engineering College, Perundurai - 638060, Erode, Tamil Nadu, India.
vidyapriya.mba@kongu.edu

ABSTRACT
In times of market stress, gold serves as a diversified investment and a means of loss mitigation. It can act as a protection against currency risk and inflation. The major goal of this study is to determine whether the gold prices are affected by the prior data for the chosen Asian nations and to assist investors in making decisions and developing their investment strategies.predicted or actual returns on bonds, equities, and real estate fall, demand for gold rises, driving up its price. Gold can be used to protect against currency depreciation, inflation, and deflation. Even though several studies have been conducted about the gold price volatility for a specific commodity or a single country, this research is intended to study the trend of gold markets of the selected Asian countries and to help the investors who wish to invest in Asian markets. As a result of the research, before making an investment decision in gold, investors must take price, authenticity, purity, and budget into account. In general, gold prices fluctuate more than other commodities do, so investors should hold off on buying gold until the perfect time and seek professional assistance.
Keywords: Gold price, Volatility, Investment, Asian market,

INTRODUCTION TO THE STUDY

This study outlines the numerous factors that affect gold's price. Investments are made using money to purchase assets to generate income or capital growth. Investments have four financial goals: risk, return, security, and liquidity. For the following reasons, gold is highly regarded as an investment tool. It can easily be converted to cash and retains its value over time as a commodity largely because of its fixed supply, unlike a currency that the government could easily print. It also serves as an inflationary hedge, a portfolio for diversification and risk reduction, and is useful in the production of significant goods like jewelry and electronics, among others. In times of market stress, gold serves as a diversified investment and a means of loss mitigation. It can act as a protection against currency risk and inflation. The major goal of this study is to determine whether the gold prices are affected by the prior data for the chosen Asian nations and to assist investors in making decisions and developing their investment strategies.

PRICE DRIVERS

The following factors are thought to be responsible for changes in the price of gold:

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Reserves at central banks: Gold and paper money are held in reserve by central banks. According to the World Gold Council, central banks have just started buying more gold than they are selling for the first time in decades. The price of gold increases as central banks diversify their monetary reserves away from the paper money they have collected and toward gold. Many countries around the world, including the United States, Germany, Italy, France, Portugal, Greece, and the Eurozone, have reserves that are predominantly of gold.

Dollar value: In general, the price of gold is inversely tied to the value of the US dollar. This is because when the dollar is strong, people tend to invest and trade in dollars. But individuals choose to invest in gold through means like exchange Traded funds or coins when the economy is uncertain and the currency is weak

The demand for jewelry globally and in the industry (including from emerging economies): In terms of volume, the three countries that use the most gold for jewelry are India, China, and the United States. For instance, consumer demand in China reached 200 tonnes in the first two months of 2012, which is a significant rise over the 209 tonnes it took to reach in the same period the year before. Gold is used in the production of high-precision electronics like GPS units and medical devices like stents, which account for another 12 percent of demand. The basic law of supply and demand states that as consumer demand rises for things like jewelry and technology, the price of gold rise as well.

Protection of wealth (especially during times of geopolitical tensions): During times of economic instability, such as the late-2000s recession, more people resort to gold investing because of its enduring worth. During uncertain times, gold is frequently regarded as a "safe haven" for investors. When predicted or actual returns on bonds, equities, and real estate fall, demand for gold rises, driving up its price. Gold can be used to protect against currency depreciation, inflation, and deflation. Furthermore, gold is seen as a hedge against political turmoil, as seen by the current unrest in the Middle East and North Africa (MENA), which may be partly responsible for gold's recent climb to new highs.

VOLATILITY

Volatility is the rate at which the price of a security rises and falls. The greater the price movement up and down, the greater the volatility.

INDUSTRY PROFILE

STOCK MARKET

A stock market, equity market, or share market is the gathering of buyers and sellers (a loose network of economic transactions, rather than a physical facility or discrete entity) of stocks (also known as shares), which represent ownership claims on businesses; these may include securities listed on a public stock exchange as well as stock that is only traded privately. Shares of private enterprises sold to investors via equity crowdfunding platforms are an example of the latter. Shares of common equity, as well as other asset kinds such as corporate bonds and convertible bonds, are listed on stock exchanges.

SEBI

The Securities and Exchange Board of India (SEBI) regulates the Indian securities market. It was founded in 1988 and given statutory powers on January 30, 1992, by the SEBI Act of 1992. SEBI's headquarters is located in the Mumbai commercial area of Bandra Kurla, and it has Northern, Eastern, Southern, and Western Regional Offices in New Delhi, Kolkata, Complex Chennai, and Ahmedabad, respectively.

NSE

The National Stock Exchange of India Limited (NSE) is India's largest stock exchange, headquartered in Mumbai. The NSE was founded in 1992 as the country's first demutualized electronic exchange. The NSE was the first exchange in the country to provide a contemporary, fully automated screen-based electronic trading system, allowing investors all over the country to trade easily.

NCDEX (National Commodities and Derivatives Exchange)

The National Commodities and Derivatives Exchange (NCDEX) is a commodities exchange dealing primarily in agricultural commodities in India. The National Commodities and Derivatives Exchange was established in 2003. The exchange was founded by some of India's leading financial institutions

such as ICICI Bank Limited, the National Stock Exchange of India, and the National Bank for Agricultural and Rural Development, among others.

The National Commodities and Derivatives Exchange (NCDEX) is one of the top commodity exchanges in India based on value and the number of contracts, second only to the Multi Commodity Exchange (MCX) with its focus on energy and precious metals. The National Commodities and Derivatives Exchange is located in Mumbai but has offices across the country to facilitate trade.

COMPANY PROFILE

Pace Stock Broking Services Pvt. Ltd. operates as a brokerage house. Its activities include trading on NSE, NSE (F&O), BSE, NCDEX, and MCX; commodities trading; and application and Web based Internet trading. The company's activities also comprise providing portfolio advisory, equity research, and technical analysis through emails/SMSes and publications; debt syndication; depository services on CDSL; IPOs and mutual fund distribution; and online back office. It also offers portfolio management services; wealth advisory services for NRIs, such as life and general insurance, mutual funds advisory services; tax planning; retirement planning; and wealth protection services. The company serves corporate, banks, institutions, NRIs, and foreign nationals. Pace Stock Broking Services Pvt. Ltd. was founded in 1995 and is based in New Delhi, India.

REVIEW OF LITERATURE

"International Gold Price Movements, 1972-1982" was a paper by I S Gulati and AshokaMody, (1982), which studied gold price movements during the last decade 1972-82. It concluded that the value movements of the gold were found to appear as cyclical i.e. moved up from 1971 it reached a peak in 1974, fell till 1976, rose again till 1980 then fell up to 1982. The major reason for this cyclical movement was believed to be the speculative behavior that influenced the world economic system.

Ricardo Suganuma, (2000), in his paper "Reality Check for Volatility Models," examined models such as Generalized Autoregressive Conditional Heteroskedasticity GARCH and Exponential weighted moving average (EWMA) models. It concluded that it is the simple volatility model to determine the volatility.

A research work entitled "Forecasting volatility in the stock market" by SergiyLadokhin and Dr. Erik Winands, (2009), focused on different forecasting models for market indices. The forecasting models used include Exponential weighted moving average, Auto Regressive Moving Average (ARMA), and Generalized Autoregressive Conditional Heteroskedasticity (GARCH). The study found that Exponentially Weighted and Simple Moving Average methods are both efficient and relatively easy to implement.

Entitled "An overview of global gold market and gold price forecasting" ShahriarShafiee and ErkanTopal, (2010), reviewed the gold price movements for 40 years and analyse therelationship between the gold price and financial variables.This model proposed that historical data of minerals have three components to study the fluctuation of prices- a long-term trend reversion component, a diffusion component, and a jump or dip component and alsothe same model evaluated each component to estimate the long-run prices of minerals. This study validated the above model and locatedthe gold price for the next 10 years.

"Comparative analysis on the effects of the Asian and global financial crises on precious metal markets", by Lucía Morales and Bernadette Andreosso-O'Callaghan, (2011), attempted to compare the effects of the financial crisis on the volatility of various precious metals in developed economies using GARCH and EGARCH models for the period of fifteen years between 1995-2010.The variables under this study were gold, platinum, palladium, and Zurich silver. The main result showed that there existed volatility persistent between precious metals.

The dynamic relationship between precious metals", a research article by "Ahmet Sensoy", (2013), examined the volatility shifts for four metals such as gold, silver, platinum, and palladium using GARCH (1,1) model. The author used data for the year between 1999-2013. He found that gold had a significant effect on the other three metals and silver also had a role in the platinum and palladium prices.

The study on "Time Series Model for Forecasting Intraday Volatilities" by DominykasSerksnas, (2013), aimed to construct different intraday forecasting techniques for future contracts and to seek

outthe accuracy of every model. It employed the Exponential weighted moving average method (EWMA) and Generalized Autoregressive Conditional Heteroskedasticity, GARCH (1, 1) model. It concluded that the most effective method for forecasting intraday volatilities was EWMA.

The study entitled "An Econometric Analysis between Commodities and Financial Variables: The Case of Southeast Asia Countries" by Fahami et al., (2014), analyzed the relationship between commodities (Gold and Crude Oil) and financial variables (exchange rate and stock market indices). The study was focused on Southeast Asian countries such as Malaysia, Thailand, and Indonesia. Using the ADF test, Philip perron unit root test, Johansenjuseliuscointegration test, and Granger's causality test, the study found that Gold was the least affected commodity and has less effect on other variables.

Comparative Study of Volatility Forecasting Models: The Case of Malaysia, Indonesia, Hong Kong, and Japan Stock Markets" an article by San K. Lee and Lan T. P. Nguyen, (2017)analyzed the effectiveness of volatility forecasting models such as exponential weighted moving average (EWMA), Autoregressive Integrated Moving Average (ARIMA) and Generalized Auto-Regressive Conditional Heteroscedastic (GARCH) using stock prices of Indonesia, Malaysia, Hongkong, and Japan. This concluded that EWMA is found to be the best forecasting model for Honking among them.

"Does gold act as a hedge or a safe haven against equity and currency in Asia?" research done by Muhammad Aftab et al., (2017), investigated the gold behavior against equities and currencies across twelve countries in Asia. It found that gold acts as a hedge and safe heaven against Asian currencies except forChina and Hong Kong.

Vaneet Bhatia et al., (2018), with their co-workers did work on "Do precious metal spot prices influence each other? Evidence from a nonparametric causality-in-quantiles approach" during which they used the quantile causality approach to look at the connection among the spot prices of precious metals (gold, silver, platinum, and palladium) during the various period. It found that there existed a bi-directional relationship between the mean and variance among the varied sample prices.

A research article "A note on the implied volatility spillovers between gold and silver markets" by Anupam Dutta, (2018), aimed at finding the volatility spillover of gold and silver using a bivariate VAR-GARCH model. It suggested that the returns and shocks run significantly fromgold to silver. It also showed that portfolio risk can be diversified by investing in both silver and gold.

STATEMENT OF THE PROBLEM
RESEARCH PROBLEM

It has been discovered that the price of gold remains untouched by certain economic changes, i.e., previous data has no bearing on gold prices. In many cases, the price of gold climbed, in contrast to other financial factors that decreased the least. The safe heaven is thought to be made of gold. Therefore, the focus of this research was on examining the nature of gold price volatility for several Asian nations overten years.

RESEARCH GAP

Even though several studies have been conducted about the gold price volatility for a specific commodity or a single country,this research is intended to study the trend of gold markets of the selected Asian countries and to help the investors who wish to invest in Asian markets.

OBJECTIVES OF THE STUDY

- To study the volatility of gold prices for the selected Asian markets.
- To forecast the future investment for gold in the selected Asian countries.
- To analyze the volatility of gold prices is influenced by the previous information; and
- To interpret the results and arrive at solutions.

RESEARCH METHODS

This study took into account the volatility of gold prices in various Asian countries. Among Asian countries, emerging markets were picked as the sample based on the MSCI website's classification of markets, which includes Japan, Indonesia, India, China, Thailand, and Korea.

Table- Classification of markets as listed by the MSCI website:

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Developed Markets	Emerging Markets	Frontier Markets
Japan	Indonesia India Korea China Thailand	Vietnam

Source: MSCI website

Secondary data was employed in the study. The daily gold prices for the selected nations were obtained from the website of the World Gold Council.The study covered ten years from January 2012 to December 2022 for the analysis.

TOOLS USED FOR THE STUDY

DESCRIPTIVE STATISTICS:

Brief informative coefficients known as descriptive statistics are used, to sum up, a particular data set, which may be a sample of a population or a representation of the complete population. Measurements of central tendency and measures of variability make up descriptive statistics. The mean, median, and mode are measurements of central tendency, while the standard deviation, variance, minimum and maximum variables, kurtosis, and skewness are measures of variability.

EXPONENTIAL WEIGHTED MOVING AVERAGE:

The basic exponential smoothing method is used in the study. The use of the exponential window function is first attributed to Poisson, an extension of a numerical analysis technique from the 17th century, and later adopted by the signal processing community in the 1940s. Here, exponential smoothing is the application of the exponential, or Poisson. Exponential smoothing was first suggested in the statistical literature without citation to previous work by Robert Goodell Brown in 1956 and then expanded by Charles C. Holt in 1957.The formulation below, which is the one commonly used, is attributed to Brown and is known as "Brown's simple exponential smoothing". All the methods of Holt, Winters and Brown may be seen as a simple application of recursive filtering, first found in the 1940s.

The simplest form of exponential smoothing is given by the formula:

$$\sigma_T^2 = b r_{t-1,t}^2 + (1-b)\sigma_{t-1}^2 \; ; \; \sigma_T^2 = \lambda \sigma_{t-1,t}^2 + (1-\lambda)r_{t-1}^2$$

Where b is the smoothing factor, and $0 < b < 1$. In other words, the smoothed statistic (t is a simple weighted average of the current observation xt and the previous smoothed statistic (t−1). The term smoothing factor applied to α here is something of a misnomer, as larger values of b actually reduce the level of smoothing, and in the limiting case with b = 1 the output series is just the current observation. Simple exponential smoothing is easily applied, and it produces a smooth statistic as soon as two observations are available.

Values of b close to one have less of a smoothing effect and give greater weight to recent changes in the data, while values of b closer to zero have a greater smoothing effect and are less responsive to recent changes. There is no formally correct procedure for choosing b. Sometimes the statistician's judgment is used to choose an appropriate factor. Alternatively, a statistical technique may be used to optimize the value of b.

ANALYSIS AND INTERPRETATION

Results of descriptive statistics for the gold prices of China.

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Table-1

Mean	9370.023
Median	8683.844
Maximum	12205.48
Minimum	7285.484
Std. Dev.	1587.082

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Skewness	0.521103
Kurtosis	2.072701

Source: Data collected from the world gold council website, computed in Eviews.
Results of descriptive statistics for the gold prices of India.

Table-2

Mean	91928.03
Median	84021.53
Maximum	132967.9
Minimum	73479.17
Std. Dev.	21031.75
Skewness	1.267799
Kurtosis	3.091271

Source: Data collected from the world gold council website, computed in Eviews.
Results of descriptive statistics for the gold prices of Indonesia.

Table-3

Mean	17923511
Median	16618096
Maximum	25736147
Minimum	13765598
Std. Dev.	4187025
Skewness	1.131628
Kurtosis	2.847937

Source: Data collected from the world gold council website, computed in Eviews.
Results of descriptive statistics for the gold prices of Japan.

Table-4

Mean	147593.5
Median	140034.2
Maximum	197450.8
Minimum	124904.2
Std. Dev.	23514.03
Skewness	1.390842
Kurtosis	3.399270

Source: Data collected from the world gold council website, computed in Eviews.
Results of descriptive statistics for the gold prices of Korea.

Table-5

Mean	1622180.
Median	1545116.
Maximum	2086127.
Minimum	1310933.
Std. Dev.	281927.9
Skewness	0.568716
Kurtosis	1.894731

Source: Data collected from the world gold council website, computed in Eviews.
Results of descriptive statistics for the gold prices of Thailand.

Table-6

Mean	46145.79
Median	43233.34
Maximum	57540.78
Minimum	39675.13
Std. Dev.	6147.177

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Skewness	0.819996
Kurtosis	2.199924

Source: Data collected from the world gold council website, computed in Eviews.

Results of descriptive statistics for the gold prices of Vietnam.

Table-7

Mean	31789300
Median	29663556
Maximum	41252939
Minimum	25408172
Std. Dev.	5367324.
Skewness	0.806319
Kurtosis	2.426043

Source: Data collected from the world gold council website, computed in Eviews.

ANNUAL STANDARD DEVIATION

Table-8: Annual standard deviation for the gold prices of selected Asian countries.

Year	Japan	India	China	Indonesia	Thailand	Vietnam	Korea
2012	28,224.6	2894.81	238.01	377553.12	1324.52	1002696.29	51041.48
2013	1,524.1	1116.13	97.04	213818.45	407.61	361678.04	14255.56
2014	2,843.8	1390.57	285.87	281084.75	1003.27	854967.19	47918.02
2015	1,088.1	742.23	95.53	91372.73	403.16	273915.14	12469.39
2016	1,549.7	516.31	81.61	122449.72	283.40	237376.49	9529.20
2017	888.7	410.90	484.84	219192.81	257.08	212221.47	8383.80
2018	781.8	483.22	39.68	133800.76	210.25	215611.48	9164.53
2019	1,192.6	476.70	34.78	82272.68	301.32	268074.80	8757.68
2020	2,425.1	2154.88	245.74	368604.08	609.23	621421.91	41141.45
2021	3,371.1	245.17	245.17	8189438.45	14647.52	11017984.38	515318.46
2022	1,755.7	71.22	71.22	150821.66	692.89	291964.37	17266.25

Source: Data collected from the world gold council website, computed in excel.

The above tablecontains information about the volatility or standard deviation for each year included in the period of study i.e., from 2012to 2022. The annual standard deviation for the gold prices is calculated for the convenience of using it in the weighted moving average model.It concluded that almost all the selected Asian countries showed low volatility rates during the years 2017, 2018, 2019, and 2022.

The high value of volatility for the countries was recorded in the year 2012 for Japan, 2021 for Indonesia, 2012 for India, 2017 for China, 2021 for Thailand, 2021 for Korea, and 2021 for Vietnam respectively. From the above, it can be concluded that the high volatility was recorded either in 2012 or 2021.

EXPONENTIAL WEIGHTED MOVING AVERAGE:

Weighted moving average of gold prices- Japan

Table-9

Year	Japan	Smoothed	Forecast	Residual
2012	124,904.2	131160.69	133,842.0	-8,937.9
2013	133,066.2	131732.33	131160.69	1,905.5
2014	137,179.0	133366.34	131732.33	5,446.7
2015	133,665.9	133456.20	133366.34	299.5
2016	140,395.0	135537.84	133456.20	6,938.8

2017	135,409.1	135499.23	135537.84	-128.7
2018	140,951.8	137135.00	135499.23	5,452.6
2019	140,034.2	138004.77	137135.00	2,899.2
2020	151,686.8	142109.38	138004.77	13,682.0
2021	188,785.4	156112.18	142109.38	46,676.0
2022	197,450.8	168513.75	156112.18	41,338.6

Source: Data collected from the world gold council website, computed in excel.

Table-9 shows the information about the smoothed and forecasted gold price volatility of Japan. The smoothing average lies between 0 to 1. When it is close to 1, there is the influence of previous information and when it is close to 0 there is no influence of previous information. The smoothing average for Japan is 0.30, which indicated that the influence of previous information on Japan's gold price volatility is low.

Table-10 Parameters of EWMA

Alpha	0.3
MSD	10,506.6
RMSE	102.50

Weighted moving average of gold prices- India

Table-11

Year	India	Smoothed	Forecast	Residual
2012	73,479.2	78697.92	79,277.78	-5,798.61
2013	89,078.5	79735.98	78,697.92	10,380.59
2014	82,238.1	79986.19	79,735.98	2,502.16
2015	77,245.7	79712.15	79,986.19	-2,740.47
2016	74,347.4	79175.67	79,712.15	-5,364.78
2017	84,021.5	79660.25	79,175.67	4,845.86
2018	81,863.6	79880.59	79,660.25	2,203.37
2019	86,658.3	80558.36	79,880.59	6,777.69
2020	98,108.2	82313.34	80,558.36	17,549.82
2021	131,200.0	87202.00	82,313.34	48,886.61
2022	132,967.9	91778.59	87,202.00	45,765.87

Source: Data collected from the world gold council website, computed in excel.

Table-11 shows the information about the smoothed and forecasted gold price volatility of India. The smoothing average lies between 0 to 1. When it is close to 1, there is the influence of previous information and when it is close to 0 there is no influence of previous information. The smoothing average for India is 0.1, which indicated that the influence of previous information on India's gold price volatility is very low.

Table-12Parameters of EWMA

Alpha	0.1
MSD	11,364.37
RMSE	106.60

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Weighted moving average of gold prices-Thailand

Table-13

Year	Thailand	Smoothed	Forecast	Residual
2012	47,905.0	45073.43	44,758.8	3,146.2
2013	51,854.7	45751.55	45073.43	6,781.2
2014	43,233.3	45499.73	45751.55	-2,518.2
2015	41,125.9	45062.34	45499.73	-4,373.9
2016	39,675.1	44523.62	45062.34	-5,387.2
2017	44,094.0	44480.66	44523.62	-429.6
2018	42,652.1	44297.80	44480.66	-1,828.6
2019	40,978.7	43965.89	44297.80	-3,319.1
2020	43,183.9	43887.69	43965.89	-782.0
2021	55,360.3	45034.94	43887.69	11,472.6
2022	57,540.8	46285.53	45034.94	12,505.8

Source: Data collected from the world gold council website, computed in excel.

Table-13 shows the information about the smoothed and forecasted gold price volatility of Thailand. The smoothing average lies between 0 to 1. When it is close to 1, there is the influence of previous information and when it is close to 0 there is no influence of previous information. The smoothing average for Thailand is 0.1, which indicated that the influence of previous information on Thailand's gold price volatility is very low.

Table-14 Parameters of EWMA

Alpha	0.1
MSD	1,387.9
RMSE	37.25

Weighted moving average of gold prices- China

Table-15

Year	China	Smoothed	Forecast	Residual
2012	10,148.4	9015.74	8,889.9	1,258.5
2013	10,529.5	9167.12	9015.74	1,513.8
2014	8,683.8	9118.79	9167.12	-483.3
2015	7,802.2	8987.13	9118.79	-1,316.6
2016	7,285.5	8816.97	8987.13	-1,701.6
2017	8,306.0	8765.87	8816.97	-510.9
2018	8,494.8	8738.76	8765.87	-271.1
2019	8,379.7	8702.86	8738.76	-359.0
2020	9,634.2	8796.00	8702.86	931.4
2021	12,205.5	9136.94	8796.00	3,409.5
2022	11,600.6	9383.31	9136.94	2,463.6

Source: Data collected from the world gold council website, computed in excel.

Table-15shows the information about the smoothed and forecasted gold price volatility of China. The smoothing average lies between 0 to 1. When it is close to 1, there is the influence of previous information and when it is close to 0 there is no influence of previous information. The smoothing

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average for China is 0.1, which indicated that the influence of previous information on China's gold price volatility is very low.

Table-16 Parameters of EWMA

Alpha	0.1
MSD	448.6
RMSE	21.18

Weighted moving average of gold prices- Korea

Table-17

Year	Korea	Smoothed	Forecast	Residual
2012	1,741,098.1	1597598.079	1,561,723.1	179,375.0
2013	1,879,371.9	1653952.835	1597598.079	281,773.8
2014	1,545,116.4	1632185.543	1653952.835	-108,836.5
2015	1,332,095.8	1572167.601	1632185.543	-300,089.7
2016	1,310,933.2	1519920.724	1572167.601	-261,234.4
2017	1,448,703.2	1505677.224	1519920.724	-71,217.5
2018	1,421,636.8	1488869.137	1505677.224	-84,040.4
2019	1,394,783.8	1470052.077	1488869.137	-94,085.3
2020	1,625,695.8	1501180.83	1470052.077	155,643.8
2021	2,086,127.4	1618170.152	1501180.83	584,946.6
2022	2,058,415.7	1706219.261	1618170.152	440,245.5

Source: Data collected from the world gold council website, computed in excel.

Table-17shows the information about the smoothed and forecasted gold price volatility in Korea. The smoothing average lies between 0 to 1. When it is close to 1, there is the influence of previous information and when it is close to 0 there is no influence of previous information. The smoothing average for Korea is 0.2, which indicated that the influence of previous information on Korea's gold price volatility is low.

Table-18Parameters of EWMA

Alpha	0.2
MSD	65,680.1
RMSE	256.28

Weighted moving average of gold prices- Vietnam

Table-19

Year	Vietnam	Smoothed	Forecast	Residual
2012	32,505,406.4	30116870.67	29,851,477.8	2,653,928.6
2013	34,837,712.5	30588954.85	30116870.67	4,720,841.8
2014	29,663,555.5	30496414.92	30588954.85	-925,399.3
2015	26,842,543.1	30131027.74	30496414.92	-3,653,871.8
2016	25,408,171.5	29658742.12	30131027.74	-4,722,856.2

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2017	27,964,006.7	29489268.58	29658742.12	-1,694,735.4
2018	28,558,616.7	29396203.39	29489268.58	-930,651.9
2019	29,193,672.3	29375950.28	29396203.39	-202,531.1
2020	32,344,807.2	29672835.97	29375950.28	2,968,856.9
2021	41,110,864.1	30816638.78	29672835.97	11,438,028.1
2022	41,252,939.2	31860268.82	30816638.78	10,436,300.4

Source: Data collected from the world gold council website, computed in excel.

Table-19 shows the information about the smoothed and forecasted gold price volatility in Vietnam. The smoothing average lies between 0 to 1. When it is close to 1, there is the influence of previous information and when it is close to 0 there is no influence of previous information. The smoothing average for Vietnam is 0.1, which indicated that the influence of previous information on Vietnam's gold price volatility is very low.

Table-20 Parameters of EWMA

Alpha	0.1
MSE	1,826,173.6
RMSE	1351.36

Weighted moving average of gold prices- Indonesia
Table-21

Year	Indonesia	Smoothed	Forecast	Residual
2012	13,765,597.6	14796304.45	14,910,827.4	-1,145,229.8
2013	15,625,686.5	14879242.65	14796304.45	829,382.0
2014	14,638,036.7	14855122.06	14879242.65	-241,205.9
2015	15,009,017.0	14870511.55	14855122.06	153,894.9
2016	15,515,799.4	14935040.33	14870511.55	645,287.8
2017	16,618,095.8	15103345.87	14935040.33	1,683,055.4
2018	16,821,683.9	15275179.68	15103345.87	1,718,338.1
2019	18,031,866.1	15550848.33	15275179.68	2,756,686.5
2020	19,690,639.9	15964827.49	15550848.33	4,139,791.6
2021	25,736,146.9	16941959.43	15964827.49	9,771,319.4
2022	25,706,053.8	17818368.86	16941959.43	8,764,094.4

Source: Data collected from the world gold council website, computed in excel.

Table-21 shows the information about the smoothed and forecasted gold price volatility in Indonesia. The smoothing average lies between 0 to 1. When it is close to 1, there is the influence of previous information and when it is close to 0 there is no influence of previous information. The smoothing average for Indonesia is 0.1, which indicated that the influence of previous information on Indonesia's gold price volatility is very low.

Table-22 Parameters of EWMA

Alpha	0.1
MSD	2,643,219.5
RMSE	1625.80

MAJOR RESULTS FROM THE RESEARCH

- The mean value of gold prices in Japan was found to be 147593.5 which indicates the return of Gold with the risk of (standard deviation) 23514.03.
- The mean value of gold prices in Indonesia was found to be 17923511 which indicates the return of Gold with the risk of (standard deviation) 4187025.
- The mean value of gold prices in India was found to be 91928.03 which indicates the return of Gold with the risk of (standard deviation) 21,031.74.
- The mean value of gold prices in China was found to be 9,370.023 which indicates the return of Gold with the risk of (standard deviation) 1,587.082.
- The mean value of gold prices in Thailand was found to be 46,145.79 which indicates the return of Gold with the risk of (standard deviation) 6,147.177.
- The mean value of gold prices in Korea was found to be 1,622,180 which indicates the return of Gold with the risk of (standard deviation) 281,927.9.
- The mean value of gold prices in Vietnam was found to be 31789300 which indicates the return of Gold with the risk of (standard deviation) 5367324.
- From the findings of descriptive statistics, the Hypothesis that "There is no Volatility in daily sample prices of gold during the study period" is rejected.

SUGGESTIONS

- Based on the observation that the price of gold exhibits volatility across all of the sample nations, investors can plan short-term investments.
- As a result, before making an investment decision in gold, investors must take price, authenticity, purity, and budget into account.
- Investors are advised to diversify their portfolios rather than concentrating just on gold.
- During a time of market volatility, investors are warned from making quick judgments about gold investments because doing so might result in a loss of capital.
- In general, gold prices fluctuate more than other commodities do, so investors should hold off on buying gold until the perfect time and seek professional assistance.

CONCLUSION

The study was designed to examine the volatility of gold prices for each of the Asian nations that were chosen for the investigation from January 2012 to December 2022. For analysis, the study usedexponential weighted moving averageand descriptive statistics. Mean, standard deviation, kurtosis, and skewness for the daily gold prices of the chosen Asian countries were examined using descriptive statistics.

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