



A Study On Relationship Between Indian Gold Market And BSE Sensex, Nifty 50

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Abstract: This study investigates the dynamic relationship between the Indian gold market and the equity market, represented by BSE Sensex and Nifty 50, over a decade-long period. Employing a comprehensive methodological approach, including descriptive statistics, correlation analysis, regression modeling, and ARIMA forecasting, this research aims to uncover the underlying patterns and dependencies among these asset classes. The study finds a statistically significant negative correlation between gold and stock market returns, suggesting that they tend to move in opposite directions. However, regression analysis reveals that the impact of gold price changes on stock market indices is relatively limited, indicating the presence of other influential factors. The ARIMA model provides short-term forecasts for gold prices and stock market indices, offering insights into potential future trends.

Keywords: Gold Market, Nifty 50, BSE Sensex

Introduction:

Gold and the stock market stand out as two major investment options, each with a unique influence on the financial landscape. Gold, in particular, has always been a special kind of investment. People buy gold because it holds its value, protects them from inflation rising, and is seen as a safe bet during tough economic times. The stock market, on the other hand, is where people invest in companies hoping to grow their wealth. How well the stock market performs depends on several factors, including how well companies, firms are doing financially, the overall health and structure of the economy, how confident investors are feeling, and even what's happening politically around the world.

The stock market offers a diverse menu of investment options, catering to different risk appetites and financial goals. **Stocks:** Stocks are partial ownership in a corporation. When a firm performs well, its price of share usually rises, resulting in possible cash gains for investors (58). However, stock prices can change, and there is a danger of losing money if the company's performance declines. **Bonds:** These are essentially loans issued by companies or governments. Investors that buy bonds are essentially lending money and earn interest payments in return. Bonds generally offer lower returns than stocks but are considered a safer investment due to the relative stability of their prices. **Mutual Funds:** These are investment pools that combine money from many investors to purchase securities like stocks, bonds, or other assets. Professionally managed, these funds offer diversification, spreading investment risk across various holdings. This makes them a suitable choice for those new to investing. **Exchange-Traded Funds (ETFs):** They offer diversification benefits while generally charging lower costs than actively managed mutual funds. ETFs provide investors additional flexibility because they may be purchased and traded throughout the trading day. **Derivatives:** These are financial contracts where value of contract is based on the price changes of an underlying asset, such as stocks, commodities or bonds. Experienced investors mainly utilize these complicated products for hedging or speculation purposes. Stock Exchange market is a essential component in every a stock market. This intricate system acts as a central marketplace, connecting investors with companies seeking capital. India boasts several stock exchanges, each playing a vital role. However, the National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE) stand out as the two dominant players. These exchanges operate with similar trading hours, mechanisms, and settlement processes, ensuring a streamlined experience for all participants.

Bullion Market: Precious and expensive metals like gold and silver are traded in global marketplaces called bullion markets. These markets allow buying and selling to happen both directly "over-the-counter" and electronically through futures contracts. Unlike many other markets, bullion markets operate 24/7, facilitating trades across different time zones.

Physical Gold: For direct ownership of the precious metal, investors can consider physical gold in the form of coins or bars. These are readily available from reputable retailers and financial institutions, typically offered in convenient sizes such as 5 or 10 gram coins and 20-gram bars. **Gold Mutual Funds** Gold mutual funds are

investment pools that allows investors to collectively own a variety range of gold-related assets. These funds typically invest in physical gold, gold exchange-traded funds (ETFs), shares of gold mining companies, and other gold-linked securities.

Review of literature

Gadasandula, James and Rao (2024) concluded Indian households purchase gold for a great variety of purposes, despite the fact that gold is treated as a key cost in both good and bad times. India's people desire to invest in gold to protect themselves against instable market conditions and uncertainty. The research was created using a combination of secondary data analysis and a large primary survey with a sample of 600 gold investors selected by using convenience sampling technique and tried to take opinions through online questionnaire.

Bommisetti, and Moorthygari, Saheb (2024) conducted a study to identify the major factors influencing Indian gold prices. Utilizing a comparative methodology, the research combined market-specific and macroeconomic data to analyze the evolution of gold prices. The study considered unique aspects of the Indian context, such as local demand trends, festive seasons, and government regulations. The findings highlighted key variables affecting Indian gold prices, including changes in oil prices, fluctuations in the BSE index, interest rates, and currency rates.

In paper, Valarmathi (2023) delves into the dynamic interplay between gold price returns and seven sectoral indices listed on the Bombay Stock Exchange (BSE), spanning from January 2000 to May 2018. Their study focuses on investigating the degree of correlation between gold returns and the returns of these sectoral indices. The findings indicate a significant level of independence between gold price returns and the returns of the BSE sectoral indices, highlighting distinct patterns of behavior within the gold market in India is compared to specific sectors of the BSE.

Samuel (2022) examined the impact of gold rates on the stock market, specifically focusing on the Nifty 50 index. Utilizing secondary data from January 2019 to December 2020, the study incorporated 468 daily average observations. Through econometric regression analysis, the research found that gold rates significantly influence the Nifty 50 index. Additionally, Karl Pearson's correlation demonstrated a positive relationship, indicates that increases in gold prices are associated with rises in the Nifty 50 index. It means that Nifty 50 index having the impact for the improvement in the gold lead to increase in Indian stock markets' Nifty 50 index.

Panchal (2021) conducted a study to research the influence of gold prices on the Indian stock market, as represented by Nifty 50 index. Employing daily data from January 2018 to May 2021, the researcher found a contrasting relationship with the two assets. During periods of market stability, investors exhibited a preference for equities, leading to a negative correlation between gold and stock prices. However, the dynamics shifted during turbulent market conditions. As investor confidence in equities waned amid declining stock market

earnings, a flight to safety emerged, driving a positive correlation between gold and stock prices. Gold's traditional role as a safe-haven asset became evident during these periods of heightened uncertainty.

Samuel and Selvan (2020) explored the long-term relation between gold prices and the Bombay Stock Exchange (SENSEX) index. Analyzing daily data of nearly two decades from January 2000 to November 2019, the study revealed a significant long-term equilibrium between the two assets. This finding suggests a synchronized movement of gold and stock prices over an extended period, implying a potential interconnectedness between these two investment classes.

Singh and Kaur (2018) explored the relation between gold prices in the country and the NSE Nifty index using monthly data from 2001 to 2017. Their analysis employed statistical methods including unit root, Granger causality, and cointegration tests. The findings indicated a long-term equilibrium between gold and stock prices but no causal relationship between them. Additionally, both gold and stock returns exhibited positive trends with relatively stable fluctuations over time.

Statement of the problem

Despite the long-standing cultural significance of gold in India, the relationship between the gold market and Indian stock market, namely BSE Index, Nifty 50 remains unclear. This study aims to examine the nature and extent of the connection between gold prices and the BSE Sensex index, considering various timeframes. The analysis will closely examine the complex connection between gold prices and the BSE Sensex, Nifty 50. Does a direct correlation exist, whether both markets move in the same direction, rising and falling together. Alternatively, is the relationship marked by an inverse correlation, with gold prices increasing when the Sensex and nifty declines, and vice versa. Perhaps the reality is more subtle, a multifaceted interplay where various factors influence each market to different extents. By exploring these possibilities, we aim to shed light on the true nature of the connection and link between these two seemingly disparate forecasts.

Objectives of the Study

- To analyze the descriptive statistics of the stock market and gold prices.
- To assess the correlation between the returns from BSE Sensex, Nifty 50, and gold prices.
- To develop a regression equation for the relationship between stock market indices (BSE Sensex, Nifty 50) and gold prices.
- To apply the ARIMA model to forecast the next 5 days of gold prices, BSE Sensex, and Nifty 50

Research Methodology

This study employs a quantitative research design, utilizing numerical data to analyze the relationship between gold prices and two major Indian stock market indices: Nifty 50 and BSE Sensex. The study relies on secondary data, with historical gold prices obtained from Investing.com and daily closing data for Nifty 50 and BSE Sensex collected from the official websites of the National Stock Exchange of India (NSE) and the Bombay Stock Exchange (BSE). The individual data point analyzed in this study is the daily closing price. The sample frame encompasses the entire population of daily closing prices for gold, Nifty 50, and BSE Sensex from 2014 to 2023. The sample size for the analysis consists of 2,470 data points. Microsoft Excel and Power BI are used as tools for calculations and data processing in this study.

The study will begin with descriptive statistics to summarize the data using measures such as mean and standard deviation. Following this, a correlation analysis will be conducted, calculating the Pearson correlation coefficient to measure the strength and direction of the linear relationship between gold returns and the stock market indices. To further explore the link and identify potential explanatory factors influencing the indices based on gold price movements, a regression analysis will be performed. Additionally, ARIMA analysis will be utilized to forecast the next five days of gold prices and indices. To effectively communicate the findings, data visualization tools such as Power BI or other visualization software will be used to create charts and graph.

Result and discussion

Descriptive analysis

Table 1: Descriptive Statistics of Gold Price and BSE Sensex, Nifty 50

Column1	Gold Price	BSE Sensex	Nifty 50
Mean	38345.64372	39655.11166	11886.43209
Standard Error	228.0802718	272.5398193	79.69893432
Median	31729	35788.54	10771.925
Mode	29131	65721.25	7108.75
Standard Deviation	11335.383	13544.98225	3960.964873
Sample Variance	128490907.7	183466544.2	15689242.72
Kurtosis	-1.18824009	-0.956720124	-0.912061999
Skewness	0.560077269	0.63239439	0.638434444
Range	39081	52217.03	15777.8
Minimum	24597	20193.35	6000.9
Maximum	63678	72410.38	21778.7
Sum	94713740	97948125.81	29359487.25

Count	2470	2470	2470
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According to the table, the average gold price was 38,345.64 rupees, while the mean values for the NSE 50 and BSE 100 indexes were

39,655 and 11,886.44, respectively. The BSE Sensex (11,335.383) and Nifty 50 (3,960.964873) standard deviations show how far the daily closing values are from their respective averages. The gold price and indexes showed negative skewness, which is indicative of a distribution with thinner tails and a flatter peak than a normal distribution. All three also showed positive skewness, shows that positive returns are more likely than negative return.

Correlation Analysis

Table 2: Correlation between Gold Price and BSE Sensex Return, Nifty 50 Return

Column1	BSE Return	Nifty50 return	Gold Return
BSE Return	1		
NSE Return	0.061965286	1	
Gold Return	-0.10043646	0.019895324	1

Correlation Between Gold Returns and BSE Sensex (-0.100436456) is negative and weak. The implication is that the returns on gold and the BSE Sensex have a somewhat negative association. Correlation Between Gold Returns and Nifty 50(0.019895324) is positive but very weak. This indicates almost no linear relationship between gold returns and Nifty 50 returns. The very weak positive correlation implies that the movements of the Nifty 50 index are almost independent of the movements in gold returns.

Regression Analysis

For BSE Index

Table 3: Regression Analysis of Gold Price and BSE Sensex

Column1	df	SS	MS	F	Significance F
Regression	1	0.002753241	0.00275324	25.1394	5.71E-07
Residual	2467	0.270183158	0.00010952		

Total	2468	0.272936399			
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Column1	Coefficients	Standard Error	t Stat	P-value
Intercept	0.000536979	0.000210758	2.54784481	0.01089923
Gold Return	-0.121343429	0.024201301	-5.0139217	5.71E-07

The linear regression analysis examines the relation between gold returns and the BSE Sensex. The correlation coefficient (Multiple R) is 0.10, indicating a weak correlation. F-statistic is 25.14 with a very low p-value (5.71E-07), indicating that the overall regression model is statistically significant. The coefficients show that the intercept is 0.00054, and for gold return is -0.1213, both of which are statistically significant. This implies that when gold returns increase, the BSE Sensex return tends to decrease.

For Nifty 50

Table 4: Regression Analysis of Gold Price and Nifty 50

Column1	df	SS	MS	F	Significance F
Regression	1	0.00011	0.00011	0.97688	0.323066161
Residual	2467	0.2696	0.00011		
Total	2468	0.26971			

Column1	Coefficients	Standard Error	t Stat	P-value
Intercept	0.000494541	0.000210531	2.34902	0.0189
Gold Return	0.023894175	0.024175223	0.98837	0.32307

For the relation between gold returns and the Nifty 50, The correlation coefficient (Multiple R) is 0.0199, indicating an extremely weak correlation. The F-statistic is 0.97688 with a p-value of 0.3231, indicating that the overall regression model is not statistically significant. The intercept is 0.000494541 and is statistically significant, but the coefficient for gold return is 0.023894175 and is not statistically significant (p-value of 0.32307). This implies that changes in gold returns don't have a significant impact on the Nifty 50.

Unit root Test

Table 5: Unit Root Test

Column1	GOLD Return	BSE Sensex Return	NIFTY 50 Return
Tau (Observed value)	-2.19	-1.825	-1.666
Tau (Critical value)	-3.392	-3.392	-3.392
p-value (one-tailed)	0.495	0.69	0.761
alpha	0.05	0.05	0.05
Result	Non stationery	Non stationery	Non stationery

For all three-time series (Gold Return, BSE Sensex Return, and Nifty 50 Return), the observed Tau values are higher (less negative) than the critical Tau value of -3.39. Furthermore, since each case's p-value is higher than 0.05, we are unable to reject the null hypothesis (H0). This tells that the time series for the Nifty 50, BSE Sensex, and gold price are non-stationary, meaning they have a unit root. As a result, rather than varying around a steady mean or variance, these series show trends or patterns throughout time, affected by their own historical values.

Co integration test

Table 6: Johansen Co-Integration Test

H0 (Nbr. of cointegrating equations)	Eigenvalue	Statistic	Critical value	p-value
None	0.006	15.523	17.797	0.106
At most 1	0.003	7.531	11.225	0.207
At most 2	0.001	2.517	4.13	0.133

Trace Test

H0 (Nbr. of cointegrating equations)	Eigenvalue	Statistic	Critical value	p-value
None	0.006	25.572	24.275	0.034
At most 1	0.003	10.048	12.321	0.117
At most 2	0.001	2.517	4.13	0.133

The results of the cointegration tests for gold return, BSE Sensex return, and Nifty 50 return present a mixed picture. The Lambda Max Test suggests no cointegration, meaning the variables don't necessarily move together

in the long run. This is because the test statistics (15.523, 7.531, and 2.517) are all lower than their respective critical values (17.797, 11.225, and 4.130).

However, the Trace Test paints a different picture. Here, the statistic for "None" (no cointegration) is greater than the critical value ($25.572 > 24.275$). This indicates at least one cointegrating relationship exists. In simpler terms, the variables might exhibit some long-term equilibrium relationship, suggesting they move together over time.

Given that the Trace Test is often considered more reliable than the Lambda Max Test, the overall interpretation leans towards the variables (gold return, BSE Sensex return, and Nifty 50 return) having a long-term equilibrium relationship. This means they might exhibit some level of co-movement in the long run

ARIMA Test

An autoregressive integrated moving average (ARIMA) model is a statistical technique, method for analyzing and interpreting time series data and projecting future trends. It shows how a variable change over time by regressing on its own previous values.

Table 6: ARIMA Test

A	Gold Price	BSE 100	Nifty 50
SSE	306281261	413592190	36163434
p	0	0	0
q	1	1	1
d	2	2	2
res mean	-3.6800902	3.69747414	1.0458386
res s.d.	352.331879	409.433972	121.0693
sqrt mse	352.279714	409.367713	121.04929
data mean	-0.2080279	-0.0534996	0.0534939
data s.d.	495.614902	568.430723	167.68176
63263.93628		72433.61809	21813.301
63324.78236		72530.42724	21847.932
63385.53826		72627.32313	21882.592
63446.20397		72724.30576	21917.281
63506.77949		72724.30576	21952

Table 7: Forecasted data for ARIMA Test

An ARIMA model with parameters (0, 2, 1) was employed to analyze and forecast the behavior of Gold Price, BSE Sensex, and Nifty 50. These parameters indicate no autoregressive terms, twice-differenced data for stationarity, and a single moving average term. The model generated forecasts suggesting a gold price range of 63,233.78236 to 63,506.77949 within ten days, a BSE Sensex range of 72,433.61809 to 72,740.30576, and a Nifty 50 range of 21,813.301 to 21,952.

Conclusion

The study stated the impact and effect of gold prices on the Indian stock market, utilizing the BSE 100 Sensex and Nifty 50 indices as market proxies. Correlation research revealed a substantial negative link between gold returns & stock market returns, indicating a tendency for gold returns and stock market returns to move in opposite directions. This suggests that when the stock market performs well, gold return might decline, potentially acting as a hedge against losses. Interestingly, regression analysis identified a statistically positive impact of gold price changes on the stock market, although this influence was quantitatively small. This implies that while gold can influence the market, its effect is outweighed by other, more significant factors.

During the study period, gold prices, BSE Sensex, and NSE500 were found to be non-stationary as they had a unit root. Results from the Johansen cointegration test reveals gold prices and the Indian stock market, represented by both BSE Sensex and NSE500, move independently, lacking a co-integration relationship. Using the ARIMA model, the study forecasted the prices of gold, BSE Sensex, and Nifty 50 for the next five days.

This research contributes to a deeper understanding of the complex relationship between gold prices and the Indian stock market. By considering economic factors, cultural influences, and investment strategies, investors can make more informed decisions within the dynamic Indian financial landscape.

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