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# Forecasting The Price Of Gold Using The Arima Model: An Alternate Investment Strategy

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***Abstract***
*The world has experienced numerous financial and economic crises over the last few decades, which makes us consider making investments that will improve our readiness for tense situations like financial and economic catastrophes. During stressful periods in the past, all investors were biased in their decision to invest in different asset categories. Particularly, in the case of precious metals, we witnessed an extreme over-reliance on gold due to its reputation and low-risk investment option for traders and arbitrageurs in difficult times. It becomes increasingly crucial for an investor to comprehend the value of gold in the near future by projecting the gold price. We have taken 14 years of monthly data to construct an effective ARIMA model, and we can try to determine the expected momentum in the metal. This understanding prompted us to conduct a study to forecast gold prices considering six months of gold prices and compare them with the spot gold price of the imminent future, which shows a positive trend. It is very evident that the price accuracy is not particularly great in the situation of a worldwide crisis. We observed that the price accuracy is not very high during volatile times, and model accuracy is questionable, but it has been observed that the model in the recent past has predicted the gold prices fairly.*
***Key Words:*** *ARIMA, Time Series, Forecast, Gold, Investment*

## 1. INTRODUCTION

In a world of economic uncertainty, gold is scripting a remarkable comeback, reclaiming its position as a resilient and strategic financial asset beyond traditional jewellery and reserves. By 2024, central banks accounted for over 20% of global demand, highlighting their role in reserve diversification and risk management. Investments in gold-backed ETFs have surged, reflecting strong confidence in it as a hedge against inflation and market volatility. With historical real returns averaging 8% annually, gold is now recognised as a forward-looking alternative investment for diversified portfolios. Over the years, demand for gold has surged to unprecedented levels from 2020 to 2024, and global gold demand has increased on average by approximately 6% per year, cementing its role as a cornerstone of the financial world. While exploring the factors driving gold's increasing value as an investment asset, while its historical significance, once rooted in cultural and societal roles such as jewellery, later expanded to include its use as a form of currency [18]. As decades passed, the yellow metal became an indispensable part of the economy, especially in many emerging nations. Research study suggests that investors in developing markets, especially those facing financial losses, tend to adjust their portfolios by incorporating gold or similar alternative assets. This shift underscores gold's growing importance, not only as a symbol of cultural value but also as a crucial financial hedge in an increasingly interconnected global market [6] and [11].

India, as one of the fastest-developing economies, has seen the growing influence of gold, a trend highlighted [8], which analyses how gold can reduce risk in stock portfolios over the long term through diversification. The significance of the yellow metal in India's economy is undeniable, especially considering the country is one of the top importers of gold. Despite contrary evidence from industrialized nations, gold remains a strong financial hedge against oil, contributing around 7% to India's GDP in 2019. Additionally, gold plays a crucial role in both domestic and international trade, further underlining its economic importance.

Gold exports indicate a substantial impact on India's trade balance. In 2019, it was estimated that approximately 15.71% of India's exports would benefit the balance of payments. Some empirical studies have examined gold's status as a safe haven in relation to stock market dynamics [12]. Incorporating gold into investment portfolios during periods of market volatility can be advantageous, as gold's neutral value promotes sustained socioeconomic development, enhances foreign exchange profits, and contributes to economic stability [4] and [3].

The COVID-19 pandemic, like previous economic crises, has had a profound impact on global economies, including India's, which faced challenges during the 2008 financial crisis and the 2020 downturn. In such turbulent times, gold's low-risk profile has made it the asset of choice for traders, investors, and arbitrageurs, solidifying its position as a safe haven. In the aftermath of the recession, the value of gold surged significantly, tripling in just a decade. This dramatic rise, particularly in the wake of the economic downturn, demonstrates gold's resilience and enduring value as a financial asset in times of crisis.

Gold has long been regarded as a safe-haven asset, especially during periods of market volatility, inflation, and currency fluctuations. It was evident that gold helps reduce portfolio risk by providing diversification [5]. Similarly, as the economy has to be balanced, gold will be a hedge against currency risk due to its connection to exchange rates [28] and [29]. In the recent studies highlighted gold's historical role as money, contributing to its value as a store of wealth [7] with an emphasize on gold's ability to diversify portfolios [21], pointed out its universally recognized value, which creates the possibility of hedging [13]. Wang, K. M., & Lee, Y. M. (2011) [34], when we look at the current situation, which confirms gold's role as a hedge during financial crises. In view of gold's implication, gold's safe-haven properties in emerging markets [36], which demonstrate its effectiveness in mitigating risks during downturns [27]. Over the period, the market has reaffirmed gold's status during the 2008 financial crisis [23], and it also supported its role in hedging against market volatility. Together, these studies emphasise gold's enduring value as a safe-haven asset in times of economic uncertainty [1] and [25], which leads to a reduction in the overall portfolio risk and an increase in returns. Gold can be strategically used for market hedging and portfolio diversification. This is because gold is believed to retain its high value, even in the face of weak or negative market returns.

However, while the price of gold in relation to current market conditions is important, it doesn't fully explain its behaviour, as historical trends have shown that there is no clear and consistent correlation between gold and financial crises.

Nevertheless, the primary consideration for any investor making an investment decision is return. One of the most crucial—and challenging—tasks for investors in such circumstances is accurately projecting prices. To forecast asset prices and predict future trends, investors employ a variety of tools and methodologies. Given that each asset is influenced by a number of dynamic variables, which may include both quantitative and qualitative data, estimating the future price of an asset can be complex and uncertain. Time series data is commonly used for such forecasting, as highlighted, it emphasizes that the price of an asset can be tracked over time using time series, a sequence of observed values recorded at regular intervals to show the movement of selected data points [20].

In this empirical study, the AR (Auto-Regressive) and MA (Moving Average) models are used to predict the price of gold, with the ARIMA model, often referred to as the Jenkins box model, being central to the analysis. The study uses six-month daily time series data on gold prices, which were collected from the World Gold Council website. EViews software was employed to analyse the data set and generate forecasts for future trends. Additionally, regression analysis is used to examine the relationship between the dependent variable and other influencing factors. By comparing the model's predicted values with actual market data, this research aims to forecast the future price movements of gold in the market.

## 2. REVIEW OF LITERATURE

ARIMA (3,1,2) model to forecast gold prices, considering it the best fit for short-term predictions. While the model reflects overall price movements well, some differences from actual data arise due to the complexity of external influencing factors; nevertheless, the results show the true gold price trend to a certain extent and can provide consumers with useful guidance for gold investment [34]. Similar examinations and contrasted several forecasting methods, such as ARIMA, to predict the exchange rates between USD and INR, analysing a sample that runs from November 2007 through December 2017. The research concluded that ARIMA (4,1,1) was the best fit for prediction, but pointed out that, as it is based on one-dimensional data, it is not entirely reliable (19). Furthermore, Another study provides an in-depth insight into the application of the ARIMA model in gold price forecasting, using data spanning from November 2003 to January 2014, and found that ARIMA (1,1,1) was the best model for estimating future gold prices [9], one more study applies the ARIMA model to forecast gold prices, taking into account the average monthly gold price from 1990 to 2015 [28]. While using different tools altogether to identify outliers, to develop an appropriate forecasting model, they discovered that ARIMA (0,1,1) is the best-fit model due to its high accuracy. Similarly, some modern studies started to use of the ARIMA model to predict gold prices, employing monthly adjusted gold price data from January 2003 to April 2012. A six-step forecast was performed using the fitted ARIMA model, and its accuracy was evaluated by comparing predicted values with actual figures. Expanding on forecasting techniques by applying utilized the Vector Error Correction Model (VECM) to determine the long-term relationship between gold prices and several factors, including the US bond market index, oil prices, the consumer price index, and the exchange rate [14]. Given that the time series variables were nonstationary, the authors incorporated cointegration, the internal model principle, and error correction models in their analysis [26]. In another study, where the market was in a bull trend, sometimes asserted that using the Box-Jenkins Autoregressive Integrated Moving Average (ARIMA) approach to forecast gold prices in India revealed that ARIMA (3,1,3) is the most suitable model. Therefore, selecting a reliable and appropriate model for gold price prediction is crucial. On the other hand, Sekar et al. forecasted currency exchange rates using both ARIMA and EMD-RNN models, comparing the results and concluding that, for long-term forecasting, EMD+RNN produces more accurate results than ARIMA [28].

Meanwhile, an investigation was done to see the potential causes impacting gold prices, aiming to demonstrate the superiority of Dynamic Model Selection (DMS) and Dynamic Model Averaging (DMA) over linear and Bayesian model averaging approaches. Their findings revealed that the Federal Bank's financial stress index and the exchange rate component had the greatest influence on gold prices. Additionally, assessment of techniques and their predictive accuracy they have tested 17 different forecasting techniques using gold price data collected over four decades; in their conclusion, there was no single model consistently provided the best prediction across various time periods; however, based on the lowest average root mean square error, exponential smoothing (ETS) was considered the best method [10]. In a related study, another technique utilised the Factor-Augmented Vector Autoregression (FAVAR) model to determine the gold price, finding that factor F1 had a positive correlation with gold prices, while F2 and F3 showed negative correlations [16].

During recent times, investors, governments, and other stakeholders emphasised that they should consider the unequal impacts of macroeconomic factors on stock prices when making investment decisions, as an unprecedented influence was brought through the economic distress [32]. But during the long bull run, the volatility was very high, and introduced a novel approach by hybridising the ARIMA and GARCH models to improve gold price prediction [35]. Similarly, they found that Support Vector Machine (SVM) outperformed ARIMA in terms of prediction accuracy, with SVM achieving a lower RMSE and MAPE, thus suggesting SVM's superiority for commodity price prediction [7].

Another significant contribution to investment research and for innovative investment strategy through conducting a study using the natural logarithm of gold prices, concluding that it provided a robust model for predicting future prices due to the larger sample size and time span [24]. The stationarity of the gold price series was verified using both the Phillips-Perron and Augmented Dickey-Fuller unit root tests, which confirmed that the series became stationary after first differencing. Lastly, [31] [2] underscored that predicting gold prices is crucial for the financial sectors of all countries. They highlighted that accurate forecasting models are essential for enhancing the profitability of gold investments. Their research employed several forecasting techniques to identify the best-performing model based on error metrics, aiming to improve the accuracy of gold price prediction, which is also discussed in this study, where they have used the ARDL-ECM model to forecast gold prices, finding that gold demand Granger-causes prices, while treasury bill rates do not. Their model outperformed both stochastic mean-reverting and ARIMA models in accuracy (5).

## 3. RESEARCH OBJECTIVES

1. To estimate the accuracy of the forecasted gold price by using the ARIMA model with an actual gold price in the spot market.
2. To forecast future gold prices with the ARIMA model.

## 4. RESEARCH METHODOLOGY

Box and Jenkins first presented this time-series forecasting technique in the 1970s. Where "AR", "I", and "MA" are included. In this case, the auto-regressive model is represented by "AR", the moving average model is represented by "MA", and the integration, which shows the order of a single integer, is represented by "I". The sequence's stationarity is ascertained using the unit root test. If the sequence is non-stationary, an operation should be performed to make it stationary. The number of similar differences determines the rank of a single integer. To create the ARIMA (p, D, q) model, differential processes and the ARMA (p, q) model are fundamentally integrated [1, 1]. It is possible to make an I (D) process stationary using the approach is commonly known as the difference-stationary or unit-root procedure. The notation ARIMA (p, D, q) represents a series that may be modelled as a stationary ARMA (p, q) process after being differenced D times.

The ARIMA (p, D, q) model has the following form:

$$(\Delta^D y_t = c + \phi_1 \Delta^D y_{t-1} + \ldots + \phi_p \Delta^D y_{t-p} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \ldots + \theta_q \varepsilon_{t-q}) \quad (1)$$

Where "ΔDyt denotes a D-th differenced series, and εt is an uncorrelated process with mean zero". In lag operator notation, Liyt = yt − i. The ARIMA (p, D, q) model can be written as

$$(\phi*(L) y_t = \phi(L)(1-L)^D y_t = c + \theta(L)\varepsilon_t) \quad (2)$$

Here, $\phi*(L)$ is an unstable AR operator polynomial with exactly D unit roots. Someone can factor this polynomial as $\phi(L)(1-L)D$, where $\phi(L) = (1 - \phi 1 L - \ldots\ldots - \phi p L p)$ is a stable degree p AR lag operator polynomial. Similarly, $\theta(L) = (1 + \theta 1 L + \ldots + \theta q L q)$ is an invertible degree q MA lag operator polynomial. When two out of the three terms in ARIM A (p, D, q) are zeros, the model may be referred to, based on the non-zero parameter, dropping "AR", "I" or "MA" from the acronym describing the model. For example, ARIMA (1, 0, 0) is AR (1), ARIMA (0,1,0) is I (1), and ARIMA (0, 0, 1) is MA (1).

An ARIMA model is constructed for the present analysis of the research using secondary data from the World Gold Council website, covering the last 14 years of monthly gold prices, which spans from January 2010 to February 2025. Knowing that the ARIMA model was important for forecasting accuracy and power, the authors applied the model with great care, following these procedures.

The first step is to import the collected data into the EViews programme and modify the sample size as needed. Check the data set for stationarity after modifying the sample size. A unit root test and sequence differentiation can be used to determine whether the data set is stationary at any level. Second, "Model identification: Plotting stationary ACF and PACF after performing the series will help identify the models." We may utilise the correlogram feature in the EViews programme to plot the ACF and PACF charts. Thirdly, the best-fit model should be estimated. This involves recognising the models and choosing the best one. For that, we will use the equation estimation function to get the AIC and BIC values of each combination of identified models; the model with the lowest AIC will be considered the best fit. The chosen model and forecast period must be entered in order to use the auto-ARIMA forecasting tool to anticipate the price. This function's output shows the anticipated price for the selected time frame.

## 5. DATA ANALYSIS

There is an increasing tendency in the gold price, as seen by the accompanying chart showing the daily price over the previous six months. It is also evident that the price began to move sideways after seeing a significant surge during the first week of August, which culminated in an all-time high. The first stage in developing and using the ARIMA model for gold price forecasting is to determine which models are accessible to AR and MA. One way to identify is by using partial correlation and correlation, which are often known as the ACF and PACF. Both partial and total autocorrelation may be accessible in the EViews programme by utilising the correlogram function. Additionally, one might perform a stationary inspection. The activity should be completed using sample stationary if it isn't. Model identification should be done using ACF and

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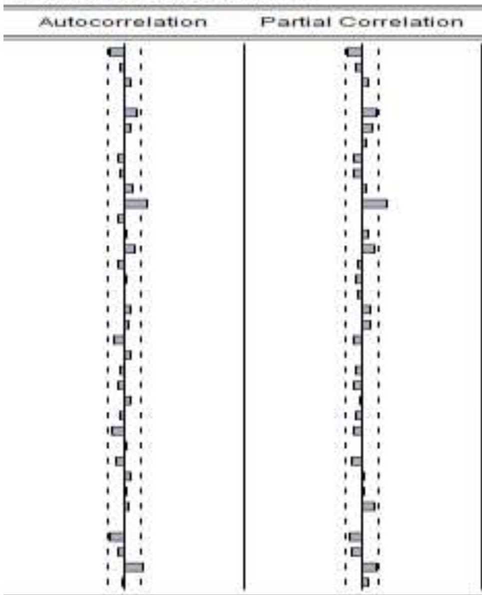
PACF once the sample stationarity has been delivered. Values for MA and AR are represented by the ACF and PACF, respectively, in this case.

Correlogram of D(PRICE_$)

Date: 03/18/25 Time: 10:43
Sample: 2010M01 2025M02
Included observations: 181



| | AC | PAC | Q-Stat | Prob |
|---|---|---|---|---|
| 1 | -0.116 | -0.116 | 2.4800 | 0.115 |
| 2 | -0.047 | -0.061 | 2.8919 | 0.236 |
| 3 | 0.056 | 0.044 | 3.4801 | 0.323 |
| 4 | -0.006 | 0.004 | 3.4860 | 0.480 |
| 5 | 0.110 | 0.117 | 5.7513 | 0.331 |
| 6 | 0.061 | 0.089 | 6.4600 | 0.374 |
| 7 | 0.002 | 0.033 | 6.4604 | 0.487 |
| 8 | -0.064 | -0.067 | 7.2502 | 0.510 |
| 9 | -0.047 | -0.075 | 7.6739 | 0.567 |
| 10 | 0.078 | 0.041 | 8.8675 | 0.545 |
| 11 | 0.195 | 0.206 | 16.301 | 0.130 |
| 12 | -0.060 | 0.000 | 17.019 | 0.149 |
| 13 | 0.024 | 0.045 | 17.137 | 0.193 |
| 14 | 0.097 | 0.107 | 19.006 | 0.165 |
| 15 | -0.050 | -0.031 | 19.514 | 0.191 |
| 16 | 0.017 | -0.055 | 19.569 | 0.240 |
| 17 | 0.008 | -0.047 | 19.581 | 0.296 |
| 18 | 0.062 | 0.068 | 20.367 | 0.313 |
| 19 | 0.033 | 0.075 | 20.588 | 0.360 |
| 20 | -0.096 | -0.074 | 22.488 | 0.315 |
| 21 | 0.048 | 0.002 | 22.960 | 0.346 |
| 22 | -0.029 | -0.053 | 23.137 | 0.394 |
| 23 | -0.053 | -0.069 | 23.734 | 0.419 |
| 24 | 0.056 | -0.024 | 24.402 | 0.439 |
| 25 | -0.039 | -0.059 | 24.723 | 0.478 |
| 26 | -0.109 | -0.079 | 27.285 | 0.395 |
| 27 | 0.009 | -0.001 | 27.302 | 0.448 |
| 28 | -0.069 | -0.092 | 28.339 | 0.447 |
| 29 | 0.058 | 0.021 | 29.082 | 0.461 |
| 30 | 0.011 | 0.024 | 29.109 | 0.512 |
| 31 | 0.034 | 0.106 | 29.365 | 0.550 |
| 32 | -0.003 | 0.005 | 29.367 | 0.600 |
| 33 | -0.127 | -0.105 | 32.971 | 0.469 |
| 34 | -0.055 | -0.095 | 33.658 | 0.484 |
| 35 | 0.157 | 0.121 | 39.225 | 0.286 |
| 36 | -0.013 | 0.057 | 39.261 | 0.326 |

*Fig.1 shows ACF and PACF functions*

The data in Figure 1 above was not stationary; first differencing is used to make the data stationary. Thus, after considering the initial difference, it evolved to ARIMA. Using the ACF and PACF charts displayed above as a guide, the study determined which models were accessible by observing that all the delays in relation to the ACF and PACF threshold limit exceeded. ACF and PACF limit exceeds in the fourth, sixth, eighth, and eleventh delays, respectively, as seen in the above chart.

The lag combinations that result in the models will be (1,1,1), and so on. The model must be chosen by using the AIC information criteria from Table 1, which shows the best fit model in the given scenario with the appropriate lags, once the various models that are accessible have been identified.

**Table 1 ARIMA- result**

| | | | | |
|---|---|---|---|---|
| Dependent Variable: D(PRICE_$) | | | | |
| Method: Least Squares | | | | |
| Date: 03/19/25 Time: 09:03 | | | | |
| Sample (adjusted): 2010M03 2025M02 | | | | |
| Included observations: 180 after adjustments | | | | |
| Convergence achieved after 15 iterations | | | | |
| MA Backcast: 2010M02 | | | | |
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
| C | 9.927131 | 4.845781 | 2.048613 | 0.042 |
| AR(1) | 0.135099 | 0.570727 | 0.236715 | 0.8132 |
| MA(1) | -0.260509 | 0.557714 | -0.4671 | 0.641 |
| R-squared | 0.015693 | Mean dependent var | | 10.052 |
| Adjusted R-squared | 0.004571 | S.D. dependent var | | 75.972 |
| S.E. of regression | 75.79822 | Akaike info criterion | | 11.511 |
| Sum squared resid | 1016930 | Schwarz criterion | | 11.564 |
| Log likelihood | -1032.95 | Hannan-Quinn critter. | | 11.532 |
| F-statistic | 1.410992 | Durbin-Watson stat | | 1.9887 |
| Prob(F-statistic) | 0.246631 | | | |

| | | | |
|---|---|---|---|
| Inverted AR Roots | .14 | | |
| Inverted MA Roots | .26 | | |

The values obtained from the model (1, 1, 1) are displayed in the equation output table above. It is crucial to take into account the AIC "Akaike information criteria" and the lowest AIC values while choosing the optimum model. That is, in this instance, -6.032265, which is less than the total amount of the recognised model. With a -6.032 AIC, model (1, 1, 1) has the lowest value; the findings show the AIC values of the top 20 models in individual combinations. Since this model is expected to fit better, it is considered the model for ARIMA-based gold price predictions


**Fig.2 ARIMA forecasting**

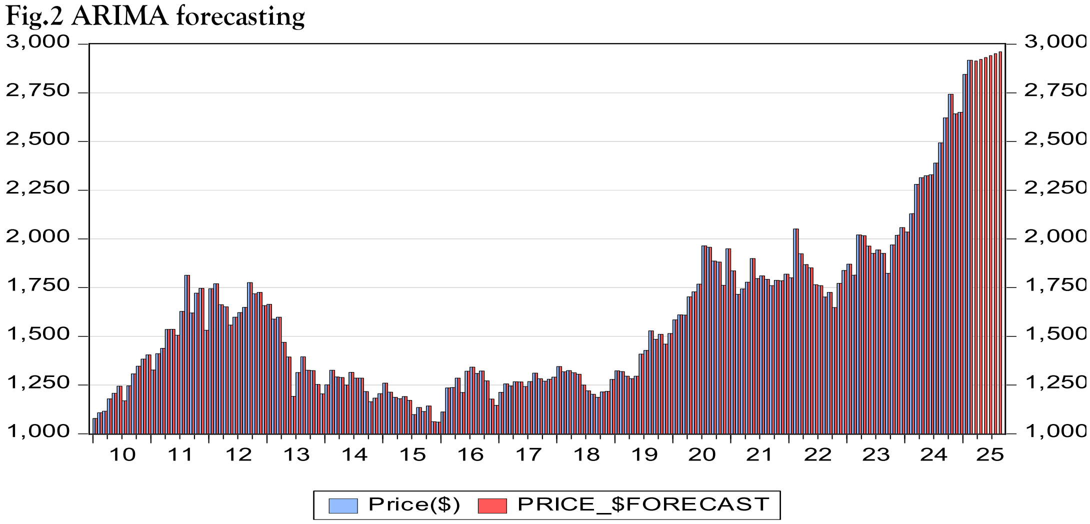



**Fig.3 Forecasted gold price**

The demand for gold is projected to drive up its price in the near future, as shown by Figures 6 and 7. The global environment also affects gold. For traders and investors, gold will be the ideal option at this point, when the nations are suffering due to the pandemic, and it is expected to be in an upward trend. Under ideal market circumstances, the prices may rise to $ 2961.25 /oz in next 6 months.

## 6. FINDINGS

The data pertaining to the price of gold between February 2025 and October 2025 indicates that gold is experiencing an upward trend, with its value consistently increasing. A correlation between the historical and current price of gold can be observed by examining the autocorrelation function. To ensure that the ARIMA model produces reliable results, a seasonality test should be performed, even though testing the ARIMA forecasting method requires that the time-series data be stationary (19). As noted this aligns with the study conducted, which used the ARIMA and GARCH models to estimate Malaysia's gold price. The study found that ARIMA is sufficient when the data do not show sharp oscillations, whereas GARCH is a more suitable technique when time series variables are volatile and their volatility is not predictable (22). Additionally, the model with the lowest AIC value should be prioritised. In this case, the ARIMA (4, 1, 4) model was considered, and the results suggest that the price of gold will continue to increase gradually in the forthcoming quarters. However, a significant divergence exists between the model's predicted price of gold and the actual price, which was $2917.6 higher than the market price per ounce. Nevertheless, the model accurately captures the rising trend of the gold price. The price of gold seems to be stabilising between $2913.7 and $2961.25 during this period, indicating that it is likely to rise in the coming days. This divergence from the expected value can be attributed to the current global situation, but it is expected that this discrepancy will diminish, thereby improving the model's accuracy.

## 7. CONCLUSION

In conclusion, the research highlights the effectiveness of the ARIMA model for short-term gold price forecasting, particularly when using first-order differencing to achieve stationarity. The ARIMA (1, 1, 1) model was identified as the most suitable for predicting gold price trends, providing valuable insights into potential market behaviour. However, the study also acknowledges the limitations of the ARIMA model, especially in capturing the full complexity of market dynamics. The significant gap between the predicted and actual gold prices indicates that external factors and the model's constraints play a crucial role in this divergence. Furthermore, while the ARIMA model offers useful predictions, the GARCH family model has demonstrated more promising results in capturing volatility and price fluctuations, suggesting its potential for more accurate forecasting in volatile market conditions. Given these findings, future research could benefit from exploring additional forecasting models, such as the VECM where Gangopadhyay and [14] used a Vector Error Correction Model (VECM) to forecast gold prices, highlighting factors like stock market index and oil prices. Their model showed gold's role as a hedge against inflation and market volatility, outperforming a random walk mode to further refine predictions and improve the accuracy of gold price forecasting. Ultimately, the study underscores the importance of continuous refinement and the integration of various modelling techniques to navigate the complexities of the gold market.

### REFERENCES

1. Aftab M, Shah SZA, Ismail I. Does gold act as a hedge or a safe haven against equity and currency in Asia? Global Business Review. 2019;20(1):105–118. doi:10.1177/0972150918803993
2. Aye GC, Gupta R, Hammoudeh S, Kim WJ. Forecasting the price of gold using dynamic model averaging. International Review of Financial Analysis. 2014;41(3):1-35. doi:10.1016/j.irfa.2015.03.010
3. Baur DG, Lucey BM. Is gold a hedge or a safe haven? An analysis of stocks, bonds and gold. Financial Review. 2010;45(2):217-229. doi:10.1111/j.1540-6288.2010.00244.x
4. Baur DG, McDermott TK. Is gold a safe haven? International evidence. Journal of Banking & Finance. 2010;34(8):1886-1898. doi:10.1016/j.jbankfin.2009.12.008
5. Beckers S, Soenen L. Gold: More attractive to non-U.S. than to US investors? Journal of Business & Finance Accounting. 1984;11(1):107-112. doi:10.1111/j.1468-5957.1984.tb00061.x
6. Calvo GA, Mendoza EG, Schmidt-Hebbel K. Rational contagion and the globalization of securities markets. Journal of International Economics. 2000;51(1):79-113. doi:10.1016/S0022-1996(99)00038-0
7. Capie F, Mills TC, Wood G. Gold as a hedge against the dollar. Journal of International Money and Finance. 2005;15(4):343-352. doi:10.1016/j.intfin.2004.07.002
8. Chua JH, Sick G, Woodward RS. Diversifying with gold stocks. Financial Analysts Journal. 1990;46(4):76-79. doi:10.2469/FAJ.V46. N4.76
9. Guha B, Bandyopadhyay B. Gold price forecasting using ARIMA model. Journal of Advanced Management Science. 2016;4(2):117-121. doi:10.12720/joams.4.2.117-121
10. Hossein K, Moshiri S, Sadeghian O. Forecasting the price of gold. Applied Economics. 2014;47(39):4141-4152. doi:10.1080/00036846.2015.1026580
11. Jaffe JF. Gold and gold stocks as investments for institutional portfolios. Financial Analysts Journal. 1898;45(2):53-59. doi:10.2469/faj. v45.n2.53
12. Juan C, Reboredo JC. Is gold a hedge or safe haven against oil price movements? Resources Policy. 2013;38(2):130-137. doi:10.1016/j.resourpol.2013.02.003.
13. Joy M. Gold and the U.S. dollar: hedge or haven? Finance Research Letters. 2011;8(3):120–131. doi:10.1016/j.frl.2011.01.001
14. Kausik M, Sarmah B, Goswami B. Forecasting the price of gold: An error correction approach. IIMB Management Review. 2014;XX:1-7. doi:10.1016/j.iimb.2015.11.001

15. Lawrence M, Bybit K, Smith J. Gold price forecasting using multivariate stochastic model. Resources Policy. 2022;76(c). doi:10.1016/j.resourpol.2021.102544
16. Lili Z, Li H, Diao C. Research of the influence of macro-economic factors on the price of gold. Procedia Computer Science. 2013;17:737-743. doi:10.1016/j.procs.2013.05.095
17. Makala D, Siti U, Safial A, Salisa H. Prediction of gold price with ARIMA and SVM. Journal of Physics: Conference Series. 2021;1767(1):012022. doi:10.1088/1742-6596/1767/1/012022
18. McCown JR, Zimmerman JL. Is gold a zero-beta asset? Analysis of the investment potential of precious metals. SSRN Electronic Journal. 2006. doi:10.2139/ssrn.920496
19. Mehar V. Forecasting USD to INR foreign exchange rate using time series analysis techniques like Holt-Winters simple exponential smoothing, ARIMA and neural networks. Academia.edu. 2017;4-5. doi:10.13140/RG.2.2.23465.08800
20. Nambiar MG, Devika P, Dhanalakshmi K. Forecasting price and analysing factors influencing the price of gold using ARIMA model and multiple regression analysis. International Journal of Research in Management, Economics and Commerce. 2012;2(11):548-563.
21. Pukthuanthong K, Roll R. Gold and the dollar (and the euro, pound, and yen). Journal of Banking & Finance. 2011;35(8):2070-2083. doi:10.1016/j.jbankfin.2011.01.014
22. Pung YP, Nor HM, Maizah HA. Forecasting Malaysian gold using GARCH model. Applied Mathematical Sciences. 2013;7(58):2879-2884. doi:10.12988/ams.2013.13255
23. Qureshi S, Rehman IU, Qureshi F. Does gold act as a safe haven against exchange rate fluctuations? The case of Pakistan rupee. Journal of Policy Modelling. 2018;40(4):685–708. doi:10.1016/j.jpolmod.2018.02.005
24. Rakesh KS, Murugesan R, Deepthi G. Forecasting monthly gold prices using ARIMA model: Evidence from Indian gold market. International Journal of Innovative Technology and Exploring Engineering. 2019;8(9S3):2278-3075. doi:10.35940/ijitee.i3294.0789s319
25. Ranaldo A, Söderlind P. Safe haven currencies. Review of Finance. 2010;14(3):385–407. doi:10.1093/rof/rfq007
26. Salmon M. Error correction models, cointegration and the internal model principle. Journal of Economic Dynamics and Control. 1988;12(2):523-549. doi:10.1016/0165-1889(88)90054-1
27. Sakemoto R. Do precious and industrial metals act as hedges and safe havens for currency portfolios? Finance Research Letters. 2018;24:256–262. doi:10.1016/j.frl.2017.09.011
28. Sharma RK. Forecasting gold price with Box Jenkins autoregressive integrated moving average method. Journal of International Economics. 2016;7(1):32-61.
29. Sjaastad LA. The price of gold and the exchange rates: once again. Resources Policy. 2008;33(2):118–124. doi:10.1016/j.resourpol.2007.10.002
30. Sjaastad LA, Scacciallani F. The price of gold and the exchange rate. Journal of International Money and Finance. 1996;15(6):879–897. doi:10.1016/S0261-5606(96)00045-9
31. Udai BT, Vardharaja G, Gandi K. Gold prices prediction: Comparative study of multiple forecasting models. YMER. 2022;21(1):745-764. doi:10.37896/ymer21.07/60
32. Umaid AS, Alam T, Siddiqui DA. Asymmetrical relationship between oil prices, gold prices, exchange rate, and stock prices during global financial crisis 2008: Evidence from Pakistan. Financial Economics. 2020;8(1):1-20. doi:10.1080/23322039.2020.1757802
33. Wang KM, Lee YM. The yen for gold. Resources Policy. 2011;36(1):39–48. doi:10.1016/j.resourpol.2010.06.002
34. Xiaohui Y. The prediction of the gold price using ARIMA model. 2nd International Conference on Social Science, Public Health and Education. 2019;196:273-276.
35. Yaziza SR, Othman NZ, Arshad MZ, Yahya AK, Hussain Z. The performance of hybrid ARIMA-GARCH modelling in forecasting gold price. Proceedings of 20th International Congress on Modelling and Simulation. 2013;1(6):1201-1207.
36. Zagaglia P, Marzo M. Gold and the US dollar: tales from the turmoil. Quantitative Finance. 2013;13(4):571-582. doi:10.1080/14697688.2012.708431