

Risk Value Analysis of Gold Futures Trading Investment Using Fundamental Analysis, Technical Analysis, and Value at Risk

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Abstract. This study was conducted to analyze the value of risk in trading Gold Trading Futures using Fundamental Analysis, Technical Analysis and Value at Risk. Fundamental analysis that uses Wage Income data other than the Agriculture Sector (Non-Farm Payroll), the conditions of the United States economy, and demand for gold prices in the world. Technical Analysis uses Moving Average Convergence/Divergence, Relative Vigor Index, and Pivot Points. Value at Risk is based on normal errors and skewness/kurtosis. The results of the analysis shown are the MACD Indicator has a truth level of 146 out of 226 days of analysis or 64.602%, the RVI Indicator has a truth level of 220 days from 226 days of analysis or 97.345%, Fundamental Analysis has a truth level of 23 out of 23 Excited for a year or 100%. Based on the level of confidence = 95%, it can be concluded that the price of gold with the normal approach (Ψ_{normal}) = 1211.1984 and the price of gold with the skewness and kurtosis approach (Ψ_{SK}) = 1247.34072.

Keyword: Risk Value Analysis, Moving Average Convergence/Divergence, Relative Vigor Index, Pivot Points

Abstrak. Penelitian ini dilakukan untuk menganalisis nilai risiko dalam Investasi Trading Gold Futures menggunakan Analisis Fundamental, Analisis Teknis dan Value at Risk. Analisis fundamental yang menggunakan data Non-Farm Payroll dan kondisi ekonomi Amerika Serikat, serta permintaan harga emas di dunia. Analisis Teknis menggunakan Moving Average Convergence/Divergence, Relative Vigor Index, dan Pivot Points. Value at Risk didasarkan pada kesalahan normal dan skewness/kurtosis. Hasil analisis yang ditunjukkan adalah Indikator MACD memiliki tingkat kebenaran 146 dari 226 hari analisis atau 64.602%, Indikator RVI memiliki tingkat kebenaran 220 hari dari 226 hari analisis atau 97.345%, Analisis Fundamental memiliki kebenaran tingkat 23 dari 23 analisis selama setahun atau 100%. Berdasarkan tingkat kepercayaan = 95%, dapat disimpulkan bahwa harga emas dengan pendekatan normal (Ψ_{normal}) = 1211.1984 dan harga emas dengan pendekatan skewness dan kurtosis (Ψ_{SK}) = 1247.34072.

Kata Kunci: Analisis Nilai Risiko, Moving Average Convergence/Divergence, Relative Vigor Index, Pivot Points

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1. Introduction

In the investment world known as the term high-risk high return. An investment of any kind, has risks as well as expected profits. Trading does not have certainty about profits or losses, analytical skills are needed in predicting prices, so do not do gambling that can lead to losses. Therefore,

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Risk Management is used to manage risks, to know and analyze risks and to anticipate and minimize the risks that occur in the investment world.

One way to minimize risk is to read the state of the gold market through the economic situation and the things that affect demand for gold supply, namely Fundamental Analysis. Another way to minimize risk is to use indicators in Technical Analysis using historical data. Moving Average Convergence/ Divergence is one of the most widely used indicators in determining market trends, in order to determine price trends in certain situations and certain time periods. The Relative Vigor Index is one indicator that has a high level of sensitivity in daily transactions, this is because this indicator follows the latest price $h-1$, different from other indicators that take price values from a certain period.

The field of risk management in the last few years has experienced a revolution that began with the emergence of a method called Value at Risk (VaR) as a method for measuring financial market risk that began to be developed in 1990. Hermansah stated that VaR is a concept used in risk measurement in risk management. VaR is defined as the estimated value of the maximum loss that may occur in a certain period with a certain level of confidence and in normal market conditions. From this definition, there are three important variables, namely the amount of loss, the period of time and the level of confidence [1].

Value at Risk (VaR) is an important measure to assess the level of risk in financial markets which states the market risk in the form of numbers [2]. The VaR estimation results at a 99% confidence level indicate that the historical data method has the lowest VaR estimation [2].

2. Theoretical Foundations

Futures gold trading investment is more active than physical gold investment and is done online. Investment trading gold futures traded value of gold is online, not trade gold is physical [3]. Here are the characteristics of futures gold trading investments:

1. Using a one-price system (at the same time buying and selling prices)
2. Unit Price in US dollars (US \$)
3. In exchanges symbolized by (xauusd)
4. Unit Weight TO (Tray Once)
5. Minimum Transaction 1 lot or 100 TO is equal to 3.1 kg for a regular account. Minimum Transaction of 0.01 lot or 1 TO is equal to 0.031 kg for Cent or mini accounts.
6. Using a guarantee fund system called leverage. Leverage aims to increase the potential return on an investment. This proportion implies how much capital (collateral) is needed to get certain loan funds in trading.
7. Trading day : Monday - Friday.

2.1. Fundamental Analysis

The Financial Statement is the starting point of the analysis, Fundamental Analysis provides firmness in determining direction. Non-Farm Payroll greatly influences price movements during 24-hour release, but the main points of long-term price movements are Economic Conditions and requests for Foreign Exchange and commodity offers themselves [4].

2.2. Technical Analysis

Technical analysis is an analysis technique based on stock prices. Technical analysis collects historical prices that have occurred from time to time, and then uses that data to predict future price movements [5].

One of the Technical Analysis in price forecasting is the Moving Average Convergence/Divergence and Relative Vigor Index. RVI indicator. Price limitation is very necessary in order to limit the possibility of loss and targets in the price checkpoint, one way to limit prices is by using Pivot Points [2].

2.2.1. Moving Average Convergence Divergence

MACD is an indicator that has a function to determine trends or patterns that are happening in the capital market, this is because MACD is an oscillator indicator, which is an indicator used to determine when to buy and when to sell [6]. The algorithm for getting a MACD signal is as follows:

The sequence in doing MACD (Moving Averages Convergence/Divergence) is:

- a. MACD uses periods 12 and 26 at the closing price
- b. Calculating Simple Moving Average (SMA) days to 12 and 26. Using the formula

$$SMA(n) = \frac{\text{total price from day 1 until day } n}{n} \quad (1)$$

- c. Look for Exponential Percentage values with the formula:

$$\frac{2}{\text{periode} + 1} \quad (2)$$

- d. Calculate EMA values 12, and 26 using the formula

$$\frac{\text{closing price} - SMA_{1-n}}{EP - SMA_{1-n}} \quad (3)$$

- e. Calculate MACD with $EMA(12) - EMA(26)$
- f. Calculate SMA (9) from MACD
- g. Calculate EMA (9) from MACD
- h. The result is MACD-EMA (9)

2.2.2. Relative Vigor Index

Indicator Relative Vigor Index (RVI) is an indicator that measures the strength (vigor = energy) market by observing the movement of the market. The Relative Vigor Index indicator developed

by John Ehlers, was designed with the aim of determining the direction of price trends, the underlying logic is the assumption that closing prices tend to be higher than opening prices in bullish conditions, and tend to be lower in bearish conditions [7]. The formula for getting the Relative Vigor Index signal is:

$$RVI = \frac{\text{close price} - \text{open price}}{\text{high price} - \text{low price}} \quad (4)$$

2.2.3. Pivot Points

Pivot points and Support Resistance are branches of technical analysis which are also a way of calculating the area of support and resistance. Pivot points are not indicators, but can be said to be a branch of technical analysis [5]. The formula for getting a Pivot Point is:

$$\text{Pivot} = \frac{H + L + C}{3} \quad (5)$$

The formula to get Support and Resistance can be seen in Table 1.

Table 1. Formula Support and Resistance.

Support & Resistance levels	Formula
Resistance 1	(2 x Pivot points) - L
Resistance 2	Pivot point + (H - L)
Support 1	(2 x Pivot points) - H
Support 2	Pivot point - (H - L)

2.3. Value at Risk

Value at Risk (VaR) calculation is a measurement of the worst possible losses in normal market conditions in the period t with a certain level of confidence [8]. VaR itself is symbolized by Ψ .

$$\Psi_{\text{normal}} = -\sigma \quad (6)$$

Where the value of a is the value of the normal distribution obtained from table Z for the level of confidence α . The skewness parameter shows the degree of asymmetry from the distribution between the average values. The negative value of skewness shows asymmetry that is leaning to the left while the reverse is leaning to the right. This skewness value provides an intuitive picture in the direction of the asymmetrical shape of the fat tail [9].

On the other hand, kurtosis shows the high and low of a data distribution relative to the normal distribution. Financial data showing leptokurtic patterns or fat tails, with a high incidence in the tail, shows that there are many events that turn out to be far from the average value, in contrast to what is shown in the normal distribution [9]. Because there are differences, the VaR value is finally calculated using skewness and kurtosis. VaR calculation with skewness and kurtosis errors is symbolized by Ψ_{SK} expressed as:

$$\Psi_{SK} = \mu - a'\sigma \quad (7)$$

First look for value:

$$a'(\alpha) = \alpha + \frac{sk}{6}(a^2(\alpha) - 1) + \frac{k}{24}(a^3(\alpha) - 3a(\alpha)) - \frac{sk^2}{36}(2a^3(\alpha) - 5a(\alpha)) \quad (8)$$

3. Methodology

The data used in this research is the data of secondary that is issued by the *Futures Exchange International* to get the author to use the web www.investing.com. Graph indicator that is used is taken by the trading platform, namely *MetaTrader4* (MT4) and *Meta Stock*. Data released by the Futures Exchange is an internationally accepted price.

As for what is done with the data that has been collected are as follows:

- a. Test the normality of historical Gold Futures data using the Lilliefors Normality Test.
- b. Determine Value at Risk.
- c. Determine the things that affect the price of gold using Fundamental Analysis.
- d. Determine buy or sell signals using the Moving Averages Convergence Divergence and Relative Vigor Index formulas.
- e. Determine price limits for taking profit and stop loss using the Pivot Point formula and Support Resistance.
- f. Formulate conclusions.

4. Research Findings

The data taken is historically a data gold over 1 year full from 1 August 2018 until 31 July 2019, where the operations are Monday - Friday and hours of operation at 06.00 am - 04.00 pm. This data is taken from the investing.com web address at MS Fusion Media Ltd. 7 Florinis Str. Greg Tower, 2nd Floor 1065 Nicosia, Florida. Data retrieval time is 31 July 2019.

In order to get the right signal to conduct transactions, the data collected is daily data. Daily data used include opening prices, highest prices, lowest prices, and closing prices. The data is loaded in graphical form on *MetaStock* to facilitate signal retrieval. Daily data can be seen in the following Figure 1.

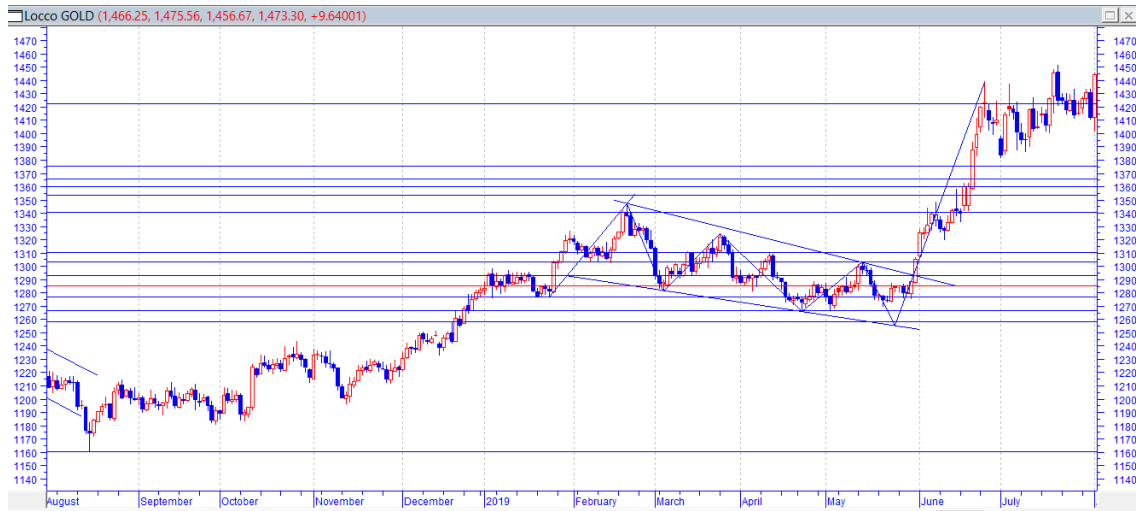


Figure 1. Historical Gold Futures Prices August 2018 - July 2019.

4.1. Value at Risk

Calculating Value at Risk depends on the distribution that is known for that distribution. The distribution used in this study is a normal distribution based on the results of the Lilliefors test. The Lilliefors test results are shown in Table 2:

Table 2. Lilliefors Test Results.

No	x_i	z_i	$f(x_i)$	$f(z_i)$	$f(z_i) - s(z_i)$	$ f(z_i) - s(z_i) $
1	1204.90	-1.77631	0.0389	0.0417	-0.0027	0.0027
2	1219.20	-1.77631	0.0675	0.0833	-0.0158	0.0158
3	1227.00	-1.3482	0.0888	0.1250	-0.0362	0.0362
4	1221.20	-1.0816	0.1397	0.1667	-0.0269	0.0269
5	1259.00	-0.7473	0.2274	0.2083	0.0191	0.0191
6	1264.30	-0.6478	0.2586	0.2500	0.0086	0.0086
7	1267.30	-0.5915	0.2771	0.2917	-0.0146	0.0146
8	1270.20	-0.5370	0.2956	0.3333	-0.0377	0.0377
9	1274.80	-0.4506	0.3261	0.3750	-0.0489	0.0489
10	1282.60	-0.3042	0.3805	0.4167	-0.0362	0.0362
11	1283.35	-0.2901	0.3859	0.4583	-0.0725	0.0725
12	1295.20	-0.0676	0.4731	0.5000	-0.0269	0.0269
13	1302.20	0.0638	0.5255	0.5417	-0.0162	0.0162
14	1303.50	0.0883	0.5352	0.5833	-0.0482	0.0482
15	1312.40	0.2554	0.6008	0.6250	-0.0242	0.0242
16	1323.80	0.4694	0.6806	0.6667	0.0140	0.0140
17	1324.25	0.4779	0.6836	0.7083	-0.0247	0.0247
18	1325.10	0.4938	0.6893	0.7500	-0.0607	0.0607
19	1325.80	0.5070	0.6939	0.7917	-0.0978	0.0978
20	1339.30	0.7605	0.7765	0.8333	-0.0568	0.0568
21	1347.10	0.9069	0.8178	0.8750	-0.0572	0.0572
21	1354.20	1.0402	0.8509	0.9167	-0.0658	0.0658
23	1400.80	1.9153	0.9723	0.9583	0.0139	0.0139
24	1423.60	2.3434	0.9904	1.0000	-0.0096	0.0096

Based on the table $|f(z_i) - s(z_i)|$ the largest value is **0.09778**. Being on the line to 19. The number of tables $n = 24$. The real rate is 0.05. Rated her is 0.180. Test criteria: reject H_0 if $\geq L_0 \geq L_{TABEL}$. Data is called normal distribution if $L_0 \leq L_{TABEL}$ or L_0 does not exceed the L_{TABEL} value which is a critical value. Then the data are normally distributed based on the Lilliefors test because $0.09778 < 0.180$.

Table 3. Skewness and Kurtosis Results.

	Score	Standard Error
Skewness	0.683	0.151
Kurtosis	-0.093	0.300

Based on Field (2009) in Odel suggest if a large sample (more than 200), normality test is enough to do by looking at the value of Skewness and Kurtosis alone, without dividing by the standard error. Data has more than 200 data, so suggestions from Field apply.

The value of table Z at the 0.05 significance of $-1.96 < x < 1.96$. Skewness value of 0.683 ($0.683 < 1.96$) means the data has a tendency to the left but is close to symmetrical or close to normal. Kurtosis value of -0.093 ($-0.093 < 1.96$) shows that the data has a platikutik peak.

Based on the Z distribution table, the 95% confidence level or 0.95 has a value of 1.645. Then,

$$\Psi_{\text{normal}} = \text{mean} - a\sigma$$

$$\Psi_{\text{normal}} = 1306.0903 - 1.645(57.68540)$$

$$\Psi_{\text{normal}} = 1306.0903 - 94.89248$$

$$\Psi_{\text{normal}} = 1211.19842.$$

Calculation of the risk value with skewness and kurtosis errors symbolized by Ψ_{SK} is stated as:

$$a'(\alpha) = \alpha + \frac{sk}{6}(a^2(\alpha) - 1) + \frac{k}{24}(a^3(\alpha) - 3a(\alpha)) - \frac{sk^2}{36}(2a^3(\alpha) - 5a(\alpha))$$

$$a'(\alpha) = 0.95 + \frac{0.683}{6}(0.95 - 1) + \frac{-0.093}{24}(0.95 - 3(0.95))$$

$$- \frac{(0.683)^2}{36}(2(0.95) - 5(0.95))$$

$$a' = 0.95 + 0.113833(-0.05) + 0.003875(0.95 - 2.85)$$

$$a' = 0.95 + 0.00569 + 0.0073625 - (-0.05539545)$$

$$a' = 1.01844795$$

Then:

$$\Psi_{\text{SK}} = \text{mean} - a'\sigma$$

$$= 1306.0903 - (1.01844795)57.68540$$

$$= 1306.0903 - 58.74958$$

$$= 1247.34072.$$

From the table above on 1 August 2018 to 31 July 2019 it can be seen that (Ψ_{normal}) is 1211.19842 and the price of gold in the highest state (Ψ_{SK}) is equal 1247.34072 so that the calculation of skewness and kurtosis on the risk value results in a risk value greater than the risk value calculation which assumes normality.

4.2. Fundamental Analysis

Thomsett [4] Financial Statement is the starting point of the analysis, Fundamental Analysis provides firmness in determining direction. Non-Farm Payroll greatly influences price movements during 24-hour release, but the main points of long-term price movements are Economic Conditions and demand for Foreign Exchange and commodity offers themselves.

4.3. Technical Analysis

4.3.1. Moving Average Convergence/Divergence

Moving Average Convergence/Divergence shows the difference between the exponential moving average (exponential moving average, commonly abbreviated as " EMA "), which is fast and slow than the closing price. The standard period suggested by Gerald Appel in the 1960s was to use periods of 12 and 26 days:

$$MACD = EMA(12) \text{ of the price} - EMA(26) \text{ of the price}$$

$$Signal = EMA(9) \text{ from MACD}$$

SMA 12, then the value taken from the price of h-1 day to day- h , i.e.

$$= \frac{1264.3 + 1256.5 + 1259.7 + 1254.1 + 1254.7 + 1257.3 + 1237.3 + 1255.1 + 1234.6 + 1236.4 + 1220.2 + 1219.2}{12}$$

$$= \frac{14949.4}{12}$$

$$= 1245.783$$

So on until 31 July 2019.

Counting EMA first time to be determined value of Exponential Percentage with the formula:

$$\frac{2}{period+1}$$

Because it uses EMA (12) and EMA (26), the EP of EMA (12) is and the EP of EMA (26) is $\frac{2}{26+1} = 0.07407$.

Then look for the value of the EMA in the manual is with $\frac{close\ price - SMA_{1-n}}{EP - SMA_{1-n}}$, for example on September 5, 2019, the closing price was 1236.00 then:

$$EMA(12) = \frac{1236 - 1235.2}{0.15384 - 1325.2}$$

$$EMA(12) = 1235.323$$

So on until 31 July 2019.

Then EMA (26):

$$EMA(12) = \frac{1236 - 1239.258}{0.07407 - 1239.258}$$

$$EMA(12) = 1239.016$$

Next, calculate the MACD by using, for example, on 5 September 2018,

$$EMA(12) - EMA(26) = 1235.323 - 1239.016$$

$$= -3.6933$$

So on until 31 July 2019.

Next calculate the SMA (9) and EMA (9) of the MACD results . On 18 September 2018

$$SMA(9) = \frac{-2.3606 + (-1.967) + (-0.6421) + (-0.6853) + (-0.3173) + (-0.3712) + (-1.3673) + (-0.5461) + (-1.0054)}{9}$$

$$= 0.11171$$

EMA(9)

$$EP = \frac{2}{9 + 1} = 0.2$$

So on until 31 July 2019.

The result is

$$MACD - EMA(9) = -1.0054 - 0.11171 = -0.7150$$

So on until 31 July 2019.

4.3.2. Relative Vigor Index

In working on the Relative Vigor Index using the formula:

$$Pivot = \frac{H + L + C}{3}$$

Example on August 1, 2018:

$$RVI = \frac{1264.3 - 1263.4}{1263.4 - 1261.9}$$

$$RVI = 0.6$$

If the signal $RVI > 0$ indicates that there is a chance Buy, otherwise if $RVI < 0$, it indicates that it has a chance to Sell. Values that are farther from 0, indicate the further the price forecast will move.

So on until 31 July 2019.

4.3.3. Pivot Points

$$Pivot = \frac{H + L + C}{3}$$

For example on 1 October 2018, the highest price is 1228.8, the lowest price was 1223.8, and the closing price was 1227.00. Then the pivot point on 2 October 2018 is:

$$Pivot = \frac{1228.8 + 1223.8 + 1227.00}{3}$$

$$Pivot = 1226.53$$

Then determine the support and resistance levels.

Resistance 1:

$$Resistance\ 1 = (2 \times Pivot\ Point) - L$$

$$Resistance\ 1 = (2 \times 1226.53) - 1223.8$$

$$Resistance\ 1 = 1229.26$$

Resistance 2:

$$Resistance\ 2 = Pivot\ Point + (H - L)$$

$$Resistance\ 2 = 1226.53 + (1228.8 - 1223.8)$$

$$Resistance\ 2 = 1231.53$$

Support 1:

$$Support\ 1 = (2 \times Pivot\ Point) - H$$

$$Support\ 1 = (2 \times 1226.53) - 1228.8$$

$$Support\ 1 = 1224.26$$

Support 2:

$$Support\ 2 = Pivot\ Point - (H - L)$$

$$Support\ 2 = 1226.53 - (1228.8 - 1223.8)$$

$$Support\ 2 = 1221.53$$

So on until 31 July 2019.

4.3.4. Data Analysis

Data analysis is carried out to find the most optimal indicator for profit.

Table 4. Analysis of Calculation Results Data (Period 18/09/2018 to 09/28/2018).

Date	MACD signal	Limitation of P/L	P/L	RVI signal	Limitation of P/L	P/L	Fundamental Signals	P/L
09/18/2018	<i>Sell</i>	1237.03	-0.33	<i>Buy</i>	1240.87	4.17		
09/19/2018	<i>Buy</i>	1242.23	4.03	<i>Buy</i>	1242.23	4.03		
09/20/2018	<i>Buy</i>	1246.93	6.93	<i>Buy</i>	1246.93	6.93		
09/21/2018	<i>Buy</i>	1249.50	6.40	<i>Sell</i>	1239.40	3.70		
09/24/2018	<i>Buy</i>	1239.70	2.00	<i>Buy</i>	1239.70	2.00		
09/25/2018	<i>Buy</i>	1222.40	-1.50	<i>Sell</i>	1222.40	1.50		
09/26/2018	<i>Buy</i>	1234.40	-5,30	<i>Sell</i>	1234.40	5.30		
09/27/2018	<i>Buy</i>	1235.03	-1.07	<i>Sell</i>	1226.33	9.77		
09/28/2018	<i>Buy</i>	1231.73	8.83	<i>Buy</i>	1231.73	8.83	<i>Sell</i>	5,4
Total P/L			20.00	Total P/L	46.23	Total P/L		5,4

In Table 4, the Profit of the MACD Indicator Signal is 20.00 points. The profit from the RVI Indicator Signal is 46.23 points. The profit from the Fundamental Analysis Signal is 5.4 points. So on until 31 July 2019.

5. Conclusion

Comparison of the analytical results, gold futures on 1 August 2018-31 July 2019 has the total profit for the year from the signal indicator MACD is 532.39 points/lot, have a degree of truth 146 of the 226 days of analysis, or 64.602%. The total annual profit for the RVI Signal Indicator is 1304.84 points/lot, having a truth level of 220 days from 226 days of analysis or 97.345%. Total profit for a year from Fundamental Analysis is 473.95 points, has a truth level of 23 out of 23 analyzes for a year or 100%.

With the VaR calculation done with a confidence level = 95%, it can be concluded that from 1 August 2018 to 31 July 2019 the lowest gold price forecast with the normal approach (Ψ_{normal}) = and the lowest gold price with the skewness and kurtosis (Ψ_{SK}) = approach. This means that the price of gold will reach the lowest value at 1247.3407 dollars per Tray Once.

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