

Gold vs. Stocks: A Comparative Analysis of Risk and Return as Investment Assets
A Quantitative Analysis of Risk and Return Using Historical Market Data (2015–2025)

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Abstract:

This study compares gold and stocks as investment assets by examining their historical risk and return characteristics over the 2015–2025 period. Gold is traditionally considered a diversification asset because its price may behave differently from equity markets during periods of financial uncertainty, while stocks are generally associated with higher long-term growth potential and greater exposure to market risk. The study uses annual gold price changes and annual S&P 500 price returns as proxies for the performance of the two asset classes. Descriptive statistical measures, including average annual return, standard deviation, minimum and maximum return, cumulative growth, compound annual growth rate, and correlation, are used to evaluate the differences between the two assets. The results show that the S&P 500 generated a higher average annual return and compound annual growth rate during the selected period, while gold experienced a similar level of annual volatility. Gold nevertheless demonstrated diversification characteristics because its annual returns were not perfectly correlated with stock returns. The findings support the view that gold and stocks have different risk-return characteristics and may therefore serve different functions within an investment portfolio. The study concludes that comparing assets solely according to average return can overlook the importance of volatility and correlation. Investors' asset-allocation decisions should therefore consider both return objectives and risk characteristics.

Keywords:

Gold, stocks, S&P 500, investment risk, investment return, diversification, portfolio management.

Introduction:

Investment decisions require investors to balance two fundamental characteristics: return and risk. Return represents the gain or loss generated by an investment, while risk reflects the uncertainty surrounding that return. Because different financial assets respond differently to economic conditions, investors often compare asset classes before deciding how to allocate their capital.

Stocks represent ownership claims on companies and are among the most widely used investment assets. A broad stock-market index such as the S&P 500 provides exposure to a large group of U.S. companies across different industries. The index is commonly used as a measure of the performance of large-cap U.S. equities. According to the Federal Reserve Bank of St. Louis, the S&P 500 tracks 500 leading companies and covers approximately 75% of U.S. equities.

Gold, in contrast, is a physical commodity that has been used as a store of value and investment asset for centuries. Unlike stocks, gold does not represent ownership in a company and does not generate dividends. Its return is primarily determined by changes in its market price. The World Gold Council notes that gold has diverse sources of demand, including investment, jewelry, technology, and central-bank reserves. These characteristics contribute to gold's distinctive behavior compared with traditional financial assets.

The relationship between gold and stocks has received substantial attention in financial research. Baur and Lucey (2010), for example, examined whether gold acts as a hedge or safe haven against stocks and found evidence that gold can provide a hedge against stocks on average and can behave as a safe haven during extreme stock-market conditions. However, Hood and Malik (2013) found that the strength of gold's hedging and safe-haven characteristics varies depending on market-volatility conditions.

1.1 Problem Statement and Research Gap

Although considerable research has examined gold's role as a hedge and safe haven, investors still need straightforward comparisons of the risk and return characteristics of gold and stocks over specific investment periods. The question is particularly relevant following periods of major economic and financial disruption, including the COVID-19 pandemic, the 2022 market decline, and subsequent inflationary pressures.

This study therefore focuses on a recent eleven-year period, from 2015 through 2025, and compares gold with the S&P 500 using annual performance data.

1.2 Research Question

How do gold and stocks compare in terms of risk and return over the 2015–2025 period?

1.3 Research Objectives

The study has four main objectives:

1. To measure the average annual return of gold and the S&P 500.
2. To compare the volatility and range of returns of the two assets.
3. To examine the relationship between gold and stock returns.
4. To evaluate the implications of the findings for portfolio diversification.

Literature Review:

2.1 Risk and Return in Investment Theory

The relationship between risk and return is a fundamental concept in finance. Modern Portfolio Theory, introduced by Markowitz (1952), argues that investors should not evaluate an asset independently because the overall risk of a portfolio depends not only on the risk of individual assets but also on how their returns move relative to one another. Accordingly, an asset with relatively volatile returns can still contribute to portfolio efficiency if its returns have a sufficiently different pattern from those of other assets. This makes correlation an important component of investment analysis. Sharpe (1964) further developed the relationship between risk and expected return through the Capital Asset Pricing Model. The framework distinguishes between systematic risk and other forms of risk and provides a theoretical foundation for relating investment returns to risk. For the purposes of this study, standard deviation is used as the primary measure of historical risk. A higher standard deviation indicates greater variation in annual returns and therefore greater historical return volatility.

2.2 Gold as an Investment Asset

Gold has traditionally been viewed as a store of value and a potential portfolio diversifier. Jaffe (1989) examined gold and gold stocks as investments for institutional portfolios and reported that gold's returns were generally independent of those of other assets, supporting the possibility that gold can contribute to diversification. More recent research has continued to examine gold's diversification role. Baur and Lucey (2010) distinguished between a hedge, which is an asset that is uncorrelated or negatively correlated with another asset on average, and a safe haven, which provides such a relationship during extreme market declines. Their analysis found that gold functioned as a hedge against stocks on average and as a safe haven during extreme stock-market conditions (Beainy & Kamel, 2026), although the safe-haven effect was relatively short-lived unless in economies in financial distress (Jabbour Al Maalouf et al., 2026), in such cases, Gold and Crypto become substitutes (El-Chaarani et al., 2025) to hedge currency devaluation. Mawad and Freiha (2024) even argue that in the absence of banking services, Crypto is adopted quicker than traditional assets such as gold. The World Gold Council's more recent analysis similarly emphasizes gold's relatively low correlation with other asset classes and its potential contribution to portfolio diversification. Its 2026 research reports that adding gold to hypothetical portfolios over various historical periods reduced portfolio volatility and improved risk-adjusted returns. However, gold should not be considered risk-free. The World Gold Council notes that gold can experience substantial price movements and has experienced both large gains and large losses in individual years. Gold also does not generate regular income such as dividends or interest,

therefore it is expected that gold fall short, especially when compared to the best equity market in the world (Beainy & Kamel, 2025), the American S&P 500.

2.3 Gold and Stocks as Complementary Assets

Previous research therefore suggests that the investment characteristics of gold and stocks differ. Stocks provide exposure to corporate earnings and economic growth, whereas gold's price is influenced by investment demand, central-bank activity, jewelry demand, technology demand, interest rates, inflation expectations, and financial-market uncertainty. Hood and Malik (2013) found that gold can function as a hedge and, to a weaker extent, a safe haven against U.S. stocks, although the strength of this relationship changes under different volatility conditions and its value depends on the world's main reserve currency, the U.S. Dollar (Kamel et al., 2025).

The existing literature provides considerable evidence concerning gold's diversification characteristics. However, many studies use long historical samples or specialized econometric models. This study takes a more straightforward approach by comparing the annual risk and return characteristics of gold and the S&P 500 over the recent 2015–2025 period. This provides a simple empirical framework suitable for investors and students examining the practical differences between the two asset classes.

Methodology:

3.1 Research Design

This research uses a quantitative comparative research design. The objective is to compare the historical performance of two investment assets:

- Gold
- S&P 500 Index

The study period covers 2015–2025, providing 11 annual observations for each asset.

The S&P 500 is used as a proxy for the U.S. stock market because it represents a broad portfolio of large-cap U.S. companies. The S&P 500 price-return series is used rather than total return so that the stock measure is conceptually comparable with gold's price appreciation. The S&P 500 is a price index and therefore does not include dividends in the price-return measure.

Gold returns are based on changes in the annual average gold price in U.S. dollars per troy ounce. The gold dataset uses monthly-average observations derived from World Bank gold-price data.

3.2 Data Sources

The study uses publicly available secondary data.

Variable	Measure	Source
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Gold	Annual change in average USD price per troy ounce	World Bank Gold dataset / published historical series
Stocks	Annual S&P 500 price return	S&P 500 historical return data
Period	2015-2025	Annual observations
Currency	U.S. dollars	Both datasets

The data are historical and therefore do not represent a forecast of future performance.

3.3 Variables

The principal variables are:

Annual Return: percentage change in the value of the asset during each year.

Volatility: measured using the sample standard deviation of annual returns.

Cumulative Return: total compounded growth over the entire period.

Compound Annual Growth Rate (CAGR):

$$CAGR = \left(\frac{\text{Ending Value}}{\text{Beginning Value}} \right)^{1/n} - 1$$

where n represents the number of years.

Correlation: Pearson correlation coefficient between annual gold returns and S&P 500 returns.

The correlation coefficient ranges from -1 to +1. A value close to +1 indicates that two assets tend to move together, while a value close to 0 indicates a weak linear relationship.

Results:

4.1 Annual Returns

The following table presents the annual price returns for gold and the S&P 500 between 2015 and 2025.

Year	Gold Return (%)	S&P 500 Return (%)
2015	-8.3%	-0.7%
2016	7.6%	9.5%
2017	0.7%	19.4%
2018	0.9%	-6.2%
2019	9.7%	28.9%
2020	27.1%	16.3%
2021	1.7%	26.9%
2022	0.1%	-19.4%
2023	7.9%	24.2%
2024	22.9%	23.3%
2025	44.1%	16.4%

Table 1: Annual Returns of Gold and the S&P 500, 2015-2025

Source: gold historical annual-average price series; S&P 500 historical price-return data.

The data show considerable variation between the two assets. Gold recorded its strongest annual return in 2025, at **44.1%**, while its weakest annual performance occurred in 2015, at **-8.3%**. The S&P 500 recorded its highest annual price return during the study period in 2019, at approximately **28.9%**, while its weakest performance occurred in 2022, at approximately **-19.4%**.

Notably, the two assets did not move in the same direction in every year. For example, in 2018, gold recorded a positive return while the S&P 500 recorded a negative return. The same pattern appeared more clearly in 2022, when gold was approximately flat while the S&P 500 experienced a substantial decline.

4.2 Descriptive Statistics

Measure	Gold	S&P 500
Average annual return	10.4%	12.6%
Median annual return	7.6%	16.4%
Standard deviation	15.2%	15.4%
Minium annual return	-8.3%	-19.4%
Maximum annual return	44.1%	28.9%
Positive-return years	10/11	8/11
Cumulative Growth	171.9%	232.8%
CAGR	9.5%	11.6%

Table 2: Risk and Return Statistics, 2015–2025

Cumulative growth represents the compounded growth calculated from the annual return observations.

The S&P 500 generated a higher average annual return of 12.6%, compared with 10.4% for gold. Its CAGR was also higher at approximately 11.6%, compared with 9.5% for gold.

However, the difference in volatility was relatively small. Gold's standard deviation was approximately 15.2%, while the S&P 500's was approximately 15.4%. Therefore, over this specific period, the two assets displayed similar levels of annual return variability.

A major difference can be observed in the downside results. The lowest annual gold return was -8.3%, compared with -19.4% for the S&P 500. Gold therefore experienced a smaller worst annual loss in the selected sample.

At the same time, gold had a much higher maximum annual return, reaching 44.1% in 2025, compared with approximately 28.9% for the S&P 500 during its strongest year in the sample.

4.3 Correlation

The calculated Pearson correlation coefficient between annual gold returns and S&P 500 returns over the 2015–2025 sample is approximately:

$$r = 0.37$$

This represents a **positive but relatively moderate relationship** between the two-return series. In other words, the two assets moved in the same direction in some years, but their movements were far from identical.

This result is relevant from a portfolio perspective because diversification benefits depend partly on the relationship between assets. Markowitz's portfolio theory emphasizes that combining assets with different return patterns can affect total portfolio risk.

The correlation result also illustrates why gold should not simply be categorized as an asset that always moves opposite to stocks. The relationship in the sample is positive rather than negative, although it remains substantially below a perfect positive correlation.

4.4 Risk-Return Comparison

A simple return-to-volatility ratio can be calculated by dividing the average annual return by the standard deviation:

$$\text{Return-to-Risk} = \frac{\text{Average Return}}{\text{Standard Deviation}}$$

Measure	Gold	S&P 500
Average return	10.4%	12.6%
Standard Deviation	15.2%	15.4%
Return-to-Risk Ratio	0.69	0.82

Table 3: Return-to-Risk Comparison

The S&P 500 produces a higher ratio under this simple historical measure because its average annual return was higher while its volatility was only slightly higher than gold's.

This result should be interpreted as a historical descriptive comparison, not as a prediction of future performance or a recommendation to select one asset over the other.



Figure 1: Gold and S&P 500, 2015-2025

Source: author calculations from the historical annual return data.

The figure demonstrates that the two assets experienced different annual return patterns. The largest divergence occurred in 2022, when the S&P 500 declined substantially while gold remained approximately unchanged. Conversely, stocks considerably exceeded gold in several strong equity-market years, including 2017, 2019, and 2021.

Discussion and Conclusion:

This study compared gold and the S&P 500 as investment assets using historical annual data from 2015 to 2025. The analysis focused on return, volatility, downside performance, cumulative growth, and correlation.

The results indicate that the S&P 500 generated the higher average annual return during the selected period, at approximately 12.6%, compared with 10.4% for gold. The S&P 500 also produced the higher calculated CAGR. These results reflect the strong performance of U.S. equities during several years in the sample, particularly 2017, 2019, 2021, 2023, and 2024.

However, the risk comparison produced a more nuanced result. Gold's annual standard deviation was approximately 15.2%, while the S&P 500's was approximately 15.4%. Thus, the difference in historical volatility was small. Gold also experienced a less severe worst annual loss during the period: approximately -8.3%, compared with -19.4% for the S&P 500.

The correlation coefficient of approximately 0.37 indicates that gold and stocks had a positive but incomplete relationship over the study period. This means that gold did not consistently move in the opposite direction of stocks, but its returns also did not closely replicate stock-market movements. This finding is consistent with the broader literature emphasizing gold's potential diversification characteristics while also showing that its relationship with equities can vary across market conditions. Baur and Lucey (2010), for example, found that gold can act as a hedge and, under certain extreme conditions, as a safe haven, while Hood and Malik (2013) found that the strength of this role depends on market volatility.

5.1 Practical Implications

The findings demonstrate that investors should not evaluate an asset solely according to its average return. An asset's volatility, downside performance, and correlation with other assets are also relevant to portfolio construction. This is consistent with Markowitz's (1952) argument that portfolio decisions should consider the interaction between assets rather than examining each investment independently.

Gold and stocks can therefore have different functions within an investment portfolio. Stocks provide exposure to corporate growth, while gold may provide diversification characteristics because its price movements do not perfectly correspond with equity returns.

5.2 Limitations

Several limitations should be recognized. First, the study uses only 11 annual observations, which limits the statistical power of the analysis. Second, gold returns are based on changes in annual average prices, while the S&P 500 figures represent annual price returns. Consequently, dividends are not included in the stock-market return measure. This makes the comparison focused on price appreciation rather than the full total return available to an investor.

Third, annual observations can hide substantial movements occurring within individual years. A monthly or daily dataset could provide a more detailed analysis of volatility, correlation, and

market reactions. Finally, the study focuses on U.S.-dollar returns and therefore does not account for the effect of exchange rates on investors using other currencies.

5.3 Future Research

Future research could extend the analysis by using monthly or daily observations and a longer sample period. A further study could compare gold, stocks, bonds, and cryptocurrencies simultaneously. Portfolio optimization could also be applied to examine how different allocations to gold and stocks affect overall portfolio volatility and risk-adjusted performance.

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