Objective

The objective of this project is to study how gold and silver behave over time in terms of volatility and deviation from their long-term trends. Using daily price data, rolling volatility measures, and Z-score–based deviation bands, the analysis aims to identify periods of elevated risk and understand how stretched prices are relative to historical norms. The goal is not to predict prices, but to provide context that supports more disciplined, risk-aware decision-making.

Methodology

- Assets: **Gold and Silver**
- Currency: INR
- Frequency: Daily
- Period: 2014-01-01 to 2026-02-06 (12 years)
- Data Source: Publicly available historical price data (Kaggle)

Daily closing prices were used for analysis. Prices were converted into daily returns to remove scale effects and ensure comparability. Rolling volatility was computed using a 252-day window to capture annualised risk dynamics.

Task 1

2016-2017	Volatility increased around major domestic policy events in India, including **demonetisation** and the rollout of **GST**. During this period, uncertainty led to increased interest in gold as a store of value.
2020-2022	The COVID-19 pandemic triggered global economic uncertainty and sharp volatility across financial markets. Both gold and silver experienced elevated volatility investors sought safe-haven assets amid equity market stress.
2026 Jan	By increasing their gold holdings and reducing reliance on the US dollar, countries aim to shield their economies from volatility in the American currency. The dollar has recently fallen to a four-year low amid tariff threats over Greenland, which sparked a sharp flight to safe-haven assets. This trend has been reinforced by strong central bank gold purchases and expectations of interest rate cuts by the Federal Reserve.

Task 2

Gold and silver differ significantly in their typical price behaviour, with silver exhibiting much higher volatility than gold. Because of this, comparing raw price movements across the two assets can be misleading.

To address this, deviation from trend is measured using **Z-scores**, which express how far prices are from their rolling average in units of historical volatility. This normalisation allows deviations to be compared meaningfully across both metals, even though they differ in price levels, volatility, and units of measurement.

Task 3

Z-score–based deviation charts were created separately for gold and silver to visualise how prices move relative to their long-term trends. Reference thresholds are included to highlight periods where prices become statistically stretched or compressed. These charts provide a clear visual summary of trend deviation and volatility behaviour over time.

Task 4

As of the most recent data point, gold is trading at a high positive Z-score. This indicates that prices are well above their long-term trend when adjusted for historical volatility, suggesting a moderately stretched condition rather than a mean-level regime.

Silver, on the other hand, currently exhibits a lower Z-score. While silver remains the more volatile metal overall, its present deviation from trend is smaller on a volatility-adjusted basis compared to gold.

Task 5

Given the presence of elevated volatility and prices trading above long-term averages, a **staggered approach** appears more appropriate than a lump-sum investment.

Staggered allocation is typically suitable when an investor has capital available but prefers **not to commit** all of it under uncertain market conditions.

I would be **inclined** towards staggered allocation because:

- It allows entry at multiple price levels rather than a single point.
- It helps smooth the average cost over time.

- It reduces the risk associated with poor market timing.

- It provides **flexibility** to benefit if prices correct before continuing higher.

This approach cushions the impact of short-term market dips while still maintaining exposure to potential long-term price appreciation.

Key Observations

Silver vs. Gold Price Dynamics

- Silver consistently exhibits **larger and more frequent price swings** compared to gold, reflecting its higher inherent volatility.

- Volatility spikes in **silver tend to be sharper and more pronounced**, especially during periods of macroeconomic stress.

- **Gold** shows relatively **smoother price movements** and more stable deviations from its long-term trend, reinforcing its role as a comparatively defensive asset.

- On a volatility-adjusted basis, **silver demonstrates wider deviations from its long-term trend**, while gold remains more contained despite recent price strength.

- These differences highlight **silver's greater sensitivity** to macroeconomic conditions and industrial demand, whereas gold's behaviour is more closely aligned with its role as a **store of value.**

Limitations

- The analysis is based entirely on historical price data and is therefore **backward-looking**. As a result, it does not account for future macroeconomic developments or

sudden structural shifts in market dynamics.

- Volatility and Z-score measures are computed using rolling windows, which means they may lag during abrupt regime changes or extreme market events.

- The study focuses **only on price-based metrics** and does not incorporate other potentially influential factors such as trading volume, interest rates, currency movements, or cross-asset correlations.

References

Why gold prices are rising globally in 2026: Explained

Why Silver Is Surging With Gold and Why Analyst Predicts $375 Price in 2026

www.silverinstitute.org

How gold can help in creating a more optimal portfolio allocation