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GOLD ETFS VS. SOVEREIGN GOLD BONDS: A COMPREHENSIVE ANALYSIS FOR INDIAN INVESTORS

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ABSTRACT

This study undertakes a thorough quantitative analysis of the historical returns and volatility of Gold Exchange Traded Funds (Gold ETFs) and Sovereign Gold Bonds (SGBs) within the Indian market. As investors increasingly transition from physical gold to digital alternatives, understanding the comparative performance of these two prominent investment instruments becomes crucial for informed decision-making. The research employed a descriptive and comparative design, utilizing monthly data from November 2015, the inception of SGBs, to June 2025. Key performance metrics, including Compounded Annual Growth Rate (CAGR), standard deviation of returns, and risk-adjusted measures like the Sharpe Ratio, were calculated and analyzed for a representative sample of Gold ETFs and all issued SGB series. The analysis quantifies absolute returns, inherent risks, and risk-adjusted performance, and also examines the impact of SGBs' unique features, such as their fixed interest component and tax benefits upon maturity. Preliminary findings indicate distinct risk-return profiles: Gold ETFs are expected to closely track market gold prices with potentially higher short-term volatility, offering liquidity for active trading. Conversely, SGBs, with their fixed interest payments and capital gains exemption at maturity, are hypothesized to offer a more stable and potentially superior risk-adjusted return, especially for long-term investors prioritizing income and tax efficiency. This study provides valuable, data-driven insights for individual investors, financial advisors, and policymakers navigating India's evolving gold investment landscape, contributing to a nuanced understanding of "paper gold" as a strategic asset class.

KEYWORDS: Gold ETFs, Sovereign Gold Bonds (SGBs), India, Historical Returns, Volatility, Quantitative Analysis, Investment Performance, Risk-Adjusted Returns, Financial Products, Digital Gold.

INTRODUCTION

Gold has historically held immense significance in India, being deeply ingrained in cultural traditions, symbolizing wealth and prosperity, and serving as a hedge against inflation and economic uncertainty.

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For centuries, physical gold in forms like jewellery, coins, and bars was the primary investment mode for Indian households. However, with the evolution of financial markets and increasing investor sophistication, modern gold investment avenues have emerged, offering distinct advantages and disadvantages compared to their physical counterparts. Among these prominent modern instruments are Gold Exchange Traded Funds (Gold ETFs) and Sovereign Gold Bonds (SGBs). Gold ETFs, introduced in India in the mid-2000s, provide investors a convenient and cost-effective way to gain exposure to gold prices without physical storage or purity concerns. They are traded on stock exchanges, and offer both liquidity and transparency. Sovereign Gold Bonds (SGBs), launched by the Government of India in 2015, aim to reduce demand for physical gold imports by offering an alternative investment. SGBs provide exposure to gold price movements, an additional fixed interest rate, and significant tax benefits if held until maturity.

While both Gold ETFs and SGBs are "paper gold" investments, they differ considerably in their underlying structures, liquidity profiles, tax implications, and income generation mechanisms. For Indian investors looking to diversify portfolios and capitalize on gold's intrinsic value, a clear understanding of the historical performance, risk characteristics, and comparative advantages of these two instruments is crucial. This article presents a comprehensive quantitative analysis of their historical returns and volatility in the Indian context. By examining their performance over a significant period, considering market fluctuations, interest rates, and policy changes, this study provides valuable insights for investors, financial advisors, and policymakers. The objective is to determine which of these popular digital gold investment options has historically offered superior risk-adjusted returns and to identify factors contributing to their respective performance characteristics. This analysis aims to empower investors to make more informed decisions when allocating a portion of their portfolio to gold.

OBJECTIVES

This quantitative analysis seeks to achieve the following specific objectives:

● To quantitatively compare the historical returns of Gold ETFs and Sovereign Gold Bonds (SGBs) in India, including calculating and analysing absolute returns over various time horizons (short-term, medium-term, and long-term) to understand their wealth creation potential.

● To assess and compare the historical volatility (risk) of Gold ETFs and SGBs by calculating metrics such as standard deviation and other relevant risk measures, quantifying price fluctuations and inherent risk.

● To evaluate the risk-adjusted returns of Gold ETFs and SGBs using metrics like the Sharpe Ratio

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or Sortino Ratio, determining which instrument has historically provided a better return for the level of risk undertaken.

● To analyze the impact of key market and economic factors on the performance of Gold ETFs and SGBs, including the influence of gold prices, interest rate movements (especially for SGBs), inflation, and broader economic conditions.

● To identify and discuss the unique features and practical implications of investing in Gold ETFs versus SGBs from the perspective of Indian investors, synthesizing quantitative findings with qualitative considerations such as liquidity, tax treatment, holding period, and ease of investment.

NEEDS

This study is necessitated by several critical factors and gaps in existing knowledge:

● **Increasing Investor Interest in Digital Gold**: There is a growing trend among Indian investors moving from physical gold to more convenient and secure digital forms, yet a clear, data-driven comparison between primary digital gold options is often lacking.

● **Lack of Comprehensive Comparative Analysis**: While individual analyses of Gold ETFs or SGBs exist, a detailed, side-by-side quantitative comparison focusing on historical returns, volatility, and risk-adjusted performance within the Indian market is scarce, leaving investors to rely on anecdotal evidence or partial information.

● **Distinct Structural Differences**: Gold ETFs and SGBs, despite being "paper gold," have fundamental structural differences (e.g., perpetual vs. fixed maturity, market-linked vs. fixed interest, taxation), necessitating a thorough comparative analysis to understand
their differential impact on investment outcomes.

● **Policy Relevance**: The Indian government introduced SGBs to reduce physical gold imports and channel savings into financial instruments; understanding their performance relative to ETFs is crucial for evaluating policy effectiveness and future refinements.

● **Informed Investment Decision-Making**: Investors require robust, evidence-based research for optimal portfolio allocation decisions, and this study addresses the practical need for clear guidance on which gold investment vehicle might be more suitable based on risk appetite, investment horizon, and financial goals.

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SIGNIFICANCE

The findings of this quantitative analysis will hold significant value for a diverse range of stakeholders:

● **For Individual Investors**: The study serves as a vital resource, providing data-backed insights to help understand trade-offs between Gold ETFs and SGBs, empowering more informed investment choices aligned with financial objectives, risk tolerance, and tax planning strategies.

● **For Financial Advisors and Wealth Managers**: The research equips financial professionals with a robust analytical framework and empirical evidence to effectively advise clients on gold investment strategies, tailor recommendations, and build diversified portfolios.

● **For Academicians and Researchers**: The study contributes to the existing body of literature on financial markets, investment products, and behavioral finance in emerging economies like India, serving as a foundation for future research.

● **For Policymakers and Regulators**: Insights from comparing performance and investor uptake of Gold ETFs and SGBs can inform future policy decisions related to gold monetization schemes, digital financial product development, and overall financial market regulation.

● **For Fund Houses and Product Developers**: Understanding historical performance and investor preferences for these products can help asset management companies and financial institutions design more attractive and efficient gold-backed investment products for the Indian market. This research bridges a critical gap in understanding modern gold investment options in India, offering a data-driven perspective crucial for effective decision-making in an evolving financial landscape.

REVIEW OF LITERATURE

The literature review for this study systematically examines existing research on gold as an investment, Exchange Traded Funds (ETFs), Sovereign Gold Bonds (SGBs), and quantitative methods for analysing financial asset performance, specifically within the Indian context. This helps identify knowledge gaps, establish a theoretical foundation, and inform the methodological approach of the current research.

Broad Categories of Literature Explored:

● **Gold as an Asset Class and its Role in Portfolio Diversification**: This includes classical theories on gold's role as a safe-haven asset, inflation hedge, and store of value. Modern portfolio theory (MPT) applications, examining gold's correlation with other asset classes and its effectiveness in reducing

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overall portfolio risk, are also reviewed. Studies on how global gold price drivers interact with local demand, supply, and import policies, particularly in India, are relevant.

● **Exchange Traded Funds (ETFs) in India**: General ETF literature on growth, benefits (liquidity, low cost, diversification), and risks globally and in emerging markets is considered. Specifically, research focuses on the performance, tracking error, liquidity, and investor appeal of gold-backed ETFs. Papers examining the evolution, investor behavior, and specific characteristics of Gold ETFs in India, including their AUM, expense ratios, and historical performance trends, are important.

● **Sovereign Gold Bonds (SGBs) in India**: Literature detailing the rationale behind SGBs (reducing physical gold demand, financialization of savings, curbing imports) and their design features are reviewed. Performance analysis studies that have attempted to analyze SGB returns, considering both gold price appreciation and the fixed interest component, are key. Research on investor adoption and perception, awareness levels, and perceived benefits and drawbacks of SGBs is included. Papers discussing the specific tax treatment of SGBs (especially capital gains exemption on maturity) and implications of their fixed tenor are also examined.

● **Quantitative Methods for Financial Asset Analysis**: This involves return calculation methodologies (simple, compound, geometric) for different asset types. Volatility measurement literature covers standard deviation, historical volatility, implied volatility, and other risk quantification measures. In-depth understanding of risk-adjusted performance metrics like Sharpe Ratio, Sortino Ratio, and Treynor Ratio and their applicability is crucial. Basic concepts of time series analysis relevant for financial data are also considered.

● **Comparative Studies (Gold ETFs vs. SGBs or similar instruments)**: Direct comparisons of Gold ETFs and SGBs in India, even if older or less comprehensive, are foundational. Analogous comparisons of different investment forms in other asset classes might offer methodological inspiration.

METHODOLOGY

This study employs a quantitative research approach to systematically analyze and compare the historical returns and volatility of Gold Exchange Traded Funds (Gold ETFs) and Sovereign Gold Bonds (SGBs) in India. The methodology encompasses data collection, selection of relevant variables, calculation of performance metrics, and appropriate statistical analysis to draw meaningful conclusions.

1. Research Design

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The research design is descriptive and comparative. It is descriptive in that it aims to characterize the historical performance and risk profiles of Gold ETFs and SGBs. It is comparative as its core objective is to identify differences and similarities in their performance, allowing for a direct assessment of their relative attractiveness as investment vehicles.

2. DATA COLLECTION

2.1. Data Sources:

● **Gold ETFs**: Historical daily/weekly/monthly Net Asset Values (NAVs) will be sourced from official websites of Asset Management Companies (AMCs) offering Gold ETFs in India (e.g., Nippon India MF, HDFC MF, ICICI Prudential MF, SBI MF). Data will be triangulated with reliable financial data providers.

● **Sovereign Gold Bonds (SGBs)**: Official notification prices and redemption prices for each SGB series will be obtained from the Reserve Bank of India (RBI) or the Public Debt Management Cell (PDMC), Ministry of Finance. Data on the fixed annual interest rate (2.50% p.a. on the initial issue price) will be obtained from RBI notifications. Secondary market trading prices of SGBs on stock exchanges (NSE/BSE) will be considered for liquidity analysis and early redemptions, though the primary focus will be on maturity value for full return calculation.

● **Benchmark (if used for comparison, e.g., physical gold price)**: Historical daily/monthly physical gold prices in India (e.g., MCX gold futures settlement prices, Indian Bullion and Jewellers Association (IBJA) rates) will be used.

● **Other Relevant Macroeconomic Data (for contextual analysis, if required)**: Inflation rates (CPI) from MoSPI and interest rates (e.g., RBI Repo Rate, 10-year G-Sec yield) from RBI will be considered.

2.2. Sample Selection:

● **Gold ETFs**: A representative sample of the top 3-5 Gold ETFs by Assets Under Management (AUM) will be selected to cover the most liquid and widely held Gold ETFs in India.

● **SGBs**: All SGB series issued since their inception in November 2015 that have completed a minimum of 3, 5, or ideally 8 years will be included, ensuring a sufficiently long history for volatility and return calculations. For un-matured series, current market price on the exchange will be used up to the study's end date.

● **Period of Study**: The analysis will cover November 2015 (inception of SGBs) up to June 30, 2025, providing a common start date for direct comparison.

2.3. Data Frequency: Monthly data points (e.g., month-end NAVs/prices) will be primarily used for calculating returns and volatility, as it is sufficient for capturing long-term trends and managing data volume for multi-year analysis.

3. VARIABLES AND PERFORMANCE METRICS

3.1. Independent Variable: Time (period of analysis).

3.2. Dependent Variables:

● **Returns**:

○ **Absolute Returns**: Percentage change in value over a specific period.

○ Compounded Annual Growth Rate (CAGR): Used to annualize returns for multi-year periods, providing a standardized measure of growth.

CAGR=(BeginningValueEndingValue)(NumberofYears1)-1

○ **Total Return (for SGBs)**: Includes both gold price appreciation/depreciation and accrued fixed annual interest (2.50% p.a. on initial issue price, paid semi-annually).

● **Volatility (Risk)**:

○ Standard Deviation of Returns: Primary measure of historical volatility, indicating dispersion of returns around the average. Higher standard deviation implies higher risk.

StandardDeviation(σ)=n-1∑i=1n(Ri-R¯)2

Where Ri is the individual return, R¯ is the average return, and n is the number of observations.

3.3. Risk-Adjusted Performance Metrics:

● Sharpe Ratio: Measures return earned per unit of total risk. A higher Sharpe Ratio indicates better risk-adjusted performance. Sharpe Ratio=σpRp-Rf

Where Rp is the portfolio (ETF/SGB) return, Rf is the risk-free rate (e.g., 91-day T-Bill rate in India, averaged over the period), and σp is the standard deviation of the portfolio's returns.

● Sortino Ratio (Optional, but recommended for robustness): Similar to Sharpe Ratio, but only considers downside deviation (volatility from negative returns), providing a more focused view on downside risk.

SortinoRatio=DownsideDeviationRp-Rf

4. DATA ANALYSIS TECHNIQUES

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4.1. Descriptive Statistics: Mean returns, standard deviation, minimum and maximum returns will be calculated for both Gold ETFs and SGBs over the entire study period and selected sub-periods (e.g., 3-year, 5-year rolling periods) to observe trends.

4.2. Time Series Analysis: Monthly returns for both instruments will be generated. Visual inspection of return series and cumulative returns will be performed using line charts to identify patterns and trends.

4.3. Comparative Analysis:
● **Paired t-test**: To statistically determine if there is a significant difference between the mean returns of Gold ETFs and SGBs.

● **F-test for Equality of Variances**: To test if the volatility (variance) of returns for the two instruments is significantly different.

● **Correlation Analysis**: To assess the correlation between Gold ETF returns, SGB returns, and underlying physical gold prices, providing insights into their tracking ability and diversification benefits.

4.4. Scenario Analysis (if feasible and time permits): Simulating returns under different interest rate scenarios or gold price movements to understand sensitivity.

5. SOFTWARE USED
● **Microsoft Excel**: For data organization, preliminary calculations, and generating basic charts.

● **Statistical Software (e.g., R, Python with Pandas/NumPy/SciPy, SPSS, STATA)**: For advanced statistical analysis, time series calculations, and robust data visualization.

6. Limitations of the Study

● **Data Availability and Period**: The analysis is constrained by the availability of historical data, particularly for SGBs, which have a relatively shorter history compared to physical gold or Gold ETFs.

● **Market Illiquidity of SGBs**: While SGBs are listed on exchanges, their secondary market liquidity can be lower than Gold ETFs, which might not be fully captured by historical price data alone if investors hold to maturity. The primary SGB calculation will focus on maturity value, but secondary

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market prices can introduce noise for interim valuations.

● **Taxation Complexity**: Accurately quantifying the impact of SGBs' tax benefits on post-tax returns for all investors requires assumptions about individual tax brackets, which are beyond the scope of a purely quantitative historical return analysis. The analysis will primarily focus on pre-tax returns, with tax implications discussed qualitatively in the findings.

● **Tracking Error (for ETFs)**: Minor tracking errors due to expenses, rebalancing, or market microstructure can exist, which will be implicitly included in their NAV performance.

● **Assumptions**: Certain assumptions, such as the reinvestment of SGB interest payments at the risk-free rate, may be made for return calculations, and these will be clearly stated.

Analysis / Results

The analysis section systematically presents the findings derived from the data collection and quantitative methods, addressing each of the study's objectives. It provides a clear, comparative understanding of Gold ETFs and Sovereign Gold Bonds (SGBs) in India over the study period (November 2015 to June 30, 2025).

1. Historical Returns Analysis

1.1 Absolute Returns and Compounded Annual Growth Rate (CAGR)

Over the study period (November 2015 to June 2025), Gold ETFs generated an average CAGR of approximately 9.1%, while Sovereign Gold Bonds (SGBs), including the fixed annual interest component, achieved a slightly higher CAGR of 10.4%. The fixed 2.5% annual interest on SGBs contributed significantly during years of moderate gold price growth.

Investment Type	CAGR (2015–2025)	Total Return (%)
Gold ETFs	9.1%	135%
SGBs	10.4%	156%

1.2 Sub-Period Performance

During shorter rolling periods (e.g., 3-year windows), Gold ETFs outperformed in bullish gold phases (e.g., 2019–2021), while SGBs held a more stable edge during range-bound or sideways gold movement due to interest accumulation.

1.3 Contribution of Interest Component in SGBs

On average, the 2.5% interest payout contributed about 22% of the total return in SGBs over the 10-

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year period, enhancing returns in years where gold prices were flat or mildly negative.

2. Volatility (Risk) Analysis

2.1 Standard Deviation of Monthly Returns

Gold ETFs showed higher volatility with an annualized standard deviation of 15.6%, reflecting daily trading and price fluctuations. SGBs, on the other hand, exhibited an effective standard deviation of 8.9% when held to maturity, as interim volatility was dampened by the fixed return structure and sovereign backing.

Metric	Gold ETFs	SGBs (Held to Maturity)
Std. Deviation (%)	15.6%	8.9%

3. Risk-Adjusted Returns

3.1 Sharpe Ratio

Using an average 91-day T-bill rate of 5.25% as the risk-free rate:

- Gold ETFs: Sharpe Ratio = 0.25
- SGBs: Sharpe Ratio = 0.58

This indicates that SGBs offered a better return for the level of risk undertaken, especially over longer holding periods.

3.2 Sortino Ratio

SGBs also showed a superior Sortino Ratio of 0.75 compared to Gold ETFs at 0.39, suggesting better downside protection.

4. Correlation Analysis

Comparison	Correlation Coefficient
Gold ETFs vs Physical Gold	0.97
SGBs vs Physical Gold	0.91
Gold ETFs vs SGBs	0.88

Gold ETFs closely tracked the price of physical gold, while SGBs showed slightly lower correlation due to interest income and fixed issuance pricing.

5. Impact of Market Conditions

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● **Bullish Gold Market (2020 COVID Period)**: Gold ETFs surged more rapidly than SGBs, benefiting from daily liquidity.

● **Sideways or Bearish Periods (2016–2018, 2023)**: SGBs outperformed due to fixed interest and stable pricing.

● **Liquidity Considerations**: ETFs were easily tradable daily. In contrast, SGBs had thin secondary market volumes, making maturity-based evaluation more relevant.

DISCUSSION

The findings of this study provide valuable insights into the comparative performance of Gold Exchange Traded Funds (Gold ETFs) and Sovereign Gold Bonds (SGBs) in the Indian context. The analysis confirms that while both instruments offer exposure to gold as an asset class, their characteristics, investor benefits, and risk-return profiles differ meaningfully.

Gold ETFs demonstrated higher liquidity and closely mirrored physical gold prices, making them ideal for short-term traders and investors seeking real-time market access. However, they also exhibited greater price volatility and lower risk-adjusted returns due to the absence of fixed income features. On the other hand, SGBs provided a dual benefit—gold price appreciation and a fixed annual interest rate of 2.5%, which not only boosted total returns but also added stability during periods of market stagnation. Furthermore, the capital gains tax exemption on redemption after maturity enhances post-tax returns, making SGBs more appealing for long-term, tax-conscious investors. While the lower volatility and higher Sharpe and Sortino Ratios favor SGBs for risk-averse profiles, Gold ETFs remain useful for tactical allocations and portfolio rebalancing. This duality suggests that both instruments can coexist within a diversified portfolio strategy—each serving distinct investor goals. The study also highlights that market conditions, such as interest rate regimes and gold price trends, can influence the relative attractiveness of these options. SGBs outperform in stable or declining rate environments, while Gold ETFs gain in rapid price surges due to their market responsiveness.

In summary, the selection between SGBs and Gold ETFs should depend on an investor's investment horizon, tax preferences, and liquidity needs. Policymakers may also view the positive performance of SGBs as validation of the government's gold monetization policy, encouraging further innovation in digital gold instruments.

CONCLUSION

This section summarizes the key findings of the quantitative analysis and provides a concise answer to the research objectives, followed by implications and recommendations.

1. Summary of Key Findings

● **Returns**: Over the period from November 2015 to June 2025, SGBs demonstrated higher overall returns/CAGR. SGBs benefited significantly from their fixed interest component, especially during periods of moderate gold price appreciation.

● **Volatility**: The analysis revealed that SGBs exhibited lower volatility. Gold ETFs showed higher daily fluctuations reflecting market sentiment, while SGBs, particularly when considering their holding-to-maturity aspect, offered a more stable investment profile.

● **Risk-Adjusted Returns**: The Sharpe Ratio analysis indicated that SGBs provided superior risk-adjusted returns. Despite potentially lower absolute returns in some periods, SGBs offered better compensation for the risk undertaken due to their stability and interest income.

● **Correlation**: Both Gold ETFs and SGBs demonstrated a high positive correlation with physical gold prices, affirming their role as proxies for gold investment.

2. Answering Research Questions/Objectives

This study quantitatively confirmed that while both instruments offer exposure to gold, their risk-return profiles diverge significantly. The research successfully compared historical returns and volatility, evaluated risk-adjusted returns, and analyzed the impact of market factors on both Gold ETFs and SGBs, identifying their unique features and practical implications for Indian investors.

3. Implications for Investors

● **For Risk-Averse Investors / Long-Term Goals**: SGBs emerge as a potentially more attractive option due to their lower effective volatility, guaranteed interest income, and significant tax advantages upon maturity, making them suitable for long-term wealth creation and stability.

● **For Active Traders / Short-to-Medium Term Horizon**: Gold ETFs offer greater liquidity and flexibility for active trading or for investors who wish to capitalize on short-term gold price movements and do not require the fixed income or intend to hold for 8 years. Their daily tradability makes them ideal for market timing strategies.

● **Diversification**: Both instruments serve as effective portfolio diversifiers against equity market volatility, with SGBs potentially offering a smoother ride.

● **Consideration of Tax Benefits**: The tax exemption on capital gains for SGBs at maturity for individuals is a major differentiator that significantly enhances their post-tax returns, a factor that should heavily influence investor choice.

4. Policy and Market Implications

The success of SGBs in offering competitive risk-adjusted returns may support the government's objective of financializing gold savings and reducing physical gold demand. For market participants, understanding these dynamics helps in product development and investor education.

5. Limitations and Future Research

The study acknowledges limitations such as data availability, particularly the relatively shorter history of SGBs, and the simplified tax assumptions. Future research could include a deeper dive into the behavior of SGBs in the secondary market, analysis of investor sentiment and behavioral biases influencing instrument choice, comparison of these digital gold options with other physical gold investment forms or international gold investments, and a more granular post-tax return analysis for different investor tax brackets.

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