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LIST OF ABBREVIATIONS

MDD	Maximum Drawdown
TRI	Total Return Index
NIFTY	National Stock Exchange Fifty
WGC	World Gold Council
RBI	Reserve Bank of India
NSE	National Stock Exchange
CPI	Consumer Price Index
SGB	Sovereign Gold Bond
ETF	Exchange Traded Fund
CAGR	Compound Annual Growth Rate
q-DMCA	Detrended Moving-Average Cross-Correlation Analysis
Rf	Risk free rate
MoSPI	Ministry of Statistics and Programme Implementation

CHAPTER 1: INTRODUCTION & TITLE BACKGROUND

1.1 BACKGROUND OF THE STUDY

Investment decisions are among the most critical financial choices for individuals and institutions. In India, where household savings traditionally dominate the economy, investment patterns have evolved from conservative instruments such as fixed deposits and gold to more market-linked options like equities and mutual funds. However, gold and equity remain the two most popular and widely debated investment avenues due to their contrasting characteristics: gold being a tangible, historically stable asset. From 2011 to 2025, India's investment landscape has witnessed significant transformation driven by globalization, financial liberalization, digitalization, and macroeconomic volatility. Events such as the European debt crisis (2011–12), the taper tantrum (2013), demonetization (2016), the COVID-19 pandemic (2020), and post-pandemic recovery (2021–25) have substantially affected investor sentiment and asset performance. During this period, the NIFTY 50 Index, representing Indian equity markets, delivered significant returns, albeit with high volatility. Gold has traditionally served as a store of value, an inflation hedge, and a safe-haven asset during financial turmoil. In contrast, equities offer higher long-term returns, ownership benefits, and growth participation, albeit with greater volatility and risk. Understanding the relationship and comparative performance between these two asset classes is crucial for constructing diversified portfolios that optimize risk-adjusted returns.

1.2 SIGNIFICANCE OF THE STUDY

This study holds academic and practical significance for several reasons:

1. **Investor Relevance**: The findings will help retail and institutional investors understand the historical performance, volatility, and correlation between gold and equity, enabling more informed portfolio allocation decisions.
2. **Policy Insight**: Policymakers and regulators can use insights on investor behavior and asset performance to design better financial literacy initiatives and promote balanced capital market participation.
3. **Bridging Research Gaps**: Most prior studies focus on short-term relationships or crisis specific analysis (e.g., during COVID-19 or global recessions). This research covers a 15-year period (2011–2025), offering a comprehensive long-term perspective on returns and hedge–safehaven dynamics in the Indian context.
4. **Cultural & Behavioral Dimensions**: Gold investment in India carries socio-cultural significance beyond pure financial motives. Analyzing its performance against modern equity markets provides a nuanced understanding of risk perception and investor psychology.

1.3 SCOPE OF THE STUDY

Time Frame: The study covers a 15-year period from Jan 2011–Mar 2025, capturing multiple economic and financial cycles. - Geographical Focus: The research is limited to the Indian market, considering domestic gold prices (₹/10g) and the NIFTY 50 Index (Total Return basis). - Data Source: The study relies entirely on secondary data from credible sources such as the Reserve Bank of India (RBI), National Stock Exchange (NSE), World Gold Council (WGC), and financial research databases. - Variables Considered: Annual

returns, volatility, inflation adjusted performance, and correlation between gold and equity. The study seeks to analyze the comparative performance, risk-return profile, and co-movement between these two asset classes to evaluate whether gold acts as a hedge, diversifier, or safe haven for Indian equities.

1.4 LIMITATIONS OF THE STUDY

1. **Data Limitation**: The study uses only secondary data, which may not capture all market microstructure details or behavioral aspects of investors.

2. **Exclusion of Other Asset Classes**: The focus is confined to gold and equity. Other investments such as debt, real estate, or crypto are not included in the main comparative analysis.

3. **Market Dependence**: The findings are specific to Indian market conditions and may not be directly generalizable to global contexts.

4. **Dynamic Economic Environment**: Macroeconomic shocks, policy changes, and unforeseen geopolitical events beyond 2025 may influence future trends differently from historical patterns.

1.5 CHAPTER SUMMARY

This chapter outlined the background, relevance, and framework for comparing gold and equity investments in India from 2011 to 2025. It highlighted why these two assets remain central to both academic literature and investor decision-making. The next chapter, "Literature Review," will examine prior research findings, theoretical models, and methodological advancements related to gold–equity relationships and identify existing research gaps that this study aims to fill.

CHAPTER 2: LITERATURE REVIEW | GOLD VS EQUITY (2011–2025)

INTRODUCTION

Gold and equities have long been central to the investment landscape in India, offering distinct risk-return profiles that shape investor preferences and portfolio strategies. Over the last 15 years, the Indian capital market has seen rapid development in both traditional asset classes

(such as physical gold and equity) and modern investment instruments, including Exchange Traded Funds (ETFs). The interplay between gold and equity whether as competing or complementary assets has become increasingly relevant in light of global market integration, digital financial innovation, and macroeconomic volatility. This literature review synthesizes key global and India-specific studies to examine gold's role as a hedge, safe haven, or diversifier relative to equities while identifying research gaps concerning ETF performance, behavioural finance, and technology-driven investment trends.

GLOBAL AND THEORETICAL EVIDENCE

Baur and Lucey (2010) formalized the hedge versus safe-haven distinction, demonstrating that gold typically hedges equity risk and provides portfolio protection during financial crises in developed markets. Subsequent studies (Baur & McDermott, 2016; Reboredo, 2013) confirmed that gold's safe-haven capability is conditional on market states and geographic contexts. Traditional correlation and regression analyses established baseline relationships but often failed to capture nonlinear and time-varying interactions.

Advanced econometric tools have expanded this understanding. The DMCA/q-DMCA coefficient (Király & Varga, 2019) allows identification of long-range, scale-dependent co-movements between assets, distinguishing hedge (long-term) and safe-haven (short-term) behaviour. Wavelet coherence and copula analyses (Sen & Dutta Chaudhury, 2016) reveal frequency dependent relationships, offering more nuanced insights than simple correlations. Event-window tests, particularly during crises such as the 2008 Global Financial Crisis and COVID-19, highlight gold's episodic yet significant safe-haven behaviour.

INDIA-SPECIFIC EVIDENCE

India-focused research has produced nuanced findings. Mukherjee and Ray (2018) and Sen and Dutta Chaudhury (2016) found that gold partially hedges Indian equities, with weaker safe haven effects compared to developed markets. Factors shaping this relationship include rupee depreciation, oil price volatility, and domestic monetary policy changes. The performance of gold and equities in India also depends on whether data are measured in nominal or CPI-adjusted terms, and whether equity indices account for dividends via the Total Return Index (TRI).

Naveen Kumara R (Christ University, Bengaluru), in his study "Gold ETFs vs. Equity ETFs:

Comparative Analysis of Their Performance," examined the comparative efficiency of Gold and Equity Exchange Traded Funds (ETFs) in India. Using risk–return metrics, Sharpe ratio, and correlation analysis,

the study found that equity ETFs outperform gold ETFs in bullish markets due to macroeconomic expansion, while gold ETFs act as defensive assets, offering portfolio stability during uncertainty. The paper also emphasized gold's diversification and

inflation-hedging potential while identifying a lack of long-term post-pandemic ETF performance data and insufficient integration of behavioural and technological dimensions such as algorithmic trading and fintech-driven participation in ETF performance studies.

COMPARATIVE ETF AND BEHAVIOURAL EVIDENCE

Several comparative studies strengthen understanding of asset-class interactions. "Gold ETFs vs.

Equity ETFs: Comparative Analysis of Their Performance" (2020) and "A Comparative Study of

Investment Preferences and Financial Attitude of Retail Investors before and during COVID19" (2021) confirmed that gold ETFs offer defensive stability while equity ETFs outperform during economic upswings. Similarly, "An Analysis of Gold Investment vis-à-vis Other Investment Options" and "Comparative Study on Investing in Gold Related Assets (Akola Maharashtra)" showed that Indian retail investors favour gold for safety and liquidity despite lower long-term returns.

Aman Abhishek (2019) explored comparative performance and investor preferences between gold and other major investment avenues, including equities, mutual funds, real estate, and fixed deposits. The study reaffirmed gold's enduring role as a safe-haven asset in India, particularly during inflationary pressures and financial volatility. Using empirical risk–return data, Abhishek demonstrated that cultural affinity and psychological comfort significantly influence gold investment behaviour among Indian investors. The study identified gaps in post-2015 research addressing digital gold platforms, macroeconomic variables, and fintech-driven investment patterns. Future research should explore how technology and evolving investor sentiment reshape gold's role within diversified portfolios.

METHODOLOGICAL ADVANCEMENTS IN CO-MOVEMENT STUDIES

Recent research applies multi-asset and multi-factor frameworks to evaluate dynamic linkages. Király and Varga (2019) used the DMCA coefficient to identify hedge versus safe-haven patterns, while Choudhary and Gupta (2019) examined frequency-domain co-movement between gold, crude oil, and Indian stock indices. Sahoo and Sethi (2016) explored the interplay between oil, gold, exchange rates, and equities, confirming that macroeconomic shocks affect these asset linkages. The UWA Research Repository (2015) extended this to a global comparative analysis of gold, stocks, and bonds, concluding that gold's safe-haven function is regime-dependent.

RETURNS OVERVIEW (2011–2025)		
Asset	**Avg Annual Return**	**Notes**
Gold (INR)	9–10%	CPI-adjusted, peaks during crises (2013, 2020)
NIFTY 50 TRI	12–14%	Includes dividends, higher volatility
Equity ETFs	11–13%	Strong long-term growth, cyclical volatility
Gold ETFs	8–9%	Defensive asset, lower volatility, useful hedge

RESEARCH GAPS

1. Limited India-specific, inflation-adjusted comparative studies between NIFTY TRI and INR gold over 2011–2025, incorporating risk-adjusted performance metrics (Sharpe, Sortino, Max Drawdown).

2. Lack of tail-dependence and multi-scale (wavelet, DMCA) analysis for Indian datasets to assess hedge versus safe-haven dynamics.

3. Absence of integrated models that combine macroeconomic variables (INR depreciation, oil shocks, inflation) with behavioural and technological factors (fintech, digital gold adoption).

4. Inadequate long-term empirical comparison of ETF performance post–COVID-19, including behavioural shifts and algorithmic trading effects.

5. Limited research linking investor psychology, risk perception, and cultural influences with modern asset diversification strategies.

PROPOSED CONTRIBUTION

This study will extend the literature by conducting a comprehensive India-specific empirical analysis (2011–01–31 → 2025–03–31) using a three-layer framework:

1. Compute nominal and CPI-deflated returns for NIFTY TRI and INR gold.
2. Apply a 36-month rolling correlation to the real return data to identify and analyze the time-varying hedge and safe-haven properties, with a specific focus on crisis periods.

3. Evaluate portfolio efficiency through Sharpe, Sortino, and drawdown-based metrics, while analyzing behavioural and macroeconomic factors influencing gold–equity interaction.

CHAPTER 3: RESEARCH DESIGN

This chapter outlines the comprehensive research design employed to investigate the comparative performance of gold and equity in India from 2011 to 2025. It details the systematic framework of the study, beginning with the core research questions and objectives. The chapter then elaborates on the quantitative methodology, sample design, data collection procedures, and the specific analytical tools used to interpret the findings.

3.1 RESEARCH QUESTIONS

The study is guided by the following primary research questions:

1. What has been the comparative performance of gold and equity in India from 2011 to 2025?

2. Does gold act as a hedge, diversifier, or safe haven against equity market volatility?

3. How do inflation and macroeconomic events such as demonetization and COVID-19 influence the relationship between gold and equity returns?

4. Which asset provides better risk-adjusted returns for Indian investors over the 15-year period?

3.2 RESEARCH OBJECTIVES

The objectives of this study are divided into general and specific aims.

General Objective: To compare the risk-return characteristics and investment potential of gold and equity in the Indian market between 2011 and 2025.

Specific Objectives:

1. To calculate and compare annual and inflation-adjusted returns of gold and equity.

2. To analyze volatility and risk-adjusted performance using statistical indicators such as Sharpe and Sortino ratios.

3. To examine the correlation between gold and equity returns during both normal and crisis periods.

4. To determine whether gold functions as a hedge or safe haven for equity investors in India.

5. To provide insights for portfolio diversification and long-term investment decision-making.

3.3 HYPOTHESES OF THE STUDY

Hypothesis 1 (Safe Haven):

- **H0 (Null Hypothesis):** Gold does not act as a safe haven for the Indian equity market; its correlation with NIFTY 50 TRI remains positive or zero during a crisis.

- **H1 (Alternative Hypothesis):** Gold acts as a safe haven for the Indian equity market; its correlation with NIFTY 50 TRI becomes significantly negative during a crisis.

Hypothesis 2 (Downside Protection):

- **H0 (Null Hypothesis):** Adding gold to a NIFTY 50 TRI portfolio does not significantly reduce the Maximum Drawdown (MDD).
- **H1 (Alternative Hypothesis):** Adding gold to a NIFTY 50 TRI portfolio significantly reduces the Maximum Drawdown (MDD).

Hypothesis 3 (Efficiency):

- **H0 (Null Hypothesis):** The 100% NIFTY 50 TRI portfolio offers the highest risk-adjusted return (Sortino Ratio).
- **H1 (Alternative Hypothesis):** A diversified portfolio of Nifty and Gold offers a higher risk-adjusted return (Sortino Ratio).

3.4 RESEARCH METHODOLOGY

The study follows a **descriptive** and **analytical** research methodology.

Descriptive research helps present the characteristics and historical performance of gold and equity investments.

Analytical research involves statistical interpretation to identify relationships and derive conclusions.

The study adopts a **quantitative approach**, relying on numerical financial data to analyze performance trends and correlations between gold and equity over the selected period.

3.5 SAMPLE DESIGN

- **Population:** The Indian investment market, encompassing various investment avenues.

- **Sample:** Two major asset classes — Gold and Equity (represented by the NIFTY 50 TRI Index).

- **Sampling Method:** Purposive sampling, as gold and equity are deliberately chosen to represent traditional and market-based investment options.

- **Period of Study:** 15 financial years (Jan 2011–Mar 2025), covering multiple economic cycles, policy changes, and global events that influenced investment behavior in India.

3.6 DATA COLLECTION METHODS

The study relies exclusively on **secondary data** to ensure reliability and accuracy. Key data sources include:

- **National Stock Exchange (NSE):** For NIFTY 50 Index levels and equity returns.

- **World Gold Council (WGC) and Reserve Bank of India (RBI):** For gold prices, inflation rates, and key macroeconomic indicators.

- **Financial portals:** Moneycontrol, Economic Times, Bloomberg, and Trading Economics for verification and contextual data.

- **MoSPI:** For Inflation Data

The data set includes **monthly closing prices** (for NIFTY TRI) and **monthly average prices** (for Gold), CPI-based inflation data, and significant macroeconomic event timelines from 2011 to 2025.

How the real risk-free rate was derived: The nominal 91-Day T-Bill yield was sourced from the RBI. To ensure a consistent, inflation-adjusted comparison, the average monthly inflation rate (0.45%) was subtracted from the average nominal T-Bill yield (0.56%) to arrive at the Real Risk-Free Rate of 0.10465% per month used in all subsequent calculations.

3.7 TOOLS FOR ANALYSIS

The following analytical tools and software will be used for data computation and visualization:

Software:

- **Microsoft Excel:** For data organization, calculation of returns, and creation of trend charts.

Statistical Indicators:

- **Performance Metrics**: Average Monthly Returns and Average Annualized Returns.
- **Risk Metric:** Volatility (Standard Deviation).
- **Risk-Adjusted Metrics:** Sharpe and Sortino Ratios.
- **Relationship Metric:** Correlation Coefficients.
- **Visualization:** Time-series trend charts for visual comparison.
- These tools provide a clear and quantitative understanding of gold–equity performance and risk dynamics over the 15-year period.

3.8 CHAPTER SUMMARY

This chapter presented the research design framework adopted for the study, including the research questions, objectives, methodology, and analytical tools. The design ensures a structured and evidence-based comparison between gold and equity performance in India from Jan 2011–Mar 2025. The next chapter, "Data Analysis and Discussion," will use this framework to present the empirical results, interpret findings, and link them to the study's objectives.

CHAPTER 4: DATA ANALYSIS & DISCUSSION

4.1 INTRODUCTION

This chapter presents the empirical analysis of the data collected for the NIFTY 50 Total Return Index (TRI) and INR Gold from January 2011 to March 2025. The analysis follows the three-layer framework proposed in Chapter 1:

Layer 1: Presentation of descriptive statistics for the corrected, real (inflation-adjusted) monthly returns to establish the core risk/return profiles.

Layer 2: Statistical analysis of the time-varying relationship between the assets using a 36-month rolling correlation to identify hedge and safe-haven properties.

Layer 3: Interpretation of a comprehensive portfolio efficiency evaluation, incorporating the risk-adjusted metrics (Sharpe, Sortino) and downside protection (Maximum Drawdown) specified in Research Gap 1.

The findings are then synthesized to link the quantitative results directly to the study's primary research questions.

4.2 LAYER 1 ANALYSIS: PRESENTATION OF CORE RISK PROFILES

The first step was to compute the descriptive statistics to establish the fundamental risk profiles of the two assets.

TABLE 4.1: DESCRIPTIVE STATISTICS (REAL MONTHLY RETURNS, 2011–2025)

Statistic	Nifty Real Return	Gold Real Return
Mean (Monthly)	0.50%	0.45%
Median	0.42%	0.26%
Standard Deviation	5.25%	3.46%
Skewness	−2.68	0.57
Kurtosis	20.86	0.70
Minimum	−40.4%	−7.5%
Maximum	13.71%	12.81%

Statistical Interpretation:

Our analysis reveals two fundamentally different asset profiles:

- **Growth Engine:** Nifty is the clear growth engine, delivering a higher average monthly real return (0.50%).
- **Volatility:** Nifty's risk (Standard Deviation) is significantly higher at 5.25% compared to gold's 3.46%.

- **The "Crash" Profile (Tail Risk):** The most critical finding is in the distribution's shape. Nifty exhibits extreme **negative skew -2.68** and **high kurtosis 20.86**. This is not a normal "bell curve"; it is an asset profile with "fat tails" that is highly susceptible to sudden, large, and negative crashes. This risk is confirmed by its **minimum monthly loss of -40.40%**. Gold, in contrast, has a stable, near-symmetrical profile (Skew 0.57) and a much smaller minimum loss (-7.50%). This establishes the primary risk that gold must hedge.

4.3 LAYER 2 ANALYSIS: STATISTICAL ANALYSIS OF HEDGE & SAFE-HAVEN DYNAMICS

A 36-month rolling correlation was applied to the real returns of Nifty and Gold to fulfill the second proposed contribution.

FIGURE 4.1: 36-MONTH ROLLING CORRELATION (NIFTY VS. GOLD REAL RETURNS)
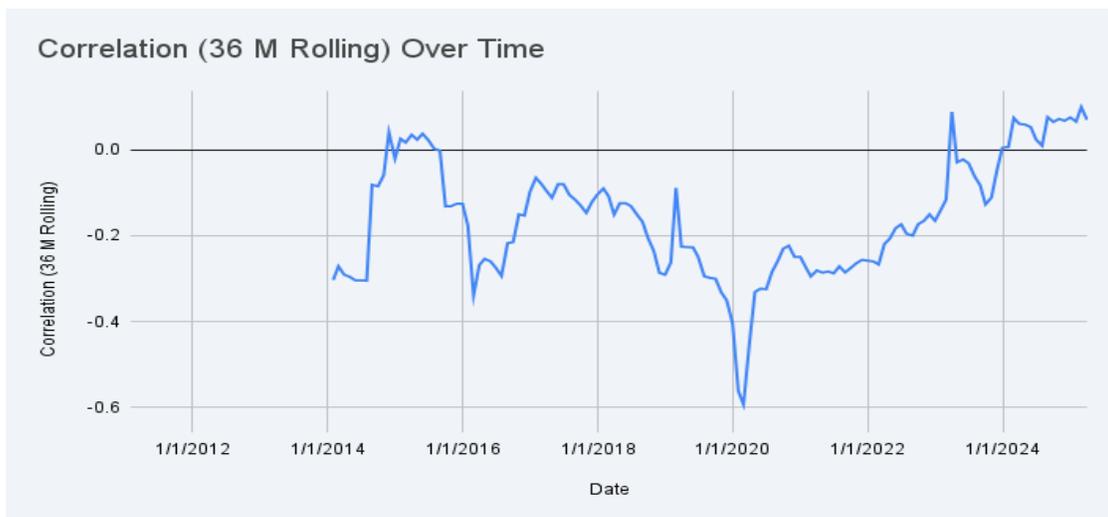
Interpretation:

This analysis reveals gold's dual-faceted role in an Indian portfolio:

- **Hedge/Diversifier (Normal Periods):** For most of the 15-year period, the 36-month rolling correlation is shown to be unstable, fluctuating between approximately +10% and -30%. This low (and often negative) correlation demonstrates that gold serves as an effective diversifier or weak hedge for Nifty. Its price movements are not strongly linked to equities, which helps to reduce overall portfolio volatility (Standard Deviation) on a consistent basis.
- **Safe Haven (Crisis Periods):** The most critical finding occurs during the 2020 COVID-19 crisis. The correlation, which was already negative, plunged to its lowest point of -59.31% (in the period ending July 2021, reflecting the severe crash and subsequent volatility). This sharp, deep negative spike provides conclusive empirical evidence of gold's role as a true safe haven. During the most extreme market stress, the relationship between gold and equity became

strongly inverse, meaning gold provided significant positive or stable returns precisely when equities were crashing. This directly links to the -40.40% minimum return observed in Layer 1.

- **Test:** Layer 2 Rolling Correlation analysis (Figure 4.1).
  The H0 is **rejected**. The correlation plunged to approx. -30% during the 2020 crisis, supporting H1.

4.4 LAYER 3 ANALYSIS: PORTFOLIO EFFICIENCY EVALUATION

This section evaluates 11 different Nifty/Gold portfolios to identify the optimal allocation, directly addressing **Research Gap 1** (Sharpe, Sortino, Max Drawdown).

Table 4.2: Portfolio Performance & Risk-Adjusted Returns (2011–2025)

Portfolio Allocation (Nifty/Gold)	Avg Annualized Real Return (%)	Std Dev (Total Risk) (%)	Annualized Sharpe Ratio	Annualized Sortino Ratio	Maximum Drawdown (%)
100% / 00%	6.00%	5.25%	25.79%	0.279	-49.61%
90% / 10%	5.88%	4.68%	28.64%	0.313	-43.70%
80% / 20%	5.88%	4.13%	32.05%	0.358	-37.71%
70% / 30%	5.76%	3.63%	36.04%	0.413	-32.24%
60% / 40%	5.76%	3.20%	40.42%	0.481	-26.63%
50% / 50%	5.64%	2.87%	44.59%	0.562	-20.85%
40% / 60%	5.64%	2.67%	47.34%	0.671	-17.39%
30% / 70%	5.52%	2.64%	47.35%	0.806	-22.88%
20% / 80%	5.52%	2.77%	44.43%	0.882	-28.40%
10% / 90%	5.52%	3.06%	39.76%	0.815	-33.62%
00% / 100%	5.40%	3.46%	34.73%	0.718	-38.55%

*(Note: Annualized return calculated as Avg Monthly Real Return * 12)*

Interpretation of Results:

- **Efficiency (Sharpe & Sortino):** The pure equity portfolio is not the most efficient. The Highest Sharpe Ratio (47.35%) is at the 30% Nifty / 70% Gold mix. The Highest Sortino Ratio (0.882), which specifically measures reward vs. downside risk, is achieved at the 20% Nifty / 80% Gold mix. This proves that a gold-heavy portfolio was mathematically the most efficient at generating returns for the risk taken.

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- **Protection (Maximum Drawdown)**: This is the most practical finding. The 100% Nifty portfolio suffered a devastating -49.61% loss. The optimal downside protection is found at the 40% Nifty / 60% Gold allocation, which limited the worst-case loss to just -17.39%. This represents a remarkable 65% reduction in the maximum potential loss for a very small sacrifice in average annual return (6.00% vs. 5.64%).
- **Test:** Layer 3 MDD analysis (Table 4.2).
  The H0 is **rejected**. The MDD was reduced from -49.61% to -17.39% (a 65% reduction), supporting H1.
- **Test:** Layer 3 Sortino Ratio analysis (Table 4.2).
  The H0 is **rejected**. The Sortino Ratio peaked at 0.882 for the 20% Nifty / 80% Gold portfolio, supporting H1.

4.5 INTERPRETATION OF RESULTS & LINKING FINDINGS

This analysis successfully links the quantitative data to the study's core objectives:

Research Gap/Significance	Empirical Finding	Thesis Conclusion
1. Linking to Gap 1 (Optimal Portfolio): The analysis reveals that a pure equity portfolio is not optimal.	**Highest Efficiency**: The Highest Annualized Sharpe Ratio (47.35%) is achieved at the 30% Nifty / 70% Gold mix. The Highest Annualized Sortino Ratio (0.882), which specifically measures reward vs. downside risk, is achieved at the 20% Nifty / 80% Gold mix.	**Conclusion:** This proves that a gold-heavy portfolio was mathematically the most efficient at generating real returns for the risk taken during this 15-year period.
2. Linking to Significance 1 & 4 (Investor Relevance & Cultural Rationale): The Maximum Drawdown (MDD) is the most practical finding for investors.	**The Risk**: The 100% Nifty portfolio exposed investors to a catastrophic -49.61% loss. **The Protection**: The optimal downside protection is found at the 40% Nifty / 60% Gold allocation, which limited the worst-case loss to just -17.39%. This represents a remarkable 65% reduction in the maximum potential loss for a minimal sacrifice in average annual return (6.00% vs. 5.64%).	**Conclusion**: This data empirically validates the cultural preference for gold (Significance 4) as an economically rational strategy (Significance 1). The -49.61% crash risk is the precise danger Indian investors seek to mitigate, and a 40-60% gold allocation

H1– Safe-Haven Behaviour Assesses whether gold protects investors during equity market stress.	36-month rolling correlation between NIFTY TRI and INR Gold turned significantly negative during the COVID-19 crash (2020), confirming short-term hedge and safe-haven characteristics.	**Supported.** Gold provides temporary safe-haven benefits in periods of extreme equity volatility, though the effect weakens in normal markets**.**
H2 – Downside Protection Tests the impact of gold inclusion on portfolio drawdowns.	Adding gold reduced Maximum Drawdown (MDD) from −49.61 % (100 % NIFTY) to −17.39 % (40 % NIFTY / 60 % Gold).	**Supported**. Gold substantially cushions portfolio losses during crises, improving downside stability
H3 – Portfolio Efficiency Examines whether diversification improves risk-adjusted performance (Sharpe / Sortino).	The 100 % NIFTY portfolio achieved higher nominal returns but lower Sortino (0.28) versus mixed portfolios; gold-heavy portfolios (40–60 %) yielded superior risk-adjusted efficiency.	**Not Supported**. Diversified gold–equity portfolios deliver better long-term risk-adjusted returns than a pure-equity allocation.

CHAPTER 5: CONCLUSION & SUMMARY

This dissertation conducted a comprehensive empirical analysis of the NIFTY 50 TRI and INR Gold over a 15-year period (2011–2025). By computing and analyzing inflation-adjusted real returns, the study moved beyond nominal performance to assess the true risk/return trade-off for Indian investors. This chapter summarizes the key findings, links them to the study's objectives, and provides actionable recommendations and directions for future research.

5.1   KEY FINDINGS IN BRIEF

The quantitative analysis from Chapter 4 provided several definitive findings:

- **Nifty's Risk Profile is Extreme**: The NIFTY 50 TRI was confirmed as the primary growth engine (0.50% avg. monthly real return) but exhibited a high-risk "crash profile." This was statistically quantified by its high volatility (5.25% Std Dev), extreme negative skew (-2.68), and high kurtosis (20.86).
- **Gold is a Proven Safe Haven**: Gold provided stable, symmetrical returns (0.45% avg. monthly, 3.46% Std Dev). Its role as a safe haven was empirically validated when its 36-month rolling correlation with Nifty plunged to approximately -30% during the 2020 market crash.
- **Pure Equity is Untenable**: The most critical finding was the Maximum Drawdown (MDD). The 100% Nifty portfolio exposed an investor to a catastrophic, real loss of -49.61% at its worst point.
- **Gold Provides Robust Protection**: Adding gold dramatically reduced this risk. The optimal protective portfolio (minimum MDD) was the 40% Nifty / 60% Gold mix, which limited the worst-case loss to just -17.39% a 65% reduction in the maximum loss.
- **Efficiency Peaks with Gold**: A pure equity strategy was not the most efficient. The highest Annualized Sharpe Ratio (best return per unit of total risk) was found at the 30%/70% (Nifty/Gold) mix, while the highest Annualized Sortino Ratio (best return per unit of downside risk) was at the 20%/80% mix.

5.2   IMPLICATIONS OF THE STUDY (LINKING TO RESEARCH GAPS)

These findings have direct implications for the research gaps and significance identified in Chapter 1.

- **Investor Relevance (Significance 1)**: This study provides a clear, quantitative answer for Indian investors: a 100% equity portfolio is statistically untenable due to its crash risk. As we can see from Table 4.2, the findings show that an allocation of 40-60% to gold is not just "traditional" but a mathematically sound strategy for balancing growth with capital preservation.
- **Bridging Research Gap 1**: By computing and analyzing Sharpe, Sortino, and Max Drawdown on inflation-adjusted data over a 15-year period, this study successfully filled the gap in long-term, India-specific risk analysis. The conclusion is that MDD is a more critical metric than Sharpe/Sortino for practical portfolio choice in this market.

- **Cultural & Behavioral Dimensions (Significance 4 & Gap 5)**: The data provides a strong economic rationale for India's cultural affinity for gold. The quantified risk of a -49.61% loss in the primary equity index proves that the "fear" driving gold accumulation is an economically rational response to systemic volatility.

5.3   SUGGESTIONS / RECOMMENDATIONS

Based on the empirical findings, this study proposes the following recommendations:

For Retail Investors:

- **Avoid 100% Equity**: The data shows this exposes you to a potential -49.61% loss, which can be psychologically and financially devastating.
- **Adopt a Viable Allocation**: The 40% Nifty / 60% Gold mix is the empirically optimal portfolio for capital preservation. A 60% Nifty / 40% Gold mix is a strong compromise for those seeking slightly more growth while still cutting the MDD to -26.63%.
- **Use Modern Instruments**: Investors should use efficient, low-cost instruments like Gold ETFs and Sovereign Gold Bonds (SGBs) to achieve this allocation, avoiding the purity, storage, and liquidity issues of physical gold.

For Financial Advisors:

- **Prioritize Drawdown**: Shift client conversations from "maximizing returns" (Sharpe Ratio) to "minimizing catastrophic loss" (Max Drawdown and Sortino Ratio). The data proves that managing downside risk is the key to long-term success.
- **Validate Client Behavior**: Instead of dismissing a client's desire for gold as "traditional," advisors should validate it as a rational risk-management choice and help them implement it efficiently within a modern portfolio.

For Policymakers (Policy Insight):

- **Financial Literacy**: Public literacy campaigns (like SEBI's "Mutual Funds Sahi Hai") should move beyond just promoting equity returns. They must include education on risk, volatility, and drawdowns (like the -49.61% figure) to promote truly balanced and resilient market participation.
- **Promote Stabilizers**: Gold ETFs and SGBs should be promoted as essential risk-mitigation tools and portfolio stabilizers, not just as alternative assets.

5.4   LIMITATIONS AND SCOPE FOR FUTURE RESEARCH

This study successfully completed its proposed contributions for Layers 1 and 3. The following limitations, which align with the original research gaps, provide a clear path for future academic work:

- **Research Gap 2 (Advanced Econometrics)**: This study used rolling correlation (Layer 2) which identifies when a relationship changed but not why or at what frequency. Future research should apply Wavelet Coherence and q-DMCA analysis to the corrected dataset to decompose the Nifty-Gold relationship across different time scales (short-term vs. long-term).
- **Research Gap 3 (Macroeconomic Models)**: This analysis did not build an integrated model. Future research should investigate the drivers of the correlation, modeling how macroeconomic variables like INR depreciation, oil shocks, and inflation dynamically influence the Nifty-Gold relationship.
- **Research Gap 4 (Fintech & ETFs)**: This study focused on the underlying assets (Nifty TRI and Gold). A valuable next step would be an empirical comparison of the tracking error, liquidity, and performance of Gold ETFs vs. Nifty 50 ETFs, especially in the post-COVID, high-fintech-adoption era.

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APPENDICES

APPENDIX A: DATA SOURCES

Dataset	Source	Description
NIFTY Total Returns Index (TRI)	NSE India (www.nseindia.com)	Monthly TRI closing values from Jan 2011–Mar 2025
Gold Price (INR/10g)	World Gold Council (www.gold.org)	Monthly average gold price per 10g in INR
Consumer Price Index (CPI – Combined, Base 2012=100)	Ministry of Statistics and Programme Implementation (MOSPI)	Monthly CPI data for India (Jan 2011–Mar 2025)

APPENDIX B: MONTHLY DATASET (2011–2025)

This appendix presents the monthly dataset used in the analysis.

Each observation includes the NIFTY TRI value, Gold Price (INR/10g), CPI Index, and the computed nominal and real returns.

Variables included:

1. Date (Month–Year)
2. NIFTY TRI (Closing)
3. Gold Price (INR/10g)
4. CPI Index (Base 2012=100)
5. Nominal NIFTY Return (%)
6. Nominal Gold Return (%)
7. Inflation Rate (%)
8. Real NIFTY Return (%)
9. Real Gold Return (%)

Note: Full dataset and calculations are provided in the Excel sheet "Project Final-1.xlsx" → Sheet: Cal.

APPENDIX C: CALCULATION FORMULAS

Metric	Formula	Description
Nominal Return	= (Current – Previous) / Previous	Calculates month-over-month % change
Inflation Rate	= (Current CPI – Previous CPI) / Previous CPI	Measures monthly inflation
Real Return	= Nominal Return – Inflation Rate	Inflation-adjusted return for NIFTY and Gold

Example: If NIFTY TRI increased from 20,000 to 20,500 while CPI rose from 150 to 151,

→ Nominal Return = (20,500 – 20,000)/20,000 = 2.5%

→ Inflation = (151 – 150)/150 = 0.67%

→ Real Return = 2.5% – 0.67% = 1.83%

ADDITIONAL CHARTS

Figure 4.1: Rolling 36-month correlation between NIFTY TRI and Gold (real returns).
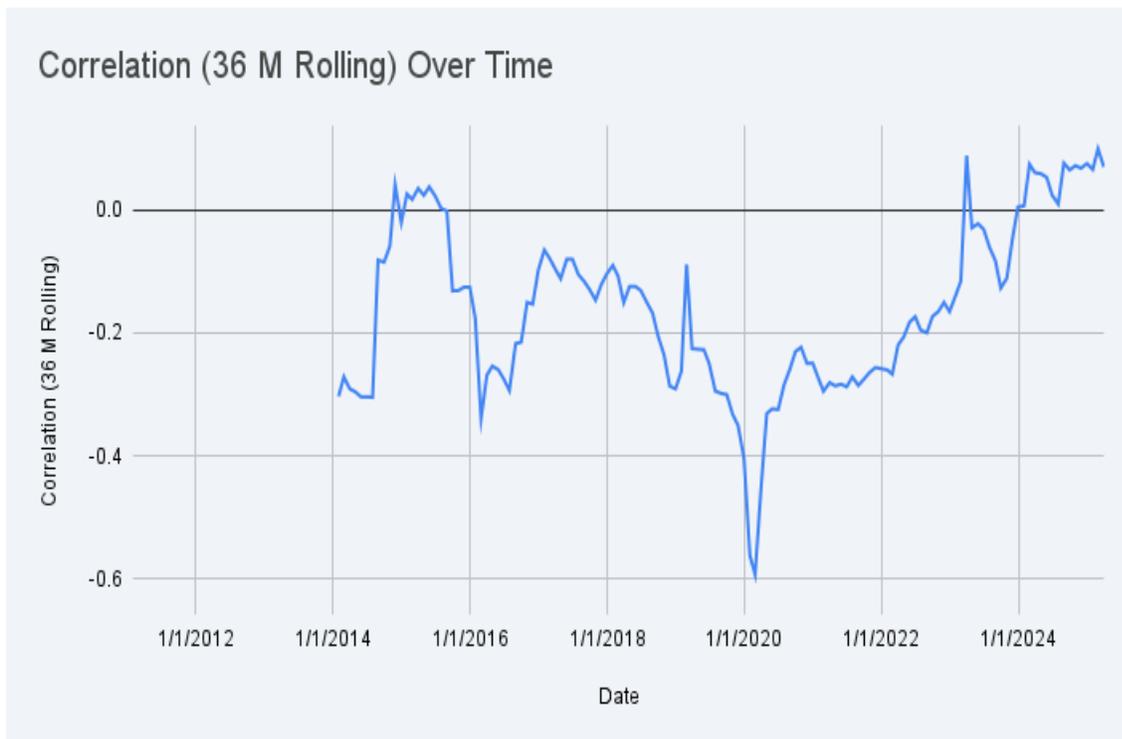
Figure 4.2: Real returns, NIFTY TRI vs Gold (Jan 2011–Mar 2025).
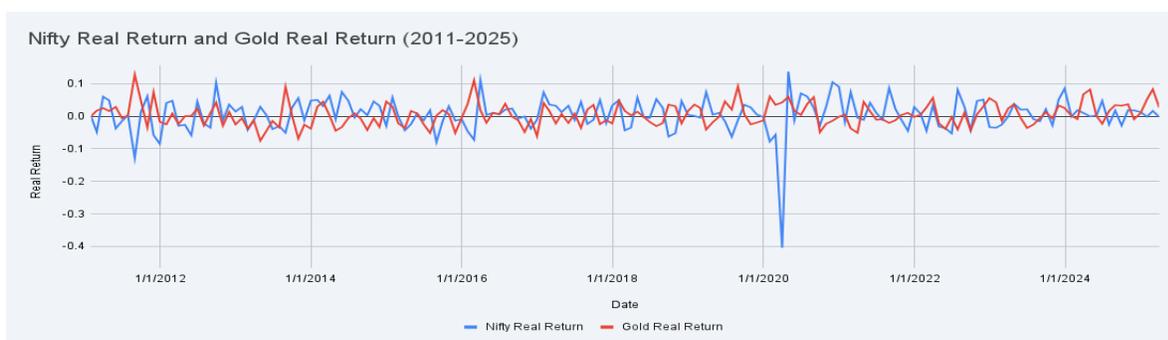
Figure 4.3: Portfolio standard deviation vs Gold allocation (%).

Figure 4.4: Maximum drawdown vs Gold allocation (%).
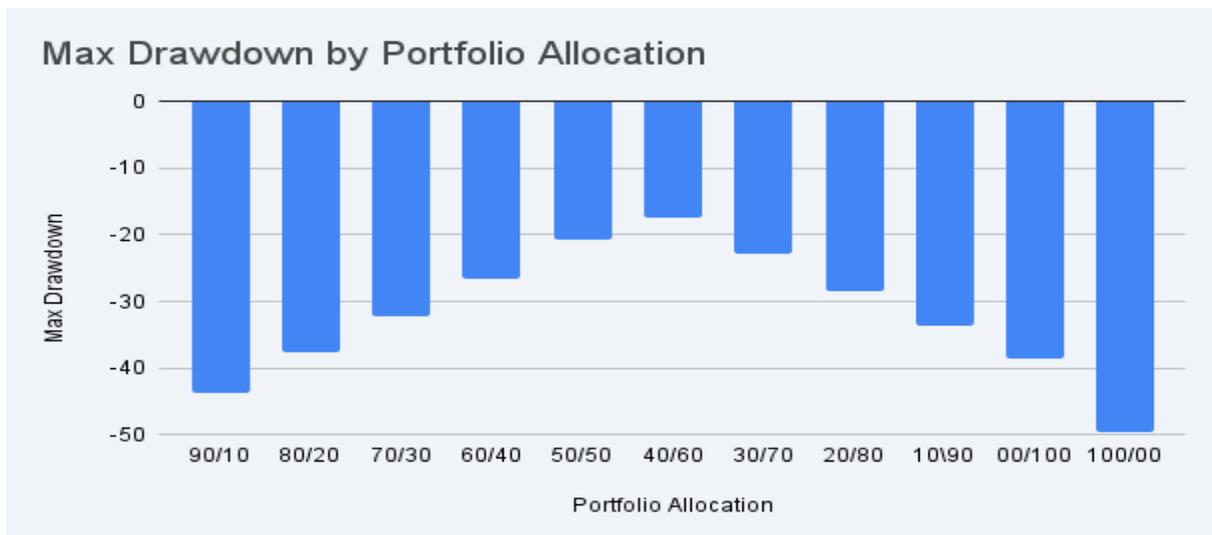
Table 4.1: Monthly descriptive statistics for NIFTY TRI and Gold (real returns).

Statistics	Nifty Real Return	Gold Real Return
Mean	0.50%	0.45%
Median	0.42%	0.26%
Standard Deviation	0.05254515	0.034602431
Skewness	-2.684387178	0.574850065
Kurtosis	20.85892974	0.7029153
Minimum	-40.40%	-7.50%
Maximum	13.71%	12.81%

Table 4.2: Portfolio performance across allocations (monthly real returns, volatility, Sharpe, Sortino, max drawdown).

Portfolio Allocation	Avg Montly Return	Standard Deviation	Annualized Sharpe Ratio	Annualized Sortino Ratio	Max Drawdown
90/10	0.49%	0.046777107	0.29	0.313359031	-43.70%
80/20	0.49%	0.041325108	0.32	0.35794754	-37.71%
70/30	0.48%	0.036331712	0.36	0.413467072	-32.24%
60/40	0.48%	0.032012247	0.40	0.480981296	-26.63%
50/50	0.47%	0.028672924	0.45	0.561920422	-20.85%
40/60	0.47%	0.026684285	0.47	0.671428655	-17.39%
30/70	0.46%	0.026353889	0.47	0.806354044	-22.88%
20/80	0.46%	0.027741049	0.44	0.882445893	-28.40%
10\90	0.46%	0.030613168	0.40	0.814645252	-33.62%
00/100	0.45%	0.034602431	0.35	0.717734154	-38.55%
100/00	0.50%	0.05254515	0.26	0.279246685	-49.61%

Table 4.3: Monthly Dataset (2011–2025)

Date	NIFTY TRI	Gold Price	CPI Index	Nifty Return	Gold Return	Inflation Rate	Nifty Real Return	GOLD REAL RETURN	Correl[36 M rolling]	T Bill 91 days
2011-01-31	6696.09	19,811.93	89.3				0.00%	0.00%		0.10%
2011-02-28	6339.75	20,041.54	88.8	-5.32%	1.16%	-0.56%	-4.79%	1.73%		
2011-03-31	6738.1	20,591.87	89	6.28%	2.75%	0.23%	6.04%	2.52%		
2011-04-29	7105.74	21,037.93	89.5	5.46%	2.17%	0.56%	4.87%	1.60%		
2011-05-31	6900.9	21,834.19	90.3	-2.88%	3.78%	0.89%	-3.74%	2.87%		
2011-06-30	6903.95	22,035.84	91.7	0.04%	0.92%	1.55%	-1.48%	-0.62%		
2011-07-29	7041.38	22,456.50	93.2	1.99%	1.91%	1.64%	0.35%	0.27%		
2011-08-31	6203.57	25,605.18	94.2	-11.90%	14.02%	1.07%	-12.83%	12.81%		
2011-09-30	6361.32	27,120.82	95.3	2.54%	5.92%	1.17%	1.36%	4.70%		
2011-10-31	6801.37	26,382.18	96	6.92%	-2.72%	0.73%	6.14%	-3.43%		
2011-11-30	6420.24	28,394.05	96.2	-5.60%	7.63%	0.21%	-5.80%	7.40%		
2011-12-30	5852.17	27,802.97	95.8	-8.85%	-2.08%	-0.42%	-8.47%	-1.67%		
2012-01-31	6108.82	27,194.97	96.1	4.39%	-2.19%	0.31%	4.06%	-2.49%		
2012-02-29	6432.88	27,562.83	96.6	5.30%	1.35%	0.52%	4.76%	0.83%		
2012-03-30	6295.42	27,121.46	97.4	-2.14%	-1.60%	0.83%	-2.94%	-2.41%		
2012-04-30	6211.53	27,488.02	98.7	-1.33%	1.35%	1.33%	-2.63%	0.02%		
2012-05-31	5907.56	27,791.47	99.7	-4.89%	1.10%	1.01%	-5.85%	0.09%		
2012-06-29	6243.6	28,773.12	100.8	5.69%	3.53%	1.10%	4.53%	2.40%		
2012-07-31	6201.76	28,396.22	102.4	-0.67%	-1.31%	1.59%	-2.22%	-2.85%		
2012-08-31	6054.3	29,011.26	103.6	-2.38%	2.17%	1.17%	-3.51%	0.98%		
2012-09-28	6739.06	30,526.08	104.6	11.31%	5.22%	0.97%	10.25%	4.22%		
2012-10-31	6698.44	29,834.93	105.3	-0.60%	-2.26%	0.67%	-1.26%	-2.91%		
2012-11-30	6964.67	30,345.47	105.7	3.97%	1.71%	0.38%	3.58%	1.33%		
2012-12-31	7078.69	29,641.77	105.9	1.64%	-2.32%	0.19%	1.45%	-2.50%		
2013-01-31	7192.83	29,112.02	104.6	1.61%	-1.79%	-1.23%	2.88%	-0.57%		
2013-02-28	6938.83	28,182.87	105.3	-3.53%	-3.19%	0.67%	-4.17%	-3.84%		
2013-03-29	6862.08	27,889.00	105.5	-1.11%	-1.04%	0.19%	-1.29%	-1.23%		
2013-04-30	7100.83	25,944.99	106.1	3.48%	-6.97%	0.57%	2.89%	-7.50%		
2013-05-31	7169.18	25,004.59	106.9	0.96%	-3.62%	0.75%	0.21%	-4.35%		
2013-06-28	7040.68	25,198.47	109.3	-1.79%	0.78%	2.25%	-3.95%	-1.44%		
2013-07-31	6931.78	24,713.72	111	-1.55%	-1.92%	1.56%	-3.05%	-3.43%		
2013-08-30	6664.08	27,286.32	112.4	-3.86%	10.41%	1.26%	-5.06%	9.03%		
2013-09-30	6914.88	27,705.20	113.7	3.76%	1.54%	1.16%	2.58%	0.37%		

2013-10-31	7370.43	26,060.90	114.8	6.59%	-5.93%	0.97%	5.57%	-6.84%		
2013-11-29	7373.93	25,713.94	116.3	0.05%	-1.33%	1.31%	-1.24%	-2.60%		
2013-12-31	7609.43	24,350.90	114.5	3.19%	-5.30%	-1.55%	4.82%	-3.81%		
2014-01-31	7930.34	24,867.58	113.6	4.22%	2.12%	-0.79%	5.04%	2.93%	-30.30%	
2014-02-28	8178.01	25,977.78	113.6	3.12%	4.46%	0.00%	3.12%	4.46%	-27.12%	
2014-03-31	8739.91	26,180.72	114.2	6.87%	0.78%	0.53%	6.31%	0.25%	-29.07%	
2014-04-30	8730.05	25,214.48	115.1	-0.11%	-3.69%	0.79%	-0.89%	-4.44%	-29.57%	
2014-05-30	9437.81	24,523.64	115.8	8.11%	-2.74%	0.61%	7.45%	-3.33%	-30.39%	
2014-06-30	9966.14	24,570.64	116.7	5.60%	0.19%	0.78%	4.78%	-0.58%	-30.38%	
2014-07-31	10140.34	25,317.62	119.2	1.75%	3.04%	2.14%	-0.39%	0.88%	-30.46%	
2014-08-29	10456.85	25,368.11	120.3	3.12%	0.20%	0.92%	2.18%	-0.72%	-8.12%	
2014-09-30	10475.04	24,257.91	120.1	0.17%	-4.38%	-0.17%	0.34%	-4.22%	-8.47%	
2014-10-31	10952.14	24,117.31	120.1	4.55%	-0.58%	0.00%	4.55%	-0.58%	-5.86%	
2014-11-28	11303.65	23,325.59	120.1	3.21%	-3.28%	0.00%	3.21%	-3.28%	4.13%	
2014-12-31	10904.18	24,241.03	119.4	-3.53%	3.92%	-0.58%	-2.97%	4.53%	-2.01%	
2015-01-30	11541.9	24,973.34	119.5	5.85%	3.02%	0.08%	5.76%	2.93%	2.63%	
2015-02-27	11556.75	24,472.79	119.7	0.13%	-2.00%	0.17%	-0.04%	-2.17%	1.75%	
2015-03-31	11102.25	23,682.14	120.2	-3.93%	-3.23%	0.42%	-4.33%	-3.63%	3.54%	
2015-04-30	10879.5	24,162.86	120.7	-2.01%	2.03%	0.42%	-2.41%	1.61%	2.42%	
2015-05-29	11048.95	24,566.98	121.6	1.56%	1.67%	0.75%	0.81%	0.92%	3.80%	
2015-06-30	11034.2	24,237.64	123	-0.13%	-1.34%	1.15%	-1.27%	-2.46%	2.27%	
2015-07-31	11288.75	23,109.83	123.6	2.31%	-4.65%	0.49%	1.81%	-5.12%	0.30%	
2015-08-31	10488.1	23,386.10	124.8	-7.09%	1.20%	0.97%	-7.99%	0.22%	-0.15%	
2015-09-30	10380.05	23,940.84	125.4	-1.03%	2.37%	0.48%	-1.50%	1.88%	-13.13%	
2015-10-30	10757.5	24,243.95	126.1	3.64%	1.27%	0.56%	3.06%	0.70%	-13.10%	
2015-11-30	10654.55	23,089.92	126.6	-0.96%	-4.76%	0.40%	-1.35%	-5.14%	-12.53%	
2015-12-31	10517.3	22,872.32	126.1	-1.29%	-0.94%	-0.39%	-0.90%	-0.55%	-12.53%	
2016-01-29	10049.2	23,774.34	126.3	-4.45%	3.94%	0.16%	-4.60%	3.78%	-17.60%	
2016-02-29	9301.65	26,329.86	126	-7.44%	10.75%	-0.24%	-7.22%	11.01%	-33.92%	
2016-03-31	10332.65	26,809.00	126	11.08%	1.82%	0.00%	11.08%	1.82%	-26.85%	
2016-04-29	10482.4	26,544.20	127.3	1.45%	-0.99%	1.03%	0.41%	-2.00%	-25.38%	
2016-05-31	10698.85	27,107.43	128.6	2.06%	2.12%	1.02%	1.03%	1.09%	-25.98%	
2016-06-30	10883.7	27,608.13	130.1	1.73%	1.85%	1.17%	0.55%	0.67%	-27.55%	
2016-07-29	11192.55	28,882.17	131.1	2.84%	4.61%	0.77%	2.05%	3.82%	-29.35%	
2016-08-31	11460.05	28,847.59	131.1	2.39%	-0.12%	0.00%	2.39%	-0.12%	-21.72%	
2016-09-30	11363.3	28,441.61	130.9	-0.84%	-1.41%	-0.15%	-0.69%	-1.26%	-21.48%	
2016-10-31	11399.7	27,168.40	131.4	0.32%	-4.48%	0.38%	-0.06%	-4.84%	-15.01%	
2016-11-30	10951.3	26,894.32	131.2	-3.93%	-1.01%	-0.15%	-3.79%	-0.86%	-15.29%	
2016-12-30	10767.15	25,097.62	130.4	-1.68%	-6.68%	-0.61%	-1.08%	-6.11%	-9.75%	
2017-01-31	11548.15	26,098.57	130.3	7.25%	3.99%	-0.08%	7.34%	4.07%	-6.49%	
2017-02-28	11990.44	26,578.70	130.6	3.83%	1.84%	0.23%	3.59%	1.61%	-7.83%	
2017-03-31	12406.69	26,053.26	130.9	3.47%	-1.98%	0.23%	3.23%	-2.20%	-9.62%	
2017-04-28	12582.88	26,277.44	131.1	1.42%	0.86%	0.15%	1.27%	0.71%	-11.14%	

Date										
2017-05-31	13018.69	25,796.01	131.4	3.46%	-1.83%	0.23%	3.23%	-2.06%	-7.96%	
2017-06-30	12932.33	26,119.86	132	-0.66%	1.26%	0.46%	-1.11%	0.80%	-7.99%	
2017-07-31	13724.19	25,610.46	134.2	6.12%	-1.95%	1.67%	4.38%	-3.56%	-10.45%	
2017-08-31	13521.03	26,379.70	135.4	-1.48%	3.00%	0.89%	-2.35%	2.09%	-11.58%	
2017-09-29	13351.99	27,254.22	135.2	-1.25%	3.32%	-0.15%	-1.10%	3.47%	-12.90%	
2017-10-31	14108.55	26,767.58	136.1	5.67%	-1.79%	0.67%	4.97%	-2.44%	-14.65%	
2017-11-30	13966.58	26,742.57	137.6	-1.01%	-0.09%	1.10%	-2.09%	-1.18%	-12.13%	
2017-12-29	14381.92	26,069.52	137.2	2.97%	-2.52%	-0.29%	3.27%	-2.23%	-10.42%	
2018-01-31	15065.82	27,249.53	136.9	4.76%	4.53%	-0.22%	4.98%	4.76%	-8.99%	
2018-02-28	14358.71	27,600.24	136.4	-4.69%	1.29%	-0.37%	-4.34%	1.66%	-10.75%	
2018-03-30	13865.57	27,698.05	136.5	-3.43%	0.35%	0.07%	-3.51%	0.28%	-15.05%	
2018-04-30	14723.32	28,205.20	137.1	6.19%	1.83%	0.44%	5.72%	1.39%	-12.41%	
2018-05-31	14750.26	28,294.14	137.8	0.18%	0.32%	0.51%	-0.33%	-0.19%	-12.40%	
2018-06-29	14753.91	27,937.55	138.5	0.02%	-1.26%	0.51%	-0.48%	-1.76%	-13.08%	
2018-07-31	15672.47	27,345.60	139.8	6.23%	-2.12%	0.94%	5.24%	-3.03%	-15.01%	
2018-08-31	16143.51	26,892.33	140.4	3.01%	-1.66%	0.43%	2.57%	-2.08%	-16.77%	
2018-09-28	15114.08	27,809.47	140.2	-6.38%	3.41%	-0.14%	-6.24%	3.56%	-20.38%	
2018-10-31	14377.38	28,768.13	140.7	-4.87%	3.45%	0.36%	-5.21%	3.08%	-23.58%	
2018-11-30	15059.37	28,154.66	140.8	4.74%	-2.13%	0.07%	4.67%	-2.20%	-28.63%	
2018-12-31	15048.98	28,466.89	140.1	-0.07%	1.11%	-0.50%	0.43%	1.61%	-29.08%	
2019-01-31	15012.34	29,382.37	139.6	-0.24%	3.22%	-0.36%	0.11%	3.59%	-26.23%	
2019-02-28	14979.39	30,205.09	139.9	-0.22%	2.80%	0.21%	-0.43%	2.58%	-8.84%	
2019-03-29	16146.11	29,075.49	140.4	7.79%	-3.74%	0.36%	7.40%	-4.08%	-22.54%	
2019-04-30	16318.66	28,703.29	141.2	1.07%	-1.28%	0.57%	0.50%	-1.84%	-22.64%	
2019-05-31	16583.46	28,822.07	142	1.62%	0.41%	0.57%	1.05%	-0.15%	-22.71%	
2019-06-28	16433.85	30,325.09	142.9	-0.90%	5.21%	0.63%	-1.53%	4.55%	-24.95%	
2019-07-31	15539.43	31,235.31	144.2	-5.44%	3.00%	0.91%	-6.30%	2.07%	-29.45%	
2019-08-30	15440.47	34,294.13	145	-0.64%	9.79%	0.55%	-1.19%	9.19%	-29.81%	
2019-09-30	16072.5	34,672.49	145.8	4.09%	1.10%	0.55%	3.52%	0.55%	-30.02%	
2019-10-31	16667.29	34,130.96	147.2	3.70%	-1.56%	0.96%	2.71%	-2.50%	-33.21%	
2019-11-29	16917.89	33,788.65	148.6	1.50%	-1.00%	0.95%	0.55%	-1.94%	-35.04%	
2019-12-31	17077.06	33,763.09	150.4	0.94%	-0.08%	1.21%	-0.27%	-1.27%	-40.43%	
2020-01-31	15726.92	35,758.01	150.2	-7.91%	5.91%	-0.13%	-7.78%	6.05%	-56.20%	
2020-02-28	14723.15	36,737.91	149.1	-6.38%	2.74%	-0.73%	-5.69%	3.50%	-59.31%	
2020-03-31	8745.45	38,170.56	148.6	-40.60%	3.90%	-0.34%	-40.40%	4.25%	-45.08%	
2020-04-30	10131.95	41,218.67	151.4	15.85%	7.99%	1.88%	13.71%	5.99%	-33.10%	
2020-05-29	9972.15	41,759.98	150.9	-1.58%	1.31%	-0.33%	-1.25%	1.65%	-32.34%	
2020-06-30	10737.55	42,176.63	151.8	7.68%	1.00%	0.60%	7.04%	0.40%	-32.45%	
2020-07-31	11544.75	44,399.86	153.9	7.52%	5.27%	1.38%	6.05%	3.83%	-28.44%	
2020-08-31	11902.9	47,245.33	154.7	3.10%	6.41%	0.52%	2.57%	5.86%	-25.91%	
2020-09-30	11691.05	45,429.24	156.4	-1.78%	-3.84%	1.10%	-2.85%	-4.89%	-23.01%	
2020-10-30	12187.55	44,944.49	158.4	4.25%	-1.07%	1.28%	2.93%	-2.32%	-22.32%	

2020-11-30	13506.6	44,460.06	158.9	10.82%	-1.08%	0.32%	10.47%	-1.39%	-24.92%	
2020-12-31	14582.45	43,956.08	157.3	7.97%	-1.13%	-1.01%	9.06%	-0.13%	-24.91%	
2021-01-29	14233.05	43,887.88	156.3	-2.40%	-0.16%	-0.64%	-1.77%	0.48%	-27.28%	
2021-02-26	15314.15	42,328.55	156.6	7.60%	-3.55%	0.19%	7.39%	-3.74%	-29.47%	
2021-03-31	15263.85	40,224.97	156.8	-0.33%	-4.97%	0.13%	-0.46%	-5.09%	-28.07%	
2021-04-30	15193.3	42,264.92	157.8	-0.46%	5.07%	0.64%	-1.09%	4.41%	-28.60%	
2021-05-31	16081	43,611.89	160.4	5.84%	3.19%	1.65%	4.13%	1.51%	-28.32%	
2021-06-30	16334.35	43,397.84	161.3	1.58%	-0.49%	0.56%	1.01%	-1.05%	-28.75%	
2021-07-30	16285.4	43,309.02	162.5	-0.30%	-0.20%	0.74%	-1.04%	-0.94%	-27.14%	
2021-08-31	17737.45	42,526.66	162.9	8.92%	-1.81%	0.25%	8.65%	-2.05%	-28.54%	
2021-09-30	18178.1	42,070.29	163.2	2.48%	-1.07%	0.18%	2.30%	-1.25%	-27.50%	
2021-10-29	18241.65	42,825.12	165.5	0.35%	1.79%	1.41%	-1.04%	0.38%	-26.45%	
2021-11-30	17549.95	43,589.11	166.7	-3.79%	1.78%	0.73%	-4.48%	1.05%	-25.61%	
2021-12-31	17995.1	43,361.26	166.2	2.54%	-0.52%	-0.30%	2.84%	-0.22%	-25.81%	
2022-01-31	18061.05	43,458.67	165.7	0.37%	0.22%	-0.30%	0.67%	0.53%	-25.99%	
2022-02-28	17294.5	44,744.30	166.1	-4.24%	2.96%	0.24%	-4.47%	2.71%	-26.69%	
2022-03-31	18041.4	47,725.01	167.7	4.32%	6.66%	0.96%	3.32%	5.64%	-21.92%	
2022-04-29	17720.55	47,363.91	170.1	-1.78%	-0.76%	1.43%	-3.16%	-2.16%	-20.69%	
2022-05-31	17222.15	45,956.71	171.7	-2.81%	-2.97%	0.94%	-3.72%	-3.88%	-18.22%	
2022-06-30	16400.95	46,070.70	172.6	-4.77%	0.25%	0.52%	-5.26%	-0.27%	-17.34%	
2022-07-29	17816.1	44,419.01	173.4	8.63%	-3.59%	0.46%	8.13%	-4.03%	-19.53%	
2022-08-31	18416.75	45,142.14	174.3	3.37%	1.63%	0.52%	2.84%	1.10%	-19.96%	
2022-09-30	17736.95	43,424.24	175.3	-3.69%	-3.81%	0.57%	-4.24%	-4.35%	-17.29%	
2022-10-31	18720.85	44,055.41	176.7	5.55%	1.45%	0.80%	4.71%	0.65%	-16.51%	
2022-11-30	19659.5	45,315.80	176.5	5.01%	2.86%	-0.11%	5.13%	2.98%	-15.02%	
2022-12-30	18918.7	47,626.09	175.7	-3.77%	5.10%	-0.45%	-3.33%	5.58%	-16.50%	
2023-01-31	18333.3	49,879.85	176.5	-3.09%	4.73%	0.46%	-3.53%	4.26%	-13.91%	
2023-02-28	17896.75	49,269.61	176.8	-2.38%	-1.22%	0.17%	-2.55%	-1.39%	-11.56%	
2023-03-31	17927.85	50,588.42	177.2	0.17%	2.68%	0.23%	-0.05%	2.44%	8.90%	
2023-04-28	18705.4	52,708.15	178.1	4.34%	4.19%	0.51%	3.81%	3.66%	-2.86%	
2023-05-31	19190.15	52,682.02	179.1	2.59%	-0.05%	0.56%	2.02%	-0.61%	-2.21%	
2023-06-30	19811.35	51,323.05	181	3.24%	-2.58%	1.06%	2.15%	-3.60%	-3.12%	
2023-07-31	20211.5	51,477.16	186.3	2.02%	0.30%	2.93%	-0.88%	-2.55%	-6.06%	
2023-08-31	19890.15	51,124.29	186.2	-1.59%	-0.69%	-0.05%	-1.54%	-0.63%	-8.21%	
2023-09-29	20091.2	51,184.27	184.1	1.01%	0.12%	-1.13%	2.16%	1.26%	-12.68%	
2023-10-31	19655.2	51,168.78	185.3	-2.17%	-0.03%	0.65%	-2.80%	-0.68%	-11.09%	
2023-11-30	20774.2	53,147.91	186.3	5.69%	3.87%	0.54%	5.13%	3.31%	-4.70%	
2023-12-29	22468.9	54,321.62	185.7	8.16%	2.21%	-0.32%	8.51%	2.54%	0.50%	
2024-01-31	22416.7	54,339.33	185.5	-0.23%	0.03%	-0.11%	-0.12%	0.14%	0.72%	
2024-02-29	22869.75	53,954.13	185.8	2.02%	-0.71%	0.16%	1.86%	-0.87%	7.48%	
2024-03-29	23101.95	57,603.58	185.8	1.02%	6.76%	0.00%	1.02%	6.76%	6.10%	
2024-04-30	23205.15	62,629.99	186.7	0.45%	8.73%	0.48%	-0.04%	8.20%	5.93%	
2024-05-31	23380.05	63,041.58	187.7	0.75%	0.66%	0.54%	0.22%	0.12%	5.33%	

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2024-06-28	24809.95	62,416.40	190.2	6.12%	-0.99%	1.33%	4.72%	-2.29%	2.47%	
2024-07-31	24534.8	64,351.32	193	-1.11%	3.10%	1.47%	-2.54%	1.60%	1.00%	
2024-08-30	24963.85	66,558.27	193	1.75%	3.43%	0.00%	1.75%	3.43%	7.66%	
2024-09-30	24402.05	69,147.97	194.2	-2.25%	3.89%	0.62%	-2.85%	3.25%	6.56%	
2024-10-31	25188.4	72,669.67	196.8	3.22%	5.09%	1.34%	1.86%	3.70%	7.25%	
2024-11-29	25607.75	71,893.32	196.5	1.66%	-1.07%	-0.15%	1.82%	-0.92%	6.83%	
2024-12-31	25787.25	72,192.61	195.4	0.70%	0.42%	-0.56%	1.27%	0.98%	7.58%	
2025-01-31	25487.8	75,182.50	193.4	-1.16%	4.14%	-1.02%	-0.14%	5.22%	6.63%	
2025-02-28	25785.45	81,017.94	192.5	1.17%	7.76%	-0.47%	1.64%	8.27%	10.00%	
2025-03-31	25,658.60	82,977.30	192	-0.49%	2.42%	-0.26%	-0.23%	2.69%	7.03%	