

An Analysis of Market Circulation and Pricing Mechanism of Gold under Its Safe-Haven Attribute

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Abstract. As a traditional safe-haven metal, gold boasts multi-dimensional attributes as a commodity, financial asset and currency. Amid drastic fluctuations in the global economy and outbreaks of geopolitical conflicts, gold frequently serves as a critical value anchor for risk hedging. Centered on gold's financial characteristics, this paper systematically dissects the global circulation system and operational model of gold. It analyzes the underlying logic of gold price volatility from four perspectives: supply, demand, macro-financial conditions and market sentiment. Against the current backdrop of de-dollarization, persistent central bank gold purchases and the restructuring of global safe assets, this study further explores the inherent correlation between gold circulation patterns and price formation. This research distinguishes the operational disparities between physical gold circulation and financialized gold circulation, reveals how central bank reserve demand, geopolitical risks and shifts in US dollar credit reshape gold prices, and identifies the latent risks accompanying gold's function as a safe-haven currency. The paper concludes that gold circulation and pricing interact bidirectionally: circulation frameworks define the gold pricing mechanism, while price swings in turn reshape the structure of gold circulation.

Keywords: Gold Circulation, Safe-Haven Currency, Gold Pricing Mechanism

1. Introduction

Endowed with scarcity, durability and divisibility, gold has long stood out as a special precious metal since ancient times. It acts as the most prevalent safe-haven asset in human history and a regular policy instrument for governments to regulate macroeconomies. Against the backdrop of intensifying turbulence in global financial markets, frequent geopolitical conflicts, mounting US sovereign debt and eroding US dollar credit, the de-dollarization drive keeps advancing. Central banks worldwide are cutting holdings of US Treasury bonds and ramping up gold reserves, triggering structural shifts in the landscape of global safe assets. Meanwhile, gold has gradually shifted its dominant attribute from monetary to financial. Market transactions have evolved from traditional physical trading to financial derivatives including spot gold, futures and ETFs [1]. This transformation greatly boosts gold liquidity and fundamentally rewrites the formation mechanism of gold prices.

The conventional gold pricing framework centered on real interest rates and the US Dollar Index, established after the Bretton Woods System, often loses explanatory power nowadays. Gold prices

frequently move against real interest rates, meaning traditional indicators alone cannot fully account for gold price volatility. Under such circumstances, this study reorganizes the operating rules of the global gold circulation system and delves deep into the underlying logic of gold price formation.

Existing literature mostly investigates gold pricing determinants or central bank reserve activities in isolation, with few studies integrating circulation and pricing into a unified analytical framework. Centered on gold's safe-haven attribute, this paper integrates features of physical gold circulation and financialized gold circulation, combines classic pricing theories with contemporary trends of de-dollarization and restructuring of safe assets, and improves a theoretical framework of "Circulation – Pricing – Safe-Haven Function" for gold. It fills research gaps caused by single-perspective analysis.

2. Attribute positioning of gold and the inherent logic of its safe-haven function

2.1. The triple attributes of gold

Distinct from ordinary non-ferrous metals, gold mining and utilization run through the entire course of human civilization. Thanks to its scarce endowment and superior physical and chemical properties, gold ranks first among the five classic metals and earns the title "King of Metals". Its unique characteristics enable wide applications in jewelry manufacturing, private collection, national reserve and international monetary settlement. As global economic regimes and the international monetary system undergo continuous transformations, gold's economic positioning keeps evolving. Shaped by its innate physical traits and institutional evolution over time, gold possesses three core attributes: commodity attribute, monetary attribute and financial attribute. The commodity attribute is intrinsic to gold, while monetary and financial attributes distinguish gold from general bulk commodities [1].

2.1.1. Commodity attribute

Gold's commodity attribute is a direct reflection of its natural properties. With outstanding ductility and corrosion resistance as well as stable physicochemical characteristics, gold forms a complete industrial chain covering gold deposit exploration, mining and smelting, deep processing and terminal sales, serving as a special raw material for industrial and consumer sectors. From the demand side, commodity-driven gold demand falls into two categories: jewelry gold and industrial gold. Jewelry gold is mostly processed into ornaments, whose demand is driven by marriage customs, holiday consumption and household disposable income. Industrial gold is widely adopted in high-end sectors, including electronic components, aerospace and dental treatment. Commodity demand underpins the base scale of physical gold circulation, yet constrained by cyclical consumption patterns, it only triggers short-term disturbances to gold prices and fails to dominate long-term price trends.

2.1.2. Monetary attribute

Gold's permanent value retention and indestructible physical features constitute its exclusive monetary attribute, which is the core foundation for academic research on gold's safe-haven logic. Gold has functioned as a universal equivalent and performed monetary functions for over three thousand years, serving as a longstanding yardstick for commodity value and playing an irreplaceable role in the history of global currency. Following the collapse of the Bretton Woods System and the decoupling of gold from the US dollar, gold ceased to circulate as legal tender but

never withdrew from the global monetary system. Amid ongoing de-dollarization, reshuffling of global safe assets and escalating geopolitical tensions, gold's monetary value is witnessing a steady revival.

On one hand, confronted with sliding US dollar credit and frequent Western financial sanctions, central banks across the globe continuously expand gold reserves to optimize reserve portfolios and hedge systemic risks arising from declining safety of US Treasury assets [2]. On the other hand, beyond the four major settlement currencies (US dollar, Euro, Japanese Yen and British Pound), gold remains the internationally recognized fifth hard currency. Even after the IMF launched Special Drawing Rights (SDRs), cross-border settlement via SDRs remains limited. Gold still acts as a vital international liquidation asset under extreme market conditions, and its monetary functions have not faded away.

2.1.3. Financial attribute

Gold's financial attribute emerged after the demonetization of gold and serves as an intermediate carrier linking its commodity and monetary attributes. During decades of rapid expansion of credit currencies, gold has built an independent and sophisticated global trading system and become a standardized investment vehicle operating under the rules of financial markets. In environments marked by global economic swings, recurring geopolitical frictions and soaring inflation, equities, bonds and foreign currency assets face heightened depreciation risks, while the US dollar loses stability and foreign exchange assets carry mounting uncertainty. Benefiting from its value-preserving and risk-hedging strengths, gold has become a popular investment instrument [2].

Current gold investment products mainly consist of spot gold, paper gold and gold derivatives [3], accompanied by maturing gold investment institutions and supporting service systems. As de-dollarization advances and strategic central bank gold purchases normalize, gold investment demand expands steadily, and its financial attribute will exert an increasingly prominent influence on pricing and market circulation.

2.2. Underlying logic of gold's safe-haven value

Gold's safe-haven function fundamentally stems from three core features: zero credit risk, rigid supply and stable intrinsic value. Compared with sovereign credit assets such as the US dollar and US Treasury bonds, gold cannot be frozen nor diluted by national debt. It preserves household wealth amid geopolitical conflicts, financial crises, hyperinflation and collapses of currency credit. Particularly under the contemporary context of weakened safety of global safe assets and weaponization of the US dollar, gold has evolved from a periodic hedging tool into a strategic value anchor amid the restructuring of the international monetary system.

Studies adopting DCC-GARCH and time-varying T-Copula models verify that major crisis events strengthen the twofold hedging linkage of gold. After the subprime mortgage crisis, gold's capacity to hedge inflation and exchange rate risks has converged, highlighting the adage "Buy gold amid turmoil" and driving continuous expansion of gold investment demand in recent years. Alongside diversification of global reserve portfolios, the scale of gold financial investment keeps growing, and the weighting of its safe-haven attribute in price formation rises persistently [4].

3. The global circulation system of gold

3.1. Supply side

Global gold supply primarily consists of mine production, recycled gold and central bank gold sales/purchases, featuring low overall supply elasticity.

First, mine production represents the core primary supply of the market. Gold deposit exploration and mine construction span multiple years. Restricted by mineral reserves, extraction costs and environmental regulations, annual mine output maintains mild steady growth and cannot ramp up rapidly following short-term gold price surges, forming the foundation of supply rigidity.

Second, recycled gold originates from recovered old jewelry, industrial scraps and melted obsolete gold devices, with extremely high price sensitivity. Sharp rallies in gold prices boost selling willingness among households and enterprises, increasing recycled gold supply to temporarily replenish market liquidity and curb excessive price hikes.

Third, central bank gold sales once served as a critical supplementary supply source. Massive centralized gold dumping by numerous central banks at the end of the 20th century created temporary supply surpluses [5]. However, amid the de-dollarization wave and reshaping of global safe asset allocation, central banks have shifted from net sellers to regular net buyers. Central banks have transformed from periodic suppliers into long-term demand drivers, and the market disturbance caused by official gold sales has diminished drastically [2].

3.2. Circulation channels

Two parallel circulation channels for gold have taken shape: physical circulation and financialized circulation. Capital and physical gold convert mutually between the two channels to form an all-dimensional circulation ecosystem.

3.2.1. Physical circulation

Physical delivery is completed via gold enterprises, jewelry manufacturers, commercial banks and offline gold retailers, corresponding to the flow of jewelry, investment bullion and industrial gold. Physical gold flows from mining and smelting enterprises to end consumers, industrial manufacturers and private collectors, with transactions settled through physical spot markets and strongly affected by consumption peak and off-peak seasons.

3.2.2. Financialized circulation

Supported by London OTC spot market, COMEX gold futures, SHFE domestic gold futures and gold ETFs, most transactions settle without physical delivery and only transfer ownership of gold, with capital circulating across diverse financial products [6]. At present, trading volume in financial gold products far exceeds physical gold turnover, serving as the primary driver of short-term gold circulation and instantly transmitting global cross-market information.

3.3. Market participants

Gold market participants form a three-tier structure: retail investors, institutional investors and global central banks.

Retail investors participate through regular bank gold investment plans, physical gold purchases and small-lot gold ETF subscriptions, prioritizing asset preservation with scattered capital pools.

Institutional participants include public funds, hedge funds, mining conglomerates, jewelry groups and major market makers, commanding enormous capital volumes. They deploy derivatives for hedging to lock in costs and conduct trend investment based on macroeconomic forecasting.

Global central banks act as strategic allocators, purchasing gold to diversify foreign exchange reserves and mitigate risks tied to US dollar assets and geopolitical tensions. Central bank transactions mostly take the form of large-scale quiet OTC trades to avoid disrupting short-term market volatility [2].

Trading behaviors of the three participant groups jointly determine the volume and flow direction of gold circulation across different market cycles.

3.4. Core characteristics of gold circulation

First, diversified demand entities: central banks, institutional investors and retail investors constitute the main demand pillars with differentiated allocation preferences. Central banks focus on long-term strategic reserves, institutions pursue band trading and portfolio allocation, while retail investors conduct scattered value-preserving purchases, forming tiered demand streams.

Second, prominent supply rigidity: growth of mine output is capped with fixed short-term supply ceilings; only recycled gold adjusts flexibly with price swings, making aggregate supply incapable of rapid expansion to match demand spikes.

Third, financialization dominates circulation: the vast majority of global gold trading volume concentrates on derivatives and ETFs, while physical circulation accounts for a minor share of total turnover. Capital inflows and outflows in financial markets constitute the key factor reshaping short-term gold circulation patterns.

4. Core logic of gold price volatility

4.1. Supply side

Moderate changes in aggregate supply fail to drive major gold price swings. Annual mine output remains stable with slow release of new production capacity, establishing a long-term cost floor for gold. Recycled gold supply only expands when gold prices surge, acting as a short-term buffer against price appreciation. Central banks have shifted from selling to purchasing gold and no longer release reserve stock into circulation. In summary, supply evolves gradually, merely setting the long-term cost base of gold and exerting limited influence on short-term price fluctuations.

4.2. Demand side

Demand acts as the primary driver of gold price movements, with retail, institutional and central bank demand shaping short-term, medium-term and long-term market trends respectively.

4.2.1. Retail investors

Retail gold allocation is driven by inflation expectations and wealth management market conditions. Rising inflation and declining returns of wealth management products boost purchases of physical gold and small-lot ETFs, generating fragmented incremental demand that triggers mild periodic price rallies.

4.2.2. Institutional investors

Hedge funds and asset management institutions adjust gold holdings responding to shifts in the US dollar and real interest rates. When the Federal Reserve shifts to tightening monetary policy or risk assets slump globally, institutions sharply increase gold positions and trigger rapid short-term gold price volatility, serving as the major catalyst for medium-and-short-term price trends.

4.2.3. Central banks

Amid sustained de-dollarization, declining safety of US Treasury bonds and normalized international financial sanctions, central banks worldwide launch persistent strategic gold purchasing programs [2]. Central bank gold buying targets long-term reserve diversification rather than short-term speculative gains, rendering official purchases insensitive to gold price fluctuations. Even during Fed hiking cycles with rising real interest rates, central banks maintain steady gold accumulation. This rigid official demand breaks the historical pricing rule dominated by real interest rates and explains the counter-intuitive rally of gold prices amid high interest rates in recent years, forming the core long-term support for gold valuation [7].

4.3. Traditional pricing factors

The US dollar, as the global invoicing currency for gold, maintains a long-term negative correlation with gold prices: a stronger US dollar suppresses dollar-denominated international gold prices, while a weaker dollar lifts global gold purchasing demand. Real interest rates serve as the classic anchor for gold pricing: falling real interest rates reduce the opportunity cost of holding non-interest-bearing gold and support price appreciation. Contractionary Fed policies including rate hikes and balance sheet shrinkage, historically lift real interest rates and weigh on gold prices. Nevertheless, in the new era of large-scale official reserve accumulation, the explanatory power of these three traditional pricing factors has weakened, and divergences between indicator trends and gold prices emerge frequently.

4.4. Market sentiment (geopolitical conflicts, massive capital inflows and outflows in futures markets)

Sudden events such as geopolitical clashes, regional wars and global financial crises rapidly escalate market risk aversion [8], triggering two types of price movements:

Short-term impulse rallies: Outbreaks of localized conflicts (e.g., short-term military confrontations between the US and Iran in 2026) drive massive inflows of risk-averse capital into gold, with concentrated long positioning in COMEX futures pushing gold prices to surge intraday. If tensions ease rapidly, speculative capital takes profits and exits the market, triggering short-term price corrections.

Medium-and-long-term structural appreciation: Protracted deadlocks such as the Russia-Ukraine conflict and prolonged tensions in the Middle East fuel skyrocketing energy prices and global stagflation expectations, locking risk-averse capital into gold with sustained net long positioning in futures markets, generating multi-month bull runs. Gold prices surged over 25% within 2022 following the eruption of the Russia-Ukraine conflict.

A special transmission mechanism exists: escalated conflicts may push crude oil prices higher and amplify global inflation expectations, forcing central banks to sustain high interest rates and

temporarily suppress gold prices (e.g., Middle East tensions in June 2026 drove oil prices up, market expectations of continued hawkish Fed policy triggered short-term gold price declines). This forms a reverse transmission path where geopolitical events temporarily weigh on gold prices, yet long-term central bank purchases and hedging allocation underpin gold valuations over extended horizons. Meanwhile, large-scale shifts between long and short positions in futures markets amplify intraday price swings significantly, acting as critical catalysts for sharp short-term spikes and slumps in gold prices.

5. Inherent linkages between gold circulation and price volatility

5.1. Gold prices shaped by circulation pathways

When physical circulation is constrained by geopolitical shipping disruptions and cross-border capital controls, regional physical gold shortages push spot premiums higher and lift international benchmark gold prices. Rising financialized circulation share enables instantaneous transmission of geopolitical news to gold prices via capital flows, drastically improving the sensitivity of gold prices to market information. Sustained physical gold absorption by central banks worldwide shrinks circulating physical gold stock and lifts gold's long-term valuation from fundamental supply-demand dynamics.

5.2. Reverse impacts of gold price movements on circulation pathways

During gold price surges driven by geopolitical risk aversion, an expanded recycled gold supply replenishes physical circulation. However, elevated gold prices curb jewelry consumption, diverting massive capital from physical gold to financial instruments such as ETFs and futures. During periodic gold price corrections, central banks and retail investors conduct concentrated bargain-hunting purchases, while recycled gold supply shrinks. Capital flows back from speculative financial markets to physical gold circulation. Coupled with cross-border repatriation of national gold reserves initiated by multiple economies, the direction of global cross-border gold circulation shifts correspondingly.

6. Conclusion

Gold circulation has undergone three evolutionary phases: physical circulation, monetary circulation and financialized circulation, forming the current circulation landscape characterized by three-tier demand (central banks, institutions, retail investors), rigid supply and dominant financial trading. Gold prices are jointly determined by supply fundamentals, tiered demand, traditional factors including the US dollar and real interest rates, and geopolitical market sentiment. Among all drivers, strategic central bank gold purchases constitute the pivotal variable reshaping classic gold pricing rules.

Overall, gold circulation and prices interact bidirectionally: continuous evolution of the circulation system remodels gold's pricing logic and valuation center, while gold price swings redistribute capital and physical gold across physical and financial circulation channels and adjust the overall market circulation structure. Against the long-term backdrop of de-dollarization, sustained central bank gold demand will consolidate gold's price floor, and the weighting of gold's monetary attribute in circulation and pricing will keep rising. This paper lacks quantitative mathematical modeling for gold pricing analysis, which will be supplemented in follow-up research.

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