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## **About the World Gold Council**

The World Gold Council is the market development organisation for the gold industry. Working within the investment, jewellery and technology sectors, as well as engaging in government affairs, our purpose is to provide industry leadership, whilst stimulating and sustaining demand for gold.

We develop gold-backed solutions, services and markets, based on true market insight. As a result, we create structural shifts in demand for gold across key market sectors.

We provide insights into the international gold markets, helping people to better understand the wealth preservation qualities of gold and its role in meeting the social and environmental needs of society.

Based in the UK, with operations in India, the Far East, Turkey, Europe and the USA, the World Gold Council is an association whose members include the world's leading and most forward thinking gold mining companies.

### **For more information**

Please contact Investment Research:

#### **Juan Carlos Artigas**

juancarlos.artigas@gold.org

+1 212 317 3826

#### **Eily Ong**

eily.ong@gold.org

+44 20 7826 4727

#### **Johan Palmberg**

johan.palmberg@gold.org

+44 20 7826 4773

#### **Louise Street**

louise.street@gold.org

+44 20 7826 4765

#### **Marcus Grubb**

Managing Director, Investment

marcus.grubb@gold.org

+44 20 7826 4724

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**Executive summary**

Commodity allocations have become more common among investors as a means by which portfolio diversification can be enhanced. Globally, commodity assets under management more than doubled between 2008 and 2010 to nearly US\$380bn.<sup>1</sup>

While gold is often considered by investors as part of a larger set of commodities, its weighting in most commodity indices is small. Within indices such as the S&P Goldman Sachs Commodity Index or the Dow Jones-UBS Commodity Index, for example, gold's weighting typically ranges between just 3% and 7%. So, while there is some exposure to gold when using one of these indices, are investors in wider commodity baskets harnessing gold's investment benefits to best effect?

In previous studies, the World Gold Council has shown that adding gold to a portfolio tends to increase risk-adjusted returns and protect performance.<sup>2</sup> In other words, by adding a gold allocation of between 2% and 10%, an investor can obtain a desired expected return while incurring less risk than an equivalent portfolio without gold.

In this study, we examine gold's role in the portfolio for diversified investors who may already have an allocation to commodities.

As a result, analysis conducted by the World Gold Council demonstrates that if part of a commodity allocation is directly assigned to gold, portfolio performance is not only improved, but the investor will also reduce the potential for loss in a portfolio, by decreasing so-called *Value at Risk* (VaR).<sup>3</sup>

An investor with an asset allocation similar to a simple benchmark portfolio (50% equities, 40% fixed income, 10% commodities) during 2008 would have reduced portfolio losses by between US\$200,000 to US\$400,000 on a US\$10mn investment by allocating 5% to 10% of the overall portfolio directly to gold. Furthermore, over the past 20 years, the same investor would have increased average annual portfolio gains by between US\$100,000 to US\$200,000 by directing a similar allocation to gold. These findings suggest that portfolio managers and investors who already have exposure to commodities in their portfolio stand to benefit from including gold as a separate strategic asset class, without compromising long-term returns.

To understand why gold works in this way, it is vital to discuss its truly global market. This begins with understanding the dynamics of the gold market: a market where the sources of demand and supply are diverse and complementary; where a ready, deep and liquid global market exists; and where gold is often viewed as an alternative monetary asset with no default risk.

We show that gold's physical attributes and functional characteristics set it apart from the rest of commodities. Gold is less exposed to swings in business cycles, typically exhibits lower volatility, and tends to be significantly more robust at times of financial duress. In turn, this causes gold's correlation to other commodities to be low.

Critically, our analysis shows that the effects of gold on a diversified portfolio cannot be replicated by a commodity basket alone – for gold is indeed a commodity like no other.

1 TheCityUK, *Commodities Trading*, March 2011.

2 World Gold Council, *Gold as a tactical inflation hedge and long-term strategic asset*, July 2009; and World Gold Council, *Gold: hedging against tail risk*, September 2010.

3 Conceptually, VaR is a measure of the maximum amount an investor could expect to lose in a given period of time, with a certain degree of confidence, in the case of an unlikely, yet possible, event occurring. In statistical terms, the VaR of a portfolio, at a given confidence level  $\alpha$ , between zero and one, is the minimum value such that the probability that any other loss exceeds that value is not greater than  $(1-\alpha)$  during a period of time. Equivalently, it is the maximum expected loss during a specified period of time whose probability is not greater than  $\alpha$ .

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**The golden touch: enhancing a commodity allocation**

Indices such as the S&P Goldman Sachs Commodity Index (S&P GSCI) or the Dow Jones-UBS Commodity Index (DJ-UBSCI) are widely used by investors as benchmarks for their commodity allocations. These indices represent a comprehensive sample of the most consumed, economically significant, liquid and highly traded commodities, and are based on passive investment strategies using primarily active futures contracts.<sup>4</sup>

The S&P GSCI is a production-weighted index which includes futures contracts to approximately 20 physical commodities and which is rebalanced at the end of each month.<sup>5</sup> Rebalancing is done to accommodate changes in production weights (which are based on five year averages of each commodity's world production) and the selection of the active futures contract on the corresponding commodity. Because the index is production-based, it tends to be heavily concentrated on the energy sector, which accounts for almost two-thirds of the index. Gold's weight in the index is usually around 3% as gold's mine production is relatively small, especially when compared with the production value of energy-related commodities. This tends to artificially produce an under-allocation to gold, as recycled gold provides an alternate source of supply.

As a less energy-heavy alternative, investors use the S&P Goldman Sachs Light Energy Commodity Index (S&P GSLE), which includes the same futures contracts as the S&P GSCI, but which has a much smaller exposure to oil and other energy-related commodities. In particular, the original energy weights are divided by a factor of four, while other commodity weights are proportionally increased to total one. In this case, gold has an approximate weighting of 7%.

Similarly, investors also employ the DJ-UBSCI which is designed as a liquid and diversified benchmark for commodities investment. It provides a broad-based exposure to commodities as an asset class, since no single commodity or commodity sector dominates the index.<sup>6</sup> To find the appropriate weights, it embodies four main principles: economic significance, diversification, continuity, and liquidity. It is rebalanced once a year, and liquidity has a 2:1 ratio relative to production. This gives gold an average weight within the index of around 6.5%. DJ-UBSCI's exposure to the energy sector is a more moderate average of about one-third.

Thus, while investors typically get some exposure to gold when using one of these indices as benchmarks, its total weighting is nonetheless small. For example, for an investor with a 10% overall allocation to commodities, the effective exposure to gold is as low as 0.3% using the S&P GSCI and only as high as 0.7% when using the S&P GSLE or DJ-UBSCI. Furthermore, if an investor only holds a 5% allocation to commodities based on a benchmark index, the effective gold exposure would be miniscule.

In previous studies, analysis performed by the World Gold Council has demonstrated that adding gold to a portfolio tends to increase risk-adjusted returns. In this study we focus on investors who may already have a predetermined allocation to commodities within their portfolio. The analysis shows that if part of this allocation is directly assigned to gold, the portfolio performance is not only optimal in the sense of producing better risk-adjusted returns, but also by reducing the potential loss in a portfolio.

4 While many investors consider that active strategies in commodities, which take advantage of the shape of the futures curve and other factors, can outperform passive strategies, for the purpose of this report, we adopt the view that available benchmarks are valid proxies for long-term commodity performance.

5 While non-financial (physical) commodities are required, the index uses the futures markets as means to access the market. The number of commodities included varies depending on the eligibility of available contracts. Standard & Poor's, *S&P GSCI Index Methodology*, 2011 Edition.

6 Dow Jones-UBS, *The Dow Jones-UBS Commodity Index Handbook*, June 2010.

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**Table of Contents****Optimal portfolios**

To find optimal weightings to gold and other commodities we concentrate on a simple portfolio with a similar composition to a typical benchmark allocation; this reduces the sources of variation and simplifies the analysis. In this instance, we chose a 50% allocation to equities, given by a 30% weight to the MSCI US Equity Index and a 20% weight to the MSCI ex-US Equity Index; a 40% fixed income (including a 1% allocation to cash), given by the Barclays Capital Aggregate Index and Global Cash Index, respectively; and finally, a pre-determined 10% allocation to commodities and/or gold. We use the S&P GSLE as it is the index with the greatest diversification within the different commodity sectors, but with a longer data history relative to the DJ-UBSCI. Subsequently, we use an optimiser to find the appropriate weight between a commodity index and gold. To find the optimal weights we use Resampled Efficiency (RE) optimisation developed by Michaud and Michaud.<sup>7</sup>

These weights were based on *projected* long-term real returns, consistent with previous research notes, to remove a potential period bias, and volatility and correlation estimates based on weekly returns for the past 20 years, from January 1991 to December 2010 (Table 1). The period selection is based on data availability as well as ensuring sufficient historical data to include more than one business cycle.

Starting from a possible maximum allocation to commodities and/or gold, we find that the optimal strategic allocation to gold can be as high as 9.5% to the overall portfolio for more risk-averse investors (leaving a 0.5% to other commodities) or a moderate 4.5% (5.5% to other commodities) for those willing to take on more risk. Moreover, the optimisation results find that adding gold to a portfolio tends always to be beneficial, while a zero allocation, based on the parameters used, is never optimal, even if the investor already holds a diversified commodity basket in its portfolio.

**Table 1: Projected returns and volatilities used during portfolio optimisation<sup>1</sup>**

	<b>Return (%)</b>	<b>Volatility (%)</b>	<b>Information ratio<sup>2</sup></b>
Gold (US\$/oz)	2.0	15.6	0.13
JP Morgan 3-month T-Bill Index	0.0	1.0	0.00
BarCap US Treasury Aggregate	4.0	4.0	1.00
MSCI US Equity Index	8.0	17.2	0.46
MSCI ex US Equity Index	8.0	17.8	0.45
S&P Goldman Sachs Light Energy Index	2.0	15.3	0.13

1 Returns based on widely used long-term expectations; volatility computed using weekly returns between January 1991 and December 2010.

2 Ratio of return and volatility, also known as avg. risk-adjusted return (a higher number indicates a better return per unit of risk).

Source: Barclays Capital, JP Morgan, Standard & Poor's, MSCI, World Gold Council

7 Michaud and Michaud, *Efficiency Asset Management: a practical guide to stock and portfolio optimisation and asset allocation*, 2008, Second edition, Oxford Press, New York.

**Table of Contents****A history lesson:  
gold at the core of a portfolio**

While past performance does not guarantee a future result, one can use the analysis of different periods to understand the advantages of using gold as an integral part of a portfolio.

When looking at the performance over the past 20 years of various assets typically held by an investor, one notes the importance of having a well-diversified portfolio and the difficulty in achieving it. Diversification typically increases risk-adjusted returns and reduces exposure to extreme losses. This analysis shows that adding an allocation to gold in addition to an allocation to a commodities basket generally produced not only larger average annual returns but a higher information ratio (return per unit of risk) as well, and perhaps more importantly, reduced the losses experienced during economic downturns and decreased the VaR of a portfolio (Table 2).

We conclude that portfolio managers and investors who already have an exposure to commodities in their portfolio may benefit from including gold as a separate strategic asset class without compromising long-term returns.

Moreover, the inclusion of gold provides additional liquidity and allows for a more effective risk management strategy. Indeed, since the recent financial crisis that began to unfold in 2007, many investors and money managers (including even central bank reserve asset managers) are increasing their attention to risk management strategies, prompted in part by the increased frequency with which tail risks, previously considered unlikely, seem to be happening. This shift away from strategies that solely focus on return has no doubt proven an important catalyst for the rediscovery of gold as a viable and effective risk management tool and a foundation asset.

But, why is it that gold enhances portfolio performance in such a unique and robust manner? It is not the product of a single factor but the combination of gold's many features, characteristics and market dynamics that make it such a unique asset.

**Table 2: Performance for assets and portfolios containing various allocations to gold<sup>1</sup>**

	Gold (US\$/oz)	MSCI US	MSCI ex US	BarCap US Agg	JPM 3M Tbill	S&P GSCI Light	Portfolio <sup>2</sup>		
							0% gold	5% gold	10% gold
<b>January 1991 to December</b>									
<b>2010</b>									
Return	6.8	7.1	4.1	6.9	4.3	3.2	6.0	6.1	6.3
Volatility	15.6	17.2	17.8	3.9	0.3	15.3	8.9	8.6	8.5
Inf. ratio	0.43	0.41	0.23	1.74	13.23	0.21	0.67	0.71	0.74
5% VaR	3.39	3.74	3.53	0.85	0.01	3.09	1.67	1.65	1.67
<b>2008</b>									
Return	4.1	-36.5	-43.3	4.9	4.1	-37.7	-24.3	-22.3	-20.3
Volatility	31.3	34.9	39.6	5.6	0.5	36.9	20.5	19.4	18.4
Inf. ratio	0.13	-1.05	-1.09	0.87	8.28	-1.02	-1.19	-1.15	-1.10
5% VaR	7.96	7.88	9.27	1.15	0.03	10.38	5.17	4.77	4.26
<b>2009</b>									
Return	29.6	30.7	34.6	6.3	1.4	24.3	20.4	20.6	20.9
Volatility	18.4	25.4	26.6	4.0	0.1	22.0	13.6	12.9	12.3
Inf. ratio	1.61	1.21	1.30	1.59	10.32	1.11	1.50	1.60	1.70
5% VaR	3.17	4.90	7.43	0.88	0.01	4.49	2.75	2.54	2.64
<b>2010</b>									
Return	29.5	13.2	6.2	6.5	0.5	17.1	9.4	9.9	10.5
Volatility	14.4	17.4	19.9	3.0	0.0	18.6	10.2	9.8	9.4
Inf. ratio	2.04	0.76	0.31	2.22	9.13	0.92	0.92	1.01	1.11
5% VaR	3.16	4.08	4.32	0.53	0.00	3.78	2.31	2.24	2.26

1 Calculations are based on weekly total returns and converted to annualised return and volatility when applicable.

- 2 Portfolio using a 30% allocation to US equities, 20% to international equities, 39% to fixed income, 1% to cash and various allocations to gold and commodity indices. A 0% gold allocation is equivalent to a 10% allocation to the S&P GSLE; 5% in gold implies 5% in S&P GSLE; and a 10% gold weight implies a 0% allocation to S&P GSLE.

Source: Standard & Poor's, MSCI, Barclays Capital, JP Morgan, World Gold Council

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**Gold’s essence:  
a distinct behaviour**

There are a number of distinctive qualities that separate gold from the rest of the commodities complex, such as its role in central banks’ reserve asset management and the outstanding physical and chemical properties that make it ideal for use in technological applications. The combination of these and many other features cause gold to stand out from other commodities.

Gold is, in many ways, synonymous with luxury and wealth. Half of all gold in above-ground stocks still exists in the form of jewellery, yet it is also an important financial asset and is considered by many as a currency in its own right. It is proven as a store of wealth and an efficient diversifier of risk. Gold’s religious and cultural significance around the world make it a sought after good for reasons beyond direct financial worth. It also acts as a reliable and essential component used in a range of electronics, medical and dental applications and is continually proving its wider relevance as an innovative enabler to new technologies.

Gold is a scarce yet enduring element and the geographical diversity of mine production contributes to gold’s lower volatility relative to other commodities – this makes it less subject to geopolitical and other idiosyncratic risks, such as variations in weather due to climate patterns.

Moreover, the size, depth and liquidity of the gold market rank not only very high among other commodities but even when compared to other assets classes, including sovereign debt and individual stocks. It is the combination of these factors and gold’s ability to reduce credit and counterparty risk by which gold can add liquidity, increase diversification and preserve wealth even during times of economic duress or in the presence of systemic market risk.

**Demand and supply**

As with any other freely traded good, commodity prices are heavily influenced by the long-term dynamics of demand and supply, which are usually referred to as ‘fundamental drivers’. They can also be subject to short-term shocks from events such as geopolitical crises, weather and disease among others. Prices are also influenced, to a varying degree, by speculative positions in derivatives markets.

Broadly, commodities can be grouped into four categories: 1) *energy*, such as oil, natural gas, and coal; 2) *metals*, which include precious and base metals; 3) *agriculture*, such as grains; and 4) *livestock*, including cattle and hogs.<sup>8</sup>

Commodities other than gold also have desirable characteristics and, as important inputs to the global economy, are increasingly attractive as alternative sources of diversification for institutional and individual investors alike.

However, most commodities tend to be heavily exposed to one aspect or another of the economy and subject to idiosyncratic risks. For example, while oil’s global importance as a primary source of energy makes it a highly liquid commodity, the oil market is far more dependent on the business cycle than gold as oil is primarily used for industrial purposes. Similarly, oil production is geographically more concentrated in certain regions of the world; for example, more than 59% of proven reserves of oil are currently located in the Middle East.<sup>9</sup> Moreover, investors tend to access the oil market primarily via derivatives contracts which in turn increase their counterparty risk exposure.<sup>10</sup>

Not surprisingly, gold has more characteristics in common with other metals – in particular precious metals – than it does with any of the other categories. For example, beyond the obvious similarities of mine production, many metals can be reused or recycled for new fabrication, thus providing an additional source of supply. This is in stark contrast to energy, agricultural and livestock commodities which are spent, consumed, or transformed but are rarely recoverable. Metals also tend to have longer shelf lives and are less susceptible to adverse storage conditions than agricultural commodities. They can also be transported without the need for specialised infrastructures such as in the case of oil or natural gas.

8 This represents a simple categorisation of typically traded commodities, but is by no means comprehensive. Moreover, some commodities may fit within more than one category. For example, corn can be classified as an energy source, (as an input in biofuels) as well as an agricultural commodity.

9 World Fact Bank, July 2010.

10 *The Telegraph*, Oil price Q&A, May 2008.



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However, gold's similarity to other metals ends there. As Table 3 shows, the technology and industrial sectors account for a much larger portion of demand for most other metals, including silver. As such, these metals are more exposed to the business cycle. Moreover, gold is one of the densest elements, facilitating storage when compared to other metals such as copper; it is not only the most noble of metals (resistant to corrosion and oxidation), but also the most malleable and ductile known.<sup>11</sup> Because gold is nearly indestructible, all the gold that has ever been mined still exists in one form or another. Thus, recycled gold comprises a larger share of supply than for any other metal, allowing the market to absorb primary production shocks and shortages in a more effective way.

Production also constitutes a differentiating factor for the gold market. The production of many commodities, including some of the most actively traded ones, tend to be highly concentrated in particular regions of the world. For example, 47% of oil is produced in the Middle East and Eurasia, platinum primarily comes from South Africa (80%) and Russia (11%), the US is the largest source of corn production (39%), and even silver is mainly mined in Latin America. On the other hand, gold is more evenly distributed, with no single region accounting for more than 20% of production as of 2009 (Table 4). In turn, this diversification of production contributes to gold's lower volatility relative to other commodities, as it makes it less subject to geopolitical and other specific risks such as variations in weather due to climate patterns.

**Table 3: Demand and supply by source (%) for selected metals<sup>1</sup>**

Commodity	Demand			Supply		
	Jewellery	Investment/ bars and coins	Technology/ industry	Mine production	Recycling	Other sources
Gold	49%	41% <sup>2</sup>	10% <sup>3</sup>	60%	40%	
Silver	25% <sup>4</sup>	25%	50%	79%	19%	2%
Copper	2%	3%	95%	85%	15%	
Platinum	36%	9%	55%	88%	12%	

1 As of 2009 except for gold for which 2010 figures are available.

2 Includes net central bank activity which accounted for 2% of gold demand in 2010.

3 Primarily used in electronics and other high-end technology uses.

4 Includes silverware.

Source: GFMS, The Silver Institute, Johnson Matthey, US Geological Survey, International Copper Institute, World Gold Council

**Table 4: Production from primary sources by region (%) for selected commodities\***

Commodity	North	Latin	Europe	Eurasia	Middle	Africa	Asia	Oceania
	America	America			East			
Gold	14%	20%	2%	13%	1%	20%	19%	12%
Silver	9%	46%	9%	10%		2%	15%	9%
Copper	12%	53%	5%	8%	2%	6%	6%	7%
Platinum	6%	1%		12%		81%		
Oil	10%	12%	6%	16%	31%	14%	9%	2%
Natural gas	24%	6%	10%	24%	15%	7%	12%	1%
Corn	40%	14%	8%	2%		8%	27%	
Sugar cane	2%	55%				3%	39%	2%

\* As of 2009. Primary sources exclude supply from recycling activities.

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Source: GFMS, The Silver Institute, Johnson Matthey, US Geological Survey, International Copper Institute, CIA World Factbook, World Gold Council

11 Eds, Corti, and Holliday, *Gold: Science and Applications*, 2010.

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As of 2010, we estimate that approximately 168,300 tonnes of gold has been mined over the course of human history (Chart 1).<sup>12</sup> Fifty percent of above ground stocks exist in jewellery form. Gold used in technological applications, dentistry and other forms of fabrication accounts for an additional 12%. However, it is more common to estimate the size of the *financial* or *investable* gold market by looking at private investment and official sector bullion holdings, which are considered to be in near-market form. Together, these two components account for approximately 36% of all above ground gold stocks or approximately 60,400 tonnes of gold.<sup>13</sup>

Using the 2010 average price of gold of US\$1,224.52/oz, the size of *financial* gold holdings is equivalent to US\$2.4tn. To put that into context, the gold market is larger than any single European sovereign debt market, yet it is no-one's liability. The gold market is even comparable to the size of US government-guaranteed debt (US\$2.7tn), otherwise known as the agency market.<sup>14</sup> By comparison, above-ground silver stocks represent a smaller market. Industry estimates suggest that identified silver bullion stocks by the end of 2009 were around 31,000 tonnes.<sup>15</sup> Even with a conservative assumption that the actual amount of silver available to the market in terms of bars and coins is twice as large, at an average price of US\$20.25/ oz for 2010, the size of the financial silver market would be equivalent to \$40.5bn dollars (less than 2% of the financial gold market). Furthermore, as of 2009, total above ground stock estimates for copper and platinum were a much smaller US\$7.6bn and US\$3.5bn respectively.<sup>16</sup>

Most gold transactions, not only ones that are geared towards jewellery or other technological applications, but also for investment purposes, tend to be settled in bullion form. Consequently, the majority of gold trading takes place in the global over-the-counter (OTC) wholesale market for physical bullion. While OTC markets are the deepest and most liquid markets in the world, information about transactions is not always fully accessible to the public as they are conducted outside of regulated exchanges. However, evidence suggests that trading volume in the global gold market is quite large, in-line with or larger than trading of other high-quality assets such as sovereign debt.

The London Bullion Market Association (LBMA), through surveys of its members, estimates that the daily net amount of gold that was transferred between accounts in 2010 averaged US\$21bn (based on the average 2010 gold price). However, this number represents only the movement of gold rather than all trades as a significant amount of trades are simply netted between bullion dealers and within a trading book. Thus, in practice, trading volumes between the bullion banks are significantly higher. Most banks estimate that actual daily turnover is at least three times that amount and could be up to ten times higher.<sup>17</sup> This would value global OTC trading volumes anywhere between US\$63 and US\$211bn.

Even if one uses the more conservative estimate of US\$63bn, the estimated daily turnover in gold bullion is greater than that of most sovereign debt, with the exception of US government and government-backed debt.

**Chart 1: Total above ground stocks of gold in tonnes as of 2010\***

\* Based on GFMS data and estimations by the World Gold Council.

Source: GFMS, World Gold Council

12 Gold stock estimate based on World Gold Council calculations using GFMS 2010 Gold Survey and initial full year 2010 GFMS estimates.

13 Estimate by the World Gold Council using GFMS 2010 Gold Survey and initial full year 2010 GFMS estimates.

14 Securities Industry and Financial Markets Association (SIFMA).

15 GFMS Ltd, *Silver Survey 2010*.

16 GFMS Ltd, *Platinum and Palladium Survey 2010* and *Copper Survey 2010*.

17 World Gold Council, *Liquidity in the global gold market*, April 2011.

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The size and liquidity of the gold bullion spot market in financial markets is in itself a very important characteristic not shared by other commodities. While commodities do have a tangible physical demand, when viewed as financial assets, most commodities are usually accessed through exchanges, and many transactions are based on futures and other derivatives contracts. Delivery, while required upon contract expiration, is rarely expected as most contracts are either rolled over or settled via a cash equivalent.

Spot prices for the majority of commodities are available; however, in practice, they are usually derived from very short-dated futures contracts such as the implied one-day forward settlement price. Most commodities such as energy, oil, agricultural, livestock and even some metals, rely heavily on derivatives contracts for financial transactions. There are few or no incentives for investors to take, for example, delivery of 1,000 barrels of oil, or 5,000 bushels of corn. Therefore, most market participants use futures, forwards, options and other derivatives traded on exchanges or OTC markets to gain exposure to these commodities. When comparing the size and liquidity of the gold futures market relative to that on other commodities, we find that even there, gold ranks very high relative to the broader commodity complex in both size and liquidity.

In general, commodity exchanges are useful barometers of the liquidity, depth, size and health of the different individual commodity markets. A simple way to analyse the size and liquidity of a market is to look at open interest and trading volumes across all exchanges where contracts of a particular commodity are traded.<sup>18</sup> There are multiple commodity exchanges around the world. The largest of these include the Chicago Mercantile Exchange (CME) Group, the Intercontinental Exchange (ICE), the Shanghai Futures Exchange (SHF), China's Dalian Commodity Exchange, the London Metals Exchange (LME), the Tokyo Commodity Exchange (TOCOM), and the Multi Commodity Exchange of India (MCX).

Table 5 summarises these results for futures contracts, which tend to be the most liquid derivatives contracts. Gold is the largest and most liquid commodity futures market after the oil market. Moreover, even taking into account the increasing interest in gold investment over the past few years, the open interest on gold futures is just a fraction of the gold spot market. As of December 2010, the aggregate open interest in gold across commodity exchanges was US\$94.1bn, which corresponds to 4% of the US\$2.4tn of gold in private and government holdings. In comparison, the open interest in silver by the end of 2010 was over 50% of the estimated bullion stock holdings.

<sup>18</sup> Open interest refers to the total number of contracts that are not closed or delivered on a particular day. If all investors with a long position (buyers) were to require physical delivery, this would be the total amount of a particular commodity that investors with short positions (sellers) would be required to supply from the available global stocks of that commodity. It relates to the size of the market. Volume represents the number of contracts traded in a commodity market during a given period of time, and it gives a sense of liquidity. Together, they provide information about the depth of the market, or the size of an order needed to move a market by a given amount.

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**Table of Contents****Gold's role as a monetary asset**

One of gold's unique qualities is its historical relevance and importance as a monetary asset. While some other metals, including silver and copper, have also been used as money in different periods in time, gold's role as a standard of value in the monetary system is far more extensive and prevalent. Prior to 1971, for a period of well over a hundred years, gold served an important role in the global economic architecture by backing a number of currencies. Since gold has for centuries been considered a valuable and precious asset that is also rare, it was a logical choice to use gold as an anchor for currencies. This unique role of gold, in which it has dominated even over silver, has left a lasting impact and relevance for gold in the existing international monetary system. Indeed, while gold no longer has a direct role as during gold standard periods, central banks and governments continue to hold large gold reserves as a means of national wealth preservation and protection against economic instability. In fact, gold is the third largest reserve asset, accounting for 13% of all reserves globally, following US dollar- and euro-denominated assets. Moreover, gold is increasingly being used as collateral in financial transactions akin to other high quality, liquid assets such as government debt. In a research note, *Liquidity in the global gold market*, we discuss gold's liquidity as it relates to the importance of gold as a monetary asset.

**Reducing counterparty risk**

Finally, while most commodities tend not to be subject to credit risk in the same way that fixed income and equity securities are, they may still be subject to counterparty risk (the risk that the short investor cannot fulfil the contract) especially when accessed via futures markets. Given that gold is heavily traded on the spot market, investors can minimise counterparty risk by taking delivery or keeping gold in allocated accounts or products that are held primarily in allocated accounts, such as some gold-backed ETFs.

**Table 5: Aggregate open interest and trading volume in futures contracts (US\$ bn) for the most highly traded commodities<sup>1</sup>**

Commodity	As of December 2010		5-year average (January 2006 to December 2010)	
	Open interest	Volume (per day)	Open interest	Volume (per day)
Crude oil	287.8	140.3	201.8	83.5
Gold	94.1	24.6	50.8	32.5
Copper	85.7	32.2	53.5	48.4
Corn	54.5	7.1	26.4	5.3
Soybean	49.6	15.5	25.8	8.9
Wheat <sup>2</sup>	41.7	4.6	19.7	3.5
Natural gas	40.5	12.3	52.5	9.4
Aluminium	36.7	7.2	32.7	10.2
Sugar <sup>3</sup>	30.0	15.9	16.4	8.1
Coffee and cocoa	24.8	2.2	15.5	1.5
Livestock <sup>4</sup>	23.8	2.6	16.4	2.3
Silver	22.3	12.7	10.7	4.5
Zinc	14.0	13.2	8.4	5.6
Nickel	9.1	2.2	5.9	1.4
Platinum	5.1	1.3	2.8	0.8
Lead	4.3	1.2	1.9	0.8
Palladium	1.9	0.2	0.7	0.1
Tin	1.2	0.3	0.6	0.1
Rice	1.1	0.4	0.5	0.2
Coal	1.0	0.1	0.8	0.0

<sup>1</sup> Aggregate open interest and volume across all commodity exchanges where futures contracts for each commodity are traded.

- 2 Includes all grades.
  - 3 Includes raw and refined.
  - 4 Includes live cattle, feeder cattle and hogs.
- Source: Bloomberg, World Gold Council



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**The golden rule: optimal performance in good times and bad**

The composition of gold demand and supply; the depth, breadth, and liquidity of its market; and its particular role as a monetary asset not only differentiate gold from other commodities, but they also translate into a unique performance profile in terms of returns, volatility, and correlation. Moreover, these characteristics also produce in gold a very different reaction to economic and financial variables relative to other commodities in periods of expansion and recession alike. This, in turn, supports the premise that gold should not be valued only as part of a broader commodity allocation, but as a separate and integral part of a well diversified portfolio.

Over the past decade, commodities in general have benefited from growing demand spurred by global economic growth, especially given the larger role many developing markets now play in the world economy. Countries such as China, India, Russia, and many others in Latin America, Eastern Europe, the Middle East, Africa, and South East Asia have been the driving forces behind a ten-year trend of rising commodity prices. Gold has been no exception, with its price rising for the past ten consecutive years. However, unlike many other commodities, gold did not suffer the same pull-back during the recent recession. Gold's ability to provide protection in times of economic duress translated into higher investment demand and positive returns in 2008, a year that was marked by huge losses in all markets apart from a very select few (primarily US government debt).

In the long term, gold has tended to outperform versus other commodities on a risk-adjusted basis. Table 6 shows the performance of gold and a range of commodities and commodity indices for various periods. While gold has not always had better returns than other commodities, it has exhibited consistently lower volatility. At an annualised rate of 15.9% over the past 20 years, gold's volatility is lower than all individual commodities except livestock. It is even lower than that of diversified commodity baskets such as the S&P GSCI and the S&P GSLE. In turn, gold's information ratio (a measure of return per unit of risk) over the past 20 years has been one of the highest, only exceeded by copper and platinum. Moreover, the VaR for a position in gold, which measures the maximum expected loss in a given period of time with a certain degree of confidence, is one of the smallest among all commodities and the already diversified commodity indices. For example, based on historical data over the past 20 years, the maximum loss that an investor could expect to incur in a given week on a gold investment is 3.5% (with 95% confidence). Under similar parameters, an investor could expect to lose as much as 7.5% on oil, 6% on silver, and 4.7% by having a diversified allocation to the S&P GSCI.

Gold's volatility is not only lower than that of most commodity markets, it is low even when compared to other asset classes typically held in an investor's portfolio. For example, gold tends to be more volatile than fixed income assets, but less so than equities (Chart 2), even when grouped in benchmark indices such as global MSCI equity indices, let alone industry sectors or individual companies.

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**Table of Contents****Table 6: Annualised return and volatility in US\$ for various commodities and commodity indices in selected periods<sup>1</sup>**

	Annualised return <sup>2</sup> (%)				Vol. <sup>3</sup> (%)	1991-2010 Inf. ratio <sup>4</sup>	5% VaR <sup>5</sup> (%) (%)
	1975-2010	1991-2010	2008	2010			
Gold	5.8	6.6	4.3	29.2	15.6	0.4	
S&P GS Commodity Index	6.7	3.6	-51.2	10.7	21.7	0.2	4.7
S&P GS Commodity Light Energy Index	5.8	3.2	-43.0	18.6	15.3	0.2	3.4
Energy Index	n.a.	3.8	-58.2	3.6	31.2	0.1	7.0
Industrial Metals Index	n.a.	6.4	-52.5	18.5	20.6	0.3	4.1
Agriculture Index	-0.2	0.6	-30.2	35.8	18.6	0.0	3.9
Grains Index	-0.3	-0.9	-30.6	32.3	22.3	0.0	4.7
Livestock Index	7.4	-1.0	-27.9	12.6	13.7	-0.1	3.1
Crude oil	5.9	7.4	-62.3	1.5	34.4	0.2	7.5
Silver	4.4	10.0	-30.4	73.8	28.1	0.4	6.0
Platinum	n.a.	12.3	-41.8	18.7	21.1	0.6	4.5
Copper	n.a.	12.3	-56.8	34.5	25.3	0.5	5.1

1 Computations based on S&P Goldman Sachs total return commodity indices.

2 Compounded annual return, also known as compounded annual growth rate (CAGR).

3 Annualised volatility based on weekly returns.

4 Defined as the ratio between annualised return and volatility.

5 Weekly Value at Risk at a 95% confidence level as a percentage of an investment.

Source: Standard & Poor's, Bloomberg, LBMA, World Gold Council

**Chart 2: Annualised volatility (%) based on weekly returns for selected asset classes; January 1991 to December 2010**

Source: LBMA, JP Morgan, Barclays Capital, MSCI Barra, Standard & Poor's, World Gold Council

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**Achieving true diversification**

Even when compared to other commodities, gold tends to offer further diversification to an investor's portfolio. This is primarily due to the particular composition and dynamics of gold demand and supply. As we have shown, the composition of gold demand is in itself varied: it is a luxury consumption-good; a prevalent yet hidden element in modern technology; a financial asset that offers capital preservation and risk protection; and it is used as a monetary asset throughout the world. Therefore, it is less exposed to swings in business cycles and, significantly, it tends to preserve capital at times of financial duress. In turn, this causes gold's correlation to be low within the larger commodity complex (Table 7). This includes other metals, especially those that have a larger share of their demand geared towards industrial applications, such as copper and even platinum.

Not surprisingly, gold has a higher correlation to other precious metals, especially silver. Gold does share certain characteristics with silver in terms of its range of applications across jewellery, technology and investment. However, silver's demand structure makes it more susceptible to downswings in the economy. In 2008, for example, silver had a negative return of 30.4% while gold prices were up 4.3% for the year. In general, gold's correlation to silver tends to follow the business cycle, strengthening when the economy expands and weakening when it contracts. This correlation is even more accentuated when comparing gold to platinum (Chart 3) which, as previously discussed, has a much higher percentage of industrial-based demand.

It is also worth noting that, contrary to popular belief, there is no stable correlation between gold and oil prices; at times the prices of the two commodities move in the same direction, at others in opposite directions, but most of the time there is simply no consistent relationship between the two (Chart 4).

**Table 7: Correlations on returns for various commodities and commodity indices;<sup>1</sup> January 1991 to December 2010**

	Gold	Silver	Platinum	Copper	Crude oil	S&P GS Commodity Index	S&P GS Light Energy Index	DJ-UBS Commodity Index <sup>3</sup>	Energy Index	Industrial Metals Index	Agriculture Index	Grains Index	Livestock Index
Gold <sup>2</sup>	1.00												
Silver <sup>2</sup>	0.67	1.00											
Platinum	0.47	0.46	1.00										
Copper	0.26	0.27	0.30	1.00									
Crude oil	0.21	0.20	0.23	0.25	1.00								
S&P GS Commodity Index	0.28	0.25	0.32	0.37	0.91	1.00							
S&P GS Com. Light Energy Index	0.35	0.33	0.39	0.51	0.76	0.93	1.00						
DJ-UBS Commodity Index <sup>3</sup>	0.39	0.39	0.42	0.54	0.76	0.90	0.95	1.00					
Energy Index	0.21	0.19	0.25	0.26	0.95	0.97	0.81	0.81	1.00				
Industrial Metals Index	0.28	0.31	0.34	0.90	0.28	0.42	0.57	0.60	0.29	1.00			
Agriculture Index	0.20	0.21	0.24	0.28	0.22	0.41	0.66	0.60	0.23	0.31	1.00		
Grains Index	0.18	0.18	0.19	0.24	0.18	0.36	0.60	0.53	0.19	0.26	0.95	1.00	

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Livestock

Index 0.00 -0.02 0.05 0.08 0.07 0.16 0.27 0.18 0.09 0.09 0.08 0.07 1.00

1 Calculations based on total returns S&P Goldman Sachs commodity indices and subindices except otherwise noted.

2 Spot prices based on the London PM fix for gold and London fix for silver.

3 Calculated using the Dow Jones-UBS Commodity Index.

Source: Standard & Poor's, Dow Jones, Bloomberg, LBMA, World Gold Council

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**Chart 3: Gold's correlation to silver and platinum versus US capacity utilisation**

Source: LBMA, Bloomberg, World Gold Council

**Chart 4: 2-year rolling correlation between gold and oil monthly returns**

Source: LBMA, Bloomberg, World Gold Council

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**Negative correlation when it is needed most**

In a recent study titled Gold: hedging against tail risk, the World Gold Council found that gold not only tends to have a low correlation to many other assets, including commodities, but that this correlation changes during periods of economic turmoil in a way that benefits investors. Gold tends to protect against so-called tail risks, or events that are not very likely and may not be frequent, but when they do occur they have a significant negative impact on an investor's capital or wealth. This is a by-product of gold's performance during times of systemic risk when market participants seek high quality, real assets to preserve capital and minimise losses.

As Chart 5 shows, when equity prices fall by more than two standard deviations, the correlation between gold and equities tends to turn negative, while the correlation of most other commodities to equities rises significantly. However, when the economy recovers and equity prices rise sharply, their correlation to gold tends to be slightly positive. The rationale behind this behaviour is that, in a strong economy, equity prices tend to rise, but consumers also opt to increase their spending, which may include jewellery or technological devices and this, in turn, supports gold's performance.

**Chart 5: Weekly-return correlation between equities, gold and commodities when equities move by more than two standard deviations; January 1991 to December 2010**

Source: LBMA, Bloomberg, World Gold Council

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**Table of Contents****Contango and backwardation**

As we have previously discussed, investors access many commodity markets via futures contracts. Because futures contracts are based on expectations of future prices, the cost of carry and interest rates, investors are exposed to an additional source of variability: the shape of the futures curve. When the futures curve is upward sloping (futures prices are higher than spot), it is said to be in contango, which generally reflects the cost of carry. Conversely, backwardation refers to the instance in which futures prices are lower than spot. The shape of the curve, combined with the fact that futures contracts are typically rolled over or settled in cash, creates discrepancies between spot price returns and total returns which may include the cost of funding, the shape and the so-called *slide* (or effect of the passage of time) of the commodity futures markets.<sup>19</sup>

As Table 8 shows, the difference in returns obtained in the spot and futures markets can be very large and futures returns are not necessarily higher than spot returns. Take, for instance, the energy market between January 1991 and December 2010. Cumulative returns based on the spot price were 224.5% but based on futures markets, they were only 109.6%. On the other hand, gold returns tend to be consistent regardless of whether an investor chooses to use spot or futures. During the same period, gold's spot return was 258.8% compared to 262.8% on futures. This is a by-product of the shape of the gold futures curve, which tends to be flat for the most actively traded front-end of the curve, and the fact that most investors either trade in spot or can potentially take physical delivery of the futures contracts. However, exercising this latter option can be quite costly and is not often taken.

**Table 8: US dollar return (%) for various commodities and commodity indices in selected periods<sup>1</sup>**

	Cumulative spot price return				Cumulative total return			
	1975-2010	1991-2010	2008	2010	1975-2010	1991-2010	2008	2010
Gold <sup>2</sup>	673.7	258.8	4.3	29.2	679.1	262.8	2.8	27.7
S&P GS Commodity Index	141.7	190.9	-47.9	22.5	931.4	105.1	-51.2	10.9
S&P GS Commodity Light Energy Index	110.7	157.5	-38.3	29.0	669.2	88.6	-43.0	19.0
Energy Index	n.a.	224.5	-55.7	16.6	n.a.	109.6	-58.2	3.7
Industrial Metals Index	n.a.	160.7	-52.0	22.2	n.a.	249.0	-52.5	18.9
Precious Metals Index	736.4	304.4	-0.4	34.0	706.3	330.9	-1.9	33.0
Non-Precious Metals Index	132.5	187.2	-48.9	22.1	931.6	99.8	-52.3	10.2
Agriculture Index	27.0	172.9	-21.2	47.1	-7.1	13.8	-30.2	36.6
Grains Index	81.4	183.8	-23.3	50.1	-11.3	-17.1	-30.6	33.0
Livestock Index	96.6	29.3	-7.1	27.3	1207.3	-18.7	-27.9	12.9
Crude oil	691.0	231.4	-60.7	17.1	691.0	317.1	-62.3	1.6
Silver <sup>2</sup>	541.5	648.1	-30.2	76.8	381.3	581.4	-30.4	75.6
Platinum	n.a.	328.2	-41.9	20.6	n.a.	935.8	-41.8	19.1
Copper	n.a.	278.6	-58.5	36.4	n.a.	922.0	-56.8	35.2

1 Calculations based on S&P Goldman Sachs commodity indices and subindices except otherwise noted.

2 Spot prices based on the London PM fix for gold and London fix for silver.

Source: Standard & Poor's, Bloomberg, LBMA, World Gold Council

19 Slide refers to the effect of the passage of time in the derivatives contract. As a contract matures, its duration shortens bringing it closer to the front of the curve.

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### **Conclusion**

While gold does fit within the definition of a commodity – an economic good, which is valued and useful and has little or no difference in composition or quality regardless of the place of production – its market dynamics and the sheer diversity of its application make it distinct from other commodities. Gold has a unique performance profile in terms of returns, volatility and correlation, and these characteristics combine to produce in gold a very different reaction to economic and financial variables relative to other commodities in periods of expansion and recession alike.

Commodities other than gold can also be considered luxury goods or be used in technological applications. Some are basic goods used in everyday life, others are also used as inflation hedges or to protect against currency devaluation, and all of them in general provide some degree of diversification to an investor's portfolio. However, gold can be regarded as different precisely because it performs all such functions.

Over time, gold's performance follows a different path from other commodities. Gold's information ratio (a measure of return per unit of risk) over the past 20 years has been one of the highest. Moreover, the VaR for a position in gold, which measures the maximum expected loss in a given period of time with a certain degree of confidence, is one of the smallest among all commodities and even with respect to the already diversified commodity indices.

Indices such as the S&P Goldman Sachs Commodity Index or the Dow Jones-UBS Commodity Index are widely used by investors as benchmarks on their commodity allocations. However, gold's weighting within these indices is small, ranging between 3% and 7%. While investors typically get some exposure to gold when using one of these indices as benchmarks, we find that portfolio performance can still be improved by making an additional allocation to gold. An outright position in gold reduces risk without diminishing long-term expected returns.

Within this study, we show that within a simple benchmark portfolio (50% equities, 40% fixed income, 10% commodities), an optimal strategic allocation to gold can rise to as high as 9.5% for more risk-averse investors (with a 0.5% allocation to other commodities) or a moderate 4.5% (5.5% to other commodities) for those willing to take on more risk. More importantly, we find that under these conditions, an investor who holds gold only via a diversified commodities index will not achieve optimal returns (per unit of risk) or minimise expected losses.

These characteristics, in conjunction with previous World Gold Council studies, suggest that relatively small strategic allocations to gold ranging between 2% and 10% can significantly improve and protect the performance of an investment portfolio. This paper supports the premise that gold should not be viewed only as part of a broader commodity allocation, but as a separate and integral part of a well diversified investment portfolio.

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