

Gold Market Knowledge

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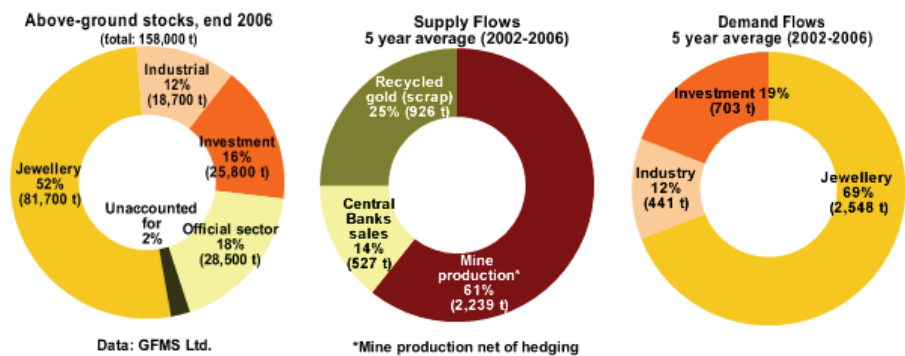
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Gold's enduring appeal and extensive functionality, including its characteristics as an investment vehicle, are underpinned by the supply and demand dynamics of the gold market. These notes offer a detailed overview of gold market fundamentals and should be viewed as complementary to the information presented in our other *Gold Market Knowledge* documents and on our websites.

Supply and demand



Gold is unusual in that it is both a commodity and a monetary asset. Because it is virtually indestructible, all the gold that has ever been mined still exists above ground in some form or another and, theoretically, the majority of above-ground stocks could easily be mobilised. That is to say that they are in simple, relatively unfabricated form, as described below. As a result of this feature, any upward spike in price is often met by the resale of above-ground stock and this is one of the reasons why the gold price is historically less volatile than the majority of other commodity prices. It also explains why gold's forward markets are generally (but not always) orderly, as considered in *Why is gold different from other assets? An empirical investigation* and *Gold derivatives: the market impact*.

GFMS Ltd. estimates that at the end of 2006 above-ground stocks represented a total quantity of approximately 158,000 tonnes, of which 66% had been mined since 1950.

The *Official sector* stocks include gold reserves held by central banks, government bodies, such as the Monetary Authority of Singapore, and supranational organisations, such as the International Monetary Fund, Bank for International Settlements, and the European Central Bank.

As is the case with most metals, the gold that satisfies demand each year comes both from mine production and from the recycling of metal that has been mined in previous years. In fact, this secondary supply forms a smaller proportion of total annual supply flows than is the case, for example, with aluminium and lead. The centre diagram above

shows that, over the past five years, recycled gold, largely from the jewellery market, has represented a quarter of gold supply, followed by sales of gold by central banks.

Annual demand for gold falls into three main categories, the largest of which is the jewellery market, which was worth \$44 billion in 2006. Industrial demand for gold is dominated by the electronics sector, but also includes dentistry and other industrial and decorative applications. The final component of demand is investment. Because a significant portion of investment demand is transacted in the over-the-counter market, it does not lend itself to ease of measurement. The investment figure shown in the diagram above includes bar hoarding, official coins, medals and imitation coins, “other retail investment” and investment in exchange traded gold funds and related products.

Identifiable investment demand increased strongly in 2006, up 8% in volume terms and over 45% in dollar terms on the previous year.

The World Gold Council publishes quarterly supply and demand statistics, while the *GFMS Annual Gold Survey* provides extensive background information on the underlying trends.

Mine production

It is known that the Egyptians mined gold before 2000 BC and the first coin containing gold was struck in the eighth century BC. It is believed that the first pure gold coin was struck on the orders of King Croesus of Lydia in the sixth century BC.

The best estimates available suggest that the total volume of gold mined over history is approximately 158,000 tonnes, of which around 66% has been mined since 1950. The upward trend in annual production is now levelling off, due not least to a considerable slowdown in exploration spending in the late 1990s. Independent analysts are of the belief that mine output will remain flat for the next few years and may even drop slightly.

Gold is produced from mines on every continent with the exception of Antarctica (where mining is forbidden), in operations ranging from the tiny to the enormous.

The dominant producing country for much of the 20th century was South Africa, which in the early 1970s was producing 1,000 tonnes per annum, or over 70% of the world total at that time. This position has been eroded in the past two decades, however, as South African production has dropped (due in part to ageing mines and reduced flexibility), while other nations have expanded their output considerably.

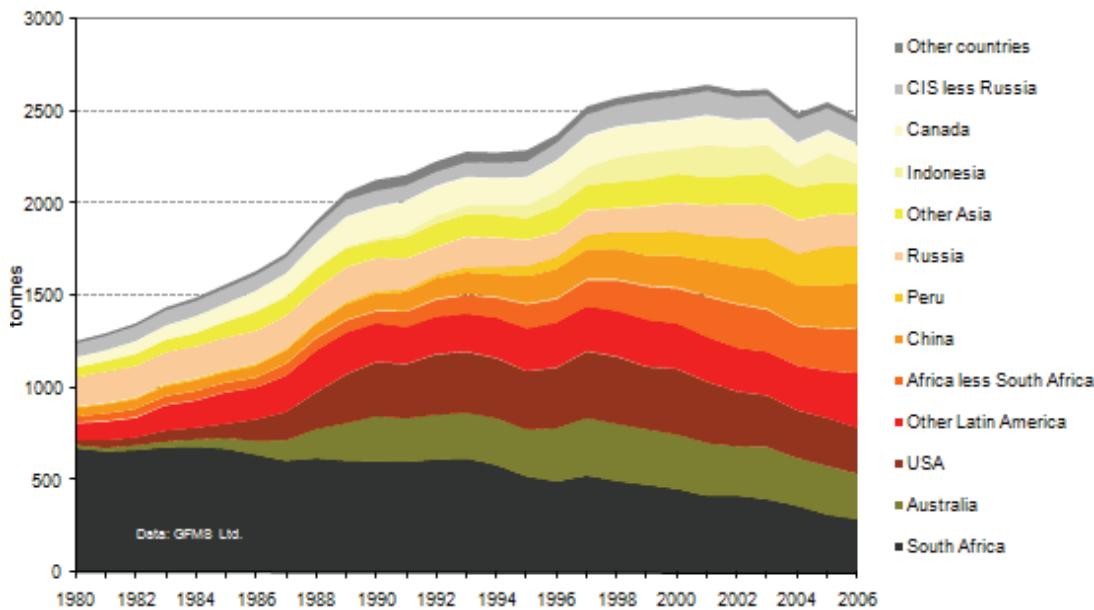
Nonetheless, in 2006 South Africa remained the world's largest producing nation, with 292 tonnes and 12% of total production, followed by the US with 252 tonnes (just over 10% of the total) and, not far behind, China, with over 247 tonnes. The most spectacular rises in output over the past decade have come from Indonesia, which in 1992 produced just two tonnes of gold but in 2005 produced over 114 tonnes, predominantly from the Grasberg mine, which is the world's largest gold producer, from a copper-gold deposit (Rio Tinto and Freeport Copper & Gold in a joint venture), and Peru, where production has risen from 18 tonnes in 1992 to 203 tonnes in 2006, of which almost half came from Newmont's Yanacocha mine, the second largest in the world, which is 14,000 feet above sea level in the Andes.

At the other end of the scale, there are a myriad of very small “artisanal” miners operating as one-man bands, panning for alluvial gold or working shallow outcrops in many parts of Africa, Latin America and Asia, and finding perhaps only a few ounces in any one year.

Increasingly gold is mined in developing countries (other than South Africa) including some of the poorest. Many of those designated as Heavily Indebted Poor Countries by the World Bank are gold producers. For some of these countries gold comprises a significant proportion of their exports; it accounts for over a third of goods exports in the case of Ghana and around half for Mali, for example.

Some mining companies refer to their output in terms of ounces, and their ore grades in terms of ounces per tonne (or in some cases in North America, per short ton). Others use the metric system. In the main, gold is thought of in terms of the troy ounce, which takes its name from the old French city of Troyes, where there was a regular marketplace at which gold was traded.

World gold mine production, 1980-2006



Grades vary enormously with ore bodies. Generally, the largest South African underground operations run at between eight and ten grammes per tonne (i.e. eight to ten parts per million), with more marginal South African operations grading between four and six grammes per tonne. At a grade of 10 grammes/tonne, therefore, it takes more than three tonnes of ore to produce one ounce of gold. Many of the world's operations are *open pits*, which tend (generally) to be of lower grade than the underground mines, running from as low as one gramme to three or four grammes per tonne. While this low grade is instructive in that it shows how rare gold is in the ground and gives an idea of how much rock has to be shifted to produce the metal, production costs are a more important parameter in determining the quality of an operation and these are a mix of both grade and operating costs.

The world's deepest gold mine is currently the Savuka (which means "rise up") mine on the north-west rim of the Witwatersrand Basin in South Africa. This operation mines to a depth of 3,774m. However, the TauTona mine, also in South Africa, is soon expected to surpass this, with plans to reach a final depth of 3,902m.

This means that, on a simplistic basis and working solely to the average numbers (and assuming a rock density of approximately 3.5kg m⁻³), some of these miners are working at a depth of around 2.4 miles and, in the case of Savuka, mining an ore grade which contains almost 20 cubic centimetres of gold in every cubic metre of rock. That's just

under 20 parts per million by volume and attests to the high technological achievements of the industry.

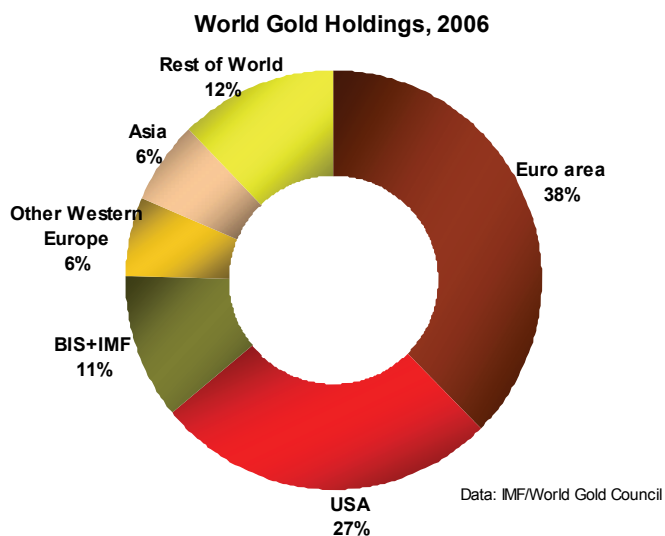
Production costs vary widely, according to the nature of the mine, be it open pit or underground and at what depth, the nature and distribution of the orebody (and by implication the metallurgy which affects processing techniques) and the grade. Average quoted cash costs for 2006 were

estimated by GFMS at US\$317/ounce with total cash costs (including depreciation, amortisation, reclamation and mine closure costs) at US\$401/ounce.

Note also that these figures do not include greenfield exploration and other ancillary costs and so most mining analysts add a further and often significant sum, depending on the mining company concerned, to come to an estimate of true total costs. Thin margins made by the mining companies in the second half of the 1990s meant that exploration expenditure tended to suffer.

Central Banks

Central banks and supranational organisations hold around one fifth of global above-ground stocks of gold as a reserve asset, a figure that is decreasing steadily over time. The figure of 28,500 tonnes shown in the *Above-ground stocks* chart above excludes gold owned by central banks and out on loan; if gold out on loan were included the figure would be slightly higher. These stocks are owned largely by central banks in Europe and North America and were acquired predominantly in the context of the Classical Gold Standard. On average, countries hold 10% of their reserves in gold, although the proportion varies widely from one country to another.



Nearly all central banks report their gold holdings every month to the International Monetary Fund (IMF) and these are published monthly in the Fund's publication International Financial Statistics. Thus changes in these holdings can easily be monitored. However, a small number of central banks have gold holdings which are not deemed to be part of official reserves and are therefore not reported. In addition there are also a few quasi- or semi-official bodies whose holdings are not reported. Monitoring these holdings is therefore more difficult.

Recycled gold

Gold is virtually indestructible so that, unless it has been lost, all the gold ever mined still exists. It is also easily recoverable from most of its uses and capable of being melted down, re-refined and reused. It follows that the supply of recycled gold, or scrap, is an important part of the dynamics of the gold market.

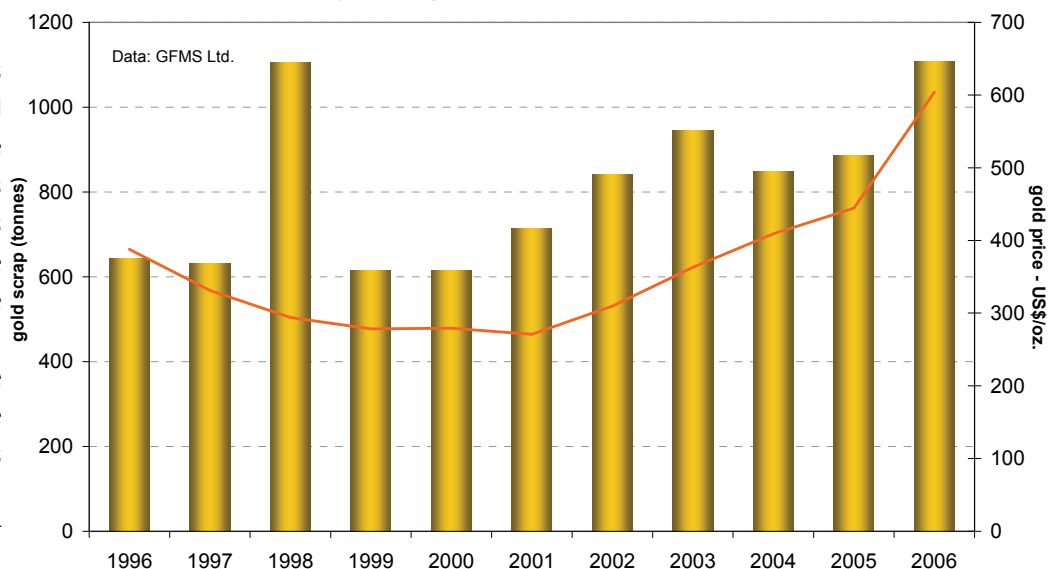
In the statistics, scrap is defined as being gold that has been sourced from old fabricated products that have been recovered and refined back into bars. It does not include jewellery that has simply been traded in and resold without being re-refined, or resold investment bars and coins.

Most recycled gold generated originates from jewellery. Smaller amounts come from recuperated electronics components and, at times, from investment bars and coins.

Although a number of central banks have increased their gold reserves over the past decade, the sector as a whole has been a net seller, contributing an average of 527 tonnes to annual supply flows between 2002 and 2006. Since September 1999, the bulk of these sales have been covered under the *Central Bank Agreement on Gold (CBGA)*. A new CBGA, covering the period from September 2004 to September 2009 was announced in March 2004.

In addition to buying and selling, central banks also affect the gold market through their lending, swaps and other derivative activities; they are the main (although not the only) supplier of leased gold to the market. Bullion banks who borrow such gold may sell it into the market to hedge their own transactions, for example with mining companies who are selling such gold forward. When the loan from the central bank falls due, it will be repaid, under a basic form of transaction, with the gold from the bullion bank's counterparty (e.g. the gold that was sold forward by the mining company once it has actually been mined). This mechanism thus affects the timing of gold supply to the market. Under the Central Bank Gold Agreement the supply of such gold to the market by signatories was capped at the level outstanding at September 1999.

Supply of old gold scrap (1996 - 2006), tonnes



The supply of scrap depends largely on economic circumstances and on the behaviour of the gold price. It is common practice in the Middle East and Asia for customers to trade in one piece of jewellery in exchange for another, and the piece traded in may be melted down rather than simply being resold. But gold can also be sold for cash either if the owner has need of money or if the owner wants to cash in a profit following a rise in the gold price. It follows that scrap supply typically rises in times of economic distress or following a price rise.

The chart above shows how the supply of scrap has changed over the last ten years. The peak in 1998 was the result of disharding during the Asian crisis of 1997-98. Around 300 tonnes of the total came from South Korea, primarily as a result of the national gold collection campaign instituted in order to help meet a shortage of foreign exchange. Individuals contributed their gold – an average of 65 grams per household – in exchange for won-denominated bonds. The rise in scrap generation in 2001 and 2002, and again recently, was primarily a result of profit taking spurred by the rise in the gold price.

Jewellery Demand

Jewellery consistently accounts for the largest share of final demand at around 70% of total demand – worth around US\$ 44 billion at the annual average gold price in 2006.

World Gold Council supports the marketing of gold jewellery through partnerships with retailers, manufacturers and distributors in the world's leading markets.

There are both differences and similarities in jewellery purchasing habits across countries. Demand is affected by different cultural and social factors but market research also shows that feelings towards gold are very similar and that there are common core attitudes towards gold across different markets. For instance, the purchase of gold jewellery is associated with special occasions such as Valentine's Day, weddings, anniversaries and birthdays throughout the world. Market research responses show that there are consumer "segments" which exist in all countries although the importance of each segment can vary from country to country.

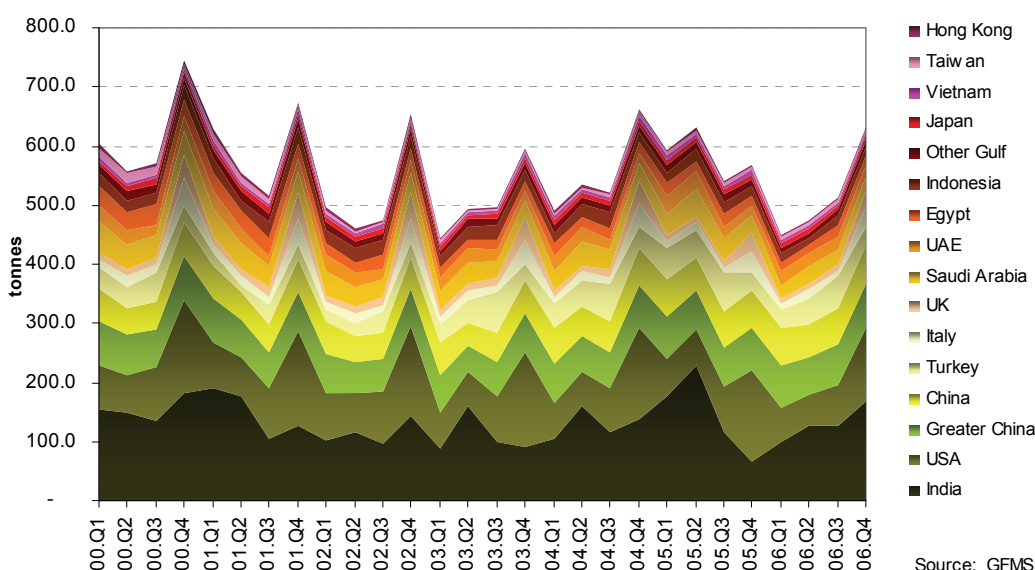
Seasonality

Jewellery demand is seasonal (see the graph below). The fourth quarter is the strongest quarter due to Diwali, Christmas and other end of year festivals when jewellery gifts are common. The long holidays around 1st May (Labour Day), National Day and Chinese New Year in China are also occasions associated with the purchase of gold jewellery.

The first quarter is normally the second strongest quarter due to the Chinese New Year, the Indian wedding season and, to a lesser extent, Valentine's day.

The second and third quarters are usually seasonally low with a relative absence of major gold giving occasions. The start of the second quarter nevertheless sees wedding seasons in parts of India while May sees the Akshaya Tritiya festival in India. Tourist demand is at its peak in Turkey in the third quarter. In contrast the third quarter sees the Shrad – a fortnight whose religious significance is not propitious for gold buying by Hindus.

Gold jewellery demand: quarterly, by country



Source: GFMS Ltd.

Competition

Except in the more traditional markets, gold

jewellery buying faces increasing competition for its share of consumers' discretionary purchasing. This comes in part from other jewellery but also, and more importantly, from electronics, home improvements, holidays, beauty treatments and luxury goods and services. Marketing, the distribution of quality products and the promotion of occasions on which to buy gold have therefore become increasingly important in stimulating purchase. Improvements in income levels and fundamental changes in consumer attitudes to gold have reversed the declines in gold demand of the late 1990s and early 2000s. In the first half of 2006, price volatility pushed the volume of gold jewellery down to 2,800 tonnes, a year-on-year decline of 16%. Price volatility has a negative impact on consumer demand as it introduces a level of uncertainty into market valuations, making consumers wary about purchasing jewellery in case they can buy it cheaper later on. However, thanks to the ascendant gold price, the value of jewellery demand reached a record high of \$44 billion, a 14% increase on the previous year. And once gold price volatility returned to its more normal, relatively low levels, jewellery demand staged a strong recovery, with substantial growth in early 2007.

India

India is the world's largest gold jewellery market by volume accounting for around 522 tonnes of consumption demand in 2006. Traditionally gold is 22 carat. Gold jewellery buying is associated with a number of festivals and, in particular, with weddings. The gold given at weddings is important for women as it traditionally remains her property. For festivals, Diwali is a traditional gold giving occasion. Akshaya Tritiya has become important in the south, encouraged by WGC promotions.

A feature of Indian demand is its extreme sensitivity to price volatility – this is the country where that factor is of most importance in affecting gold demand.

Over half of demand comes from rural or rural town areas. Demand here is largely traditional. It is affected by

incomes and thus the quality of the monsoon is important. In these areas gold is also important as a means of saving – a gold chain or bangle which can be worn on the person is considered a relatively safe way of storing wealth.

In urban areas demand is more influenced by western tastes. Like similar markets, gold here faces competition not just from other forms of jewellery but also from the broader competitive set of luxury goods, electronics and consumer services. Promotion is thus important in order to maintain and boost demand.

The majority of gold used in India is imported but most jewellery is fabricated within the country. Indeed India has a thriving jewellery industry and has become a major exporter.

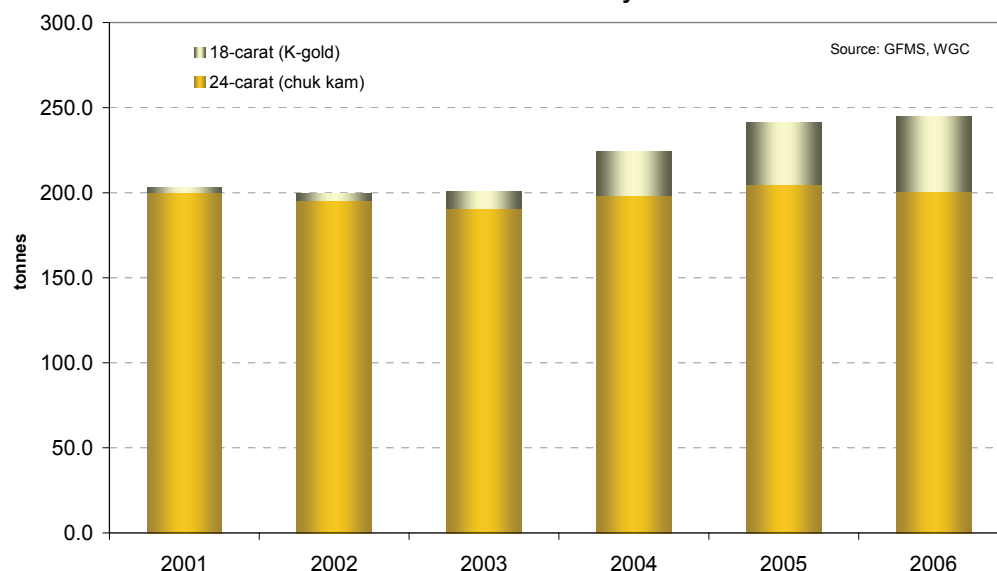
USA

In terms of consumption demand, the USA is the world's second largest gold jewellery market by volume (around 306 tonnes in 2006) and the largest by far at retail price levels (around \$90 billion in 2006). Retail value refers to the value of jewellery sold rather than the gold content. Christmas and end of year festivals are clearly the most important time of year for demand but Valentine's Day in February and Mother's Day in May are also gold-buying occasions.

Gold may be of 18, 14 or 10 carat. White gold has gained in popularity since the mid 1990's.

In the world's largest consumer market, gold clearly faces intense competition. Nevertheless promotion helped to

Chinese Gold Jewellery Demand



ensure that both the volume and retail value of gold sold increased steadily throughout the 1990s and retail value has continued to increase even through the tougher economic climate of the last few years.

Jewellery fabrication has declined in the US due to the cost competition from other centres. Most gold jewellery is now imported with Italy, Turkey and India being among the major suppliers.

China

Despite China's dynamic growth the gold jewellery market, until recently, was made difficult by strict regulation and demand was stagnant. Prices were controlled and foreign companies were unable to manufacture or sell gold. With the absence of more dynamic operators, the market was failing to produce jewellery that appealed to younger, urban consumers. Since 2002 this situation has seen a dramatic turnaround. Gradual deregulation has allowed a growing influence from outside China. Innovative products such as K-gold, 18 carat gold with Italian-inspired design, are proving successful in attracting the urban cosmopolitan market.

The majority of gold jewellery sold in China is *chuk kam* or virtually pure 24-carat gold, often bought for ceremonial occasions and with a high level of intrinsic investment value. This is sold by weight with a low retail mark-up and can on occasion be traded in by the purchaser for new jewellery or cash. K-gold, since its launch in 2003, already accounts for around 18 per cent of the market. Around half of K-gold is sold as white gold, responding to the popularity of white metal among many younger consumers.

Middle East

Many Middle Eastern markets have a strong affinity to gold. 21 carat is the traditional caratage in Saudi Arabia and the Gulf region. Dubai – always a gold trading centre – has become a major hub for gold and jewellery trading over the past ten years reflected in its reputation as “Dubai – City of Gold”.

The gold souk and other outlets cater for local and expatriate demand but also for tourists and business visitors from all over the world, particularly from India, at highly competitive prices. Gold of 18, 21, 22 and 24 carat can be purchased here in a huge variety of designs catering for all markets, but nothing below 18 carat, since metal below 18 carat is not legally considered to be gold. Gold promotions

are intrinsic to the three shopping festivals a year: the Dubai Shopping Festival in the early months; Dubai Summer Surprises; and Dubai – City that Cares during Ramadan.

Turkey

The Turkish gold jewellery market has undergone a major revival since the early 1990s with the traditional and long-standing historical affinity for gold jewellery adjusted for modern tastes. The development of good quality manufacturing has made the industry a substantial success not just locally but also in catering for tourists and in a lively export business. Turkey is now the world's fourth largest market for gold jewellery, its third largest manufacturing centre and its second biggest exporter. A combination of economic revival and successful promotions saw jewellery demand at a record in 2005, although this fell sharply in 2006 due to concerns regarding price volatility, regional security and political instability, which disrupted the tourist market.

Italy

Italy has long been the world's leading gold jewellery manufacturing centre and the leader of jewellery fashion. It has faced substantial competition from lower-cost manufacturing centres in recent years and its fabrication has declined. Its domestic consumer market has suffered too, against the background of a sluggish economy and increased competition. Despite this, Italy remains the undisputed leader of fashionable and high quality jewellery design and the city of Vicenza hosts the leading trade fair each year. While demand for basic products is declining, that for more innovative and high quality pieces is now showing healthy growth.

Industrial Demand

Current use

Industrial and dental uses account for around 12% of gold demand, or an annual average of around 400 tonnes from 2002 to 2006 inclusive.

Over half of industrial and dental demand – around 7% of total demand – is the use of gold in electronic components due to its high thermal and electrical conductivity and its outstanding resistance to corrosion. The share of electronics in total gold demand has grown over the past decade but it also fluctuates according to global GDP and the fortunes of

the electronic industry. Most gold manufacturing of electronic components occurs in North America, Western Europe or East Asia. This last region is gaining market share as companies relocate factories there to take advantage of the lower cost base. For future industrial demand, it is clearly important that next generation electronic devices and consumer goods continue to use gold within component parts. Technically, there are good reasons why this is likely to be the case, and with consumer demand for advanced electrical goods likely to grow, this could well have a positive effect on gold demand in this area.

Gold's medical use has a long history; its bio-compatibility, resistance to bacterial colonisation and to corrosion as well as its malleability mean that it can be used successfully inside the human body. Today various biomedical applications include the use of gold wires in heart transplants and gold-plated stents to support weak blood vessels. Its best-known and most wide-spread use, however, is in dentistry. Dental use currently accounts for just under 2% of gold demand, a share which is essentially stable. Japan, USA and Germany are the three leading countries manufacturing dental alloys.

Gold is also used in a number of other industrial and decorative purposes such as gold plating and coating and in gold thread (such as *jari* in India). Various techniques are used to enable gold to be used in decorative finishes. Other applications take advantages of gold's reflectivity of heat and lasers and its optical properties. Overall these uses of gold account for 2-3% of total demand.

A small share of the amount of scrap gold generated each year comes from reclaimed industrial gold, primarily from electronics use.

New uses of gold

Research over the last decade has uncovered a number of possible new practical uses for gold some of which appear to have substantial potential in increasing the industrial use of the metal. This includes the use of gold as a catalyst

including catalysts in fuel cells, chemical processing and controlling pollution. A number of companies are known to be developing industrial catalysts based on gold and this could lead to important new demand for the metal. In the rapidly developing field of nanotechnology there are many possible uses including improved LCD displays using gold nanorods, for example in mobile phones and laptops. The use of gold in coated superconductors could also create significant new industrial demand for gold.

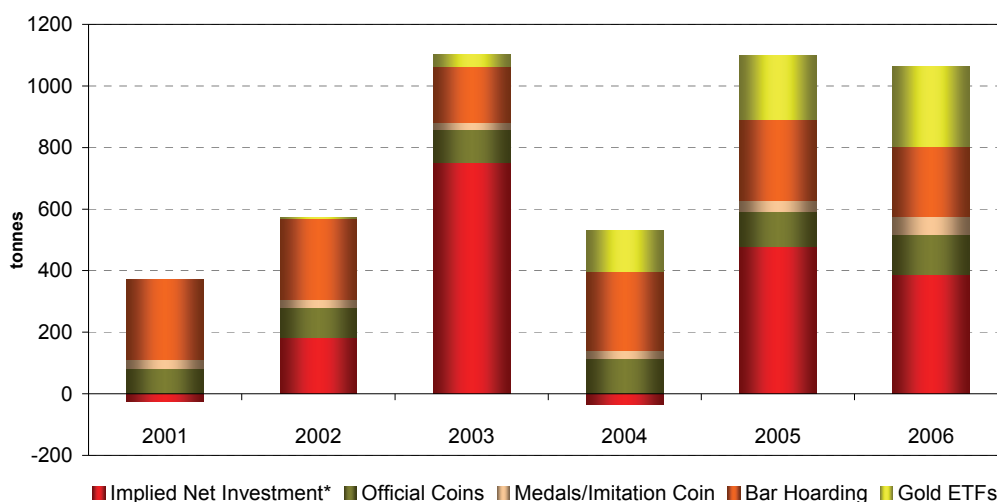
The World Gold Council organises a conference on new industrial applications for gold every three years. Contact industry@gold.org for further information.

Investment Demand

Gold's use as an investment is rooted in history and derives from its roles as a safe haven, a store of value and a monetary asset. Since gold is not a liability of any government or corporation it does not, unlike currencies, bonds and equities, run any risk of becoming worthless through the default of the issuer. In more recent times its role as an excellent portfolio diversifier as a result of the gold price's lack of correlation with mainstream investments and its role as a currency and inflation hedge have also been recognised.

For more information on the investment case for gold, as well as how to invest in gold and country-specific information on where to invest, please visit our Investing in Gold website (www.invest.gold.org).

World Investment 2001-2005



Data: GFMS Ltd.

* Implied net investment is the residual from combining all of the other GFMS data on supply and demand.

Much jewellery bought in Asia and the Middle East is also bought as an investment or means of saving. Investment as such, however, is normally understood to include the forms described in our section on How to Buy gold, which range from direct purchase of bars and coins of different shapes and sizes, investment in gold-backed securities, exposure to the gold sector through investment in mining equities or collective investment funds investing in these, warrants, futures, options and other structured products that are based on gold. The investment demand numbers reported on this website relate only to investment in coins and small bars and other identifiable retail investment; and investment in the exchange traded gold funds that are listed in a number of countries.

Investment professionals tend to draw a distinction between retail investment (purchases by individuals) and institutional investment (purchases by investment funds and other corporate entities such as pension funds). In practice, it can be difficult to distinguish between these two categories, particularly given that some private investors may have considerable holdings. Investment holdings, or private investor stocks, account for 16% of the total stocks of gold. Over the last five years or so, a “quiet revolution” has been taking place in the world of investment, which has seen identifiable investment demand soar from a low of 4 per cent of total end-use demand in 2000 to 19 per cent in 2006. When over-the-counter flows that are less readily

measured are taken into account, an estimated total of US\$ 13.2 billion of investor money found its way into gold in 2006.

The renewal of investment interest in gold is rooted in a range of factors: concerns about dollar volatility and inflationary expectations, continuing high levels of geopolitical uncertainty and increased acceptance of the role gold can play as a portfolio diversifier ■

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