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WORLD SILVER SURVEY 2003

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World Silver Survey 2003

Produced for The Silver Institute

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The *World Silver Survey* has been published annually by The Silver Institute since 1990. Copies of previous editions can be obtained by contacting The Silver Institute at the address and telephone number on the opening page. For copies outside of North America, contact GFMS at the address on page 6.

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The data on which this report is based has been obtained by The Silver Institute and Gold Fields Mineral Services (GFMS) from sources which are generally believed to be reliable. However, this does not guarantee complete accuracy in the information presented here. It is in the nature of the precious metals markets that estimates for a number of components must be made on the basis of incomplete information. A number of figures may have been revised from last year's World Silver Survey in the light of new information. The opinions expressed here represent those of the authors of the report at the time of writing.

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Contents

This is the ninth annual survey of the world silver market to be produced for The Silver Institute by Gold Fields Mineral Services (GFMS), the London-based analysts of global precious metals markets. The information contained here is based in part on the analysis of the GFMS database of international trade statistics, company report data and other public-domain information. But more importantly, it is also based on a series of interviews with the industry's main players, carried out every year by the GFMS team of analysts and consultants, which provide the essential data to allow the compilation of reliable estimates for world supply and demand.

GFMS is grateful to the many miners, refiners, bullion dealers, bankers and fabricators throughout the world who have contributed their time and information to ensuring that the picture of the industry described in the *World Silver Survey* is as complete and accurate as possible.

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Units used:
supply and demand data are given in units of million troy ounces (Moz) rounded to one decimal place.
1 Moz = 31.103 t (metric tonnes)
1 tonne = 32,151 troy ounces
1 tonne = 1,000,000 grams (g)

Terminology:
"-" = not available or not applicable
0.0 = zero or less than 0.05
"dollar" refers to the US dollar unless otherwise stated.

Prices:
Unless otherwise stated, US dollar prices are for the London Silver Market fixing.

Table Rounding:
Throughout the tables, totals may not add due to independent rounding.

1. Summary and Outlook

For what is often called an "industrial commodity", silver was remarkably resilient last year in the face of adverse economic conditions. Indeed, at $4.599, its average price was actually up 5% year-on-year. This compares favorably with copper, lead and zinc, which fell 1%, 5% and 12% respectively in 2002. Taken in isolation, one might draw the conclusion that silver, after all, still retains some of the characteristics of a precious metal, including the ability to rise in value during periods of crisis. However, it would be unwise to stretch this point too far. After all, the price comparison is a good deal less flattering when the yardstick is gold, which enjoyed a far more substantial 14% increase in 2002. (On an intra-year basis the difference is yet more stark - gold rising 25% while silver recorded a mere 2% gain.)

A review of the supply/demand data in Table 1 below provides us with an explanation for silver's resilience last year and some pointers as to how 2003 might develop. Looking first at supply, the impact of the small fall in global mine production (and an expected further modest decline this year) should not be exaggerated. For producers, more important in 2002 was the decline in their hedge positions, though de-hedging's 3% share of silver demand was dwarfed by the 11% recorded in the gold market. Furthermore, we very much doubt that de-hedging will become an important factor this year in silver.

Like mine production, the change in scrap supply in 2002 was not on a sufficient scale to impact on the market (this is another interesting contrast with what occurred in gold last year). In 2003 too, due to its relative lack of price sensitivity, scrap supply should not prove an obstacle to any potential upward move in silver prices.

The 16 Moz (500 t) fall in net government sales last year was of some significance. An important consideration here was the price sensitivity of Chinese stock mobilization - bullion supply from this source was much greater whenever silver approached the $5 level. By contrast, at lower prices, the absence of pressure from Chinese government sales was a factor in limiting the downside. We would expect a similar dynamic to operate in 2003 - certainly there is no sign of an imminent end to Chinese stock disposals and this will tend to limit the upside for the price. Finally on the supply side, our numbers indicate a modest level of net disinvestment last year. This too was a price-sensitive variable, although as the table clearly illustrates, the volume involved fell far short of the private dishoarding of bullion that occurred between 1993 and 2000. We doubt that a return to such levels of dishoarding is possible unless very much higher silver prices are realized. It might well require something closer to $6 than $5 for there to be another substantial reduction in private bullion stocks. This is

Table 1
World Silver Supply and Demand
(Million ounces)

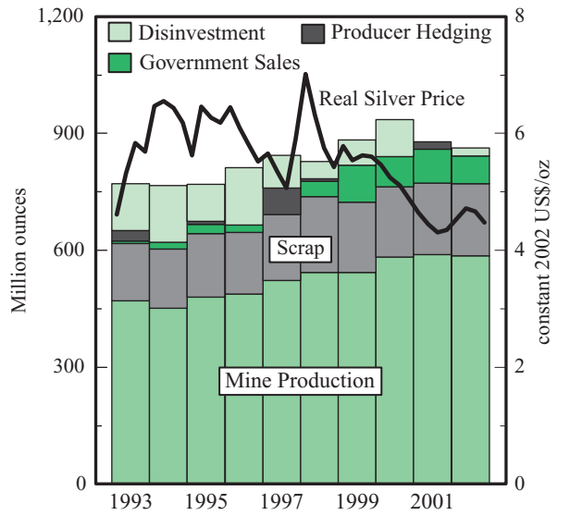
	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Supply										
Mine Production	469.9	451.4	479.5	487.9	523.1	543.6	542.9	582.8	589.2	585.9
Net Government Sales	6.0	17.6	25.3	18.9	-	40.9	95.2	78.2	87.2	71.3
Old Silver Scrap	148.5	151.9	162.7	158.2	169.1	193.7	181.2	180.8	182.7	184.9
Producer Hedging	26.7	-	7.5	-	68.1	6.5	-	-	18.9	-
Implied Net Disinvestment	120.4	145.4	94.6	147.9	84.8	43.8	65.4	94.2	-	20.9
Total Supply	**771.6**	**766.3**	**769.6**	**812.9**	**845.1**	**828.5**	**884.7**	**936.0**	**878.0**	**863.0**
Demand										
Fabrication										
Industrial Applications	270.1	281.7	295.6	297.6	320.7	316.3	340.0	376.3	338.1	342.4
Photography	199.3	201.6	210.9	212.0	219.0	225.0	226.2	220.2	213.9	205.3
Jewelry & Silverware	259.1	227.9	236.9	263.7	274.3	259.4	273.3	279.9	286.0	259.2
Coins & Medals	43.1	45.2	26.1	25.2	30.4	27.8	29.2	32.2	30.5	31.3
Total Fabrication	771.6	756.3	769.6	798.6	844.4	828.5	868.7	908.6	868.5	838.2
Net Government Purchases	-	-	-	-	0.7	-	-	-	-	-
Producer Hedging	-	9.9	-	14.3	-	-	16.0	27.4	-	24.8
Implied Net Investment	-	-	-	-	-	-	-	-	9.5	-
Total Demand	**771.6**	**766.3**	**769.6**	**812.9**	**845.1**	**828.5**	**884.7**	**936.0**	**878.0**	**863.0**
Silver Price (London US$/oz)	4.313	5.285	5.197	5.199	4.897	5.544	5.220	4.951	4.370	4.599

both a reflection on the acquisition price of a good part of the current near-market stocks and also the fact that there is simply less material around than previously.

Turning to demand, the 3.5% fall in fabrication last year was a disappointing result but maybe not entirely unexpected given the weakness of world GDP growth and industrial production, the 7% rise in the Indian rupee silver price and, at the margin, what might be the beginnings of a secular decline in photographic demand. All of these factors will be important in determining the chance for a rebound in fabrication this year. A big negative therefore is the unpromising economic outlook, which will remain a drag on the price over the rest of 2003. More positively, after a very weak opening two months, lower prices have stimulated a strong recovery in Indian imports, although these will (as always) remain highly price sensitive in the short term. Photographic demand remains under pressure from the same economic forces described above, the particular weakness of the tourism industry and also some erosion of demand from the impact of digital technology.

All in all, our conclusion is that this mix of supply/demand factors means silver is unlikely to move substantially outside its 2002 trading range. Any move to the downside would seem to require a severe economic downturn or for holders of bullion stocks to dramatically review their price targets. Neither of which seems very likely. The upside looks set to be constrained though by the weakness of fabrication demand and, in particular, the question mark against its most price sensitive component - India - plus the well documented "cap" on the market represented by Chinese supply. Yet notwithstanding this assessment, and returning to the point made at the beginning of this Summary and Outlook section, silver's residual precious metal status could see some slight bias to the upside in 2003, particularly if gold makes a move and especially if political and financial tensions were to grow again.

Figure 1
World Silver Supply



Supply

- Total supply declined by 1.7% last year, to reach 863.0 Moz (26,843 t).
- Mine production fell by 0.6%, with sharp declines in the United States and Chile outweighing strong growth in Australia, Canada and Russia.
- Scrap supply increased marginally to reach 184.9 Moz (5,751 t).
- Government sales (specifically from China) fell sharply.
- A small amount of net disinvestment occurred.

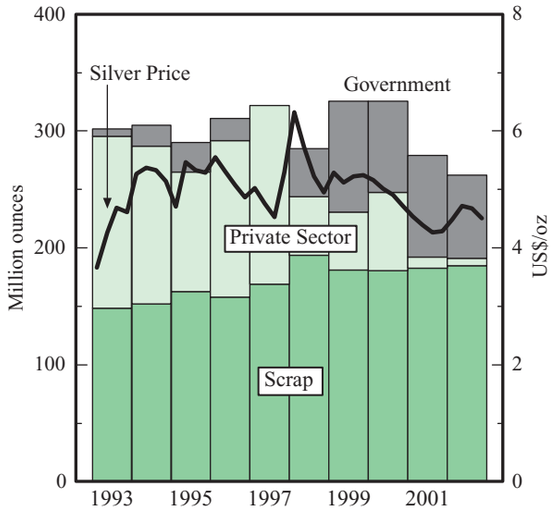
Overall silver supply fell marginally last year. The fall was concentrated in government sales, which declined by 18% or 16 Moz (500 t), but mine output also fell slightly. These declines were sufficient to more than offset an increase in scrap supply and a switch to net disinvestment.

Mine production in 2002 was some 0.6% or 3.3 Moz (103 t) down on the level of 2001. Output fell in the Americas as well as in Asia and Africa.

Mexico maintained its position as the world's number one producer, with higher output at Industrias Peñoles (the world's largest silver producer) resulting in a slight rise in that country's production. Sharp declines were recorded in the United States and Chile largely due to lower by-product silver production at copper mines. The decline in the United States was exacerbated by the closure of the McCoy/Cove gold mine in Nevada. Partially offsetting these declines were strong performances from Australia, Canada and Russia which recorded output increases of 5%, 8% and 20% respectively.

Weak global base metals prices contributed to a 3% reduction in silver production from lead and zinc and a 1% decline in silver output from copper mines. The declines in output from lead and zinc mines also relates to a structural reduction in concentrate production due to reserve exhaustion, a situation that was particularly evident in Europe following the closure of mines at Los Frailes in Spain and Laisvall in

Figure 2
Mobilization of Above-ground Stocks



Sweden. Silver by-product from gold mines also declined last year, largely due to lower grades and mine closures in the United States and Chile.

In contrast to the decline in silver production as a by-product, silver output from primary mines rose by 8% to reach 161.0 Moz (5,008 t). A major factor contributing to this was a 27% increase in production from Cannington in Australia, the world's largest silver producing mine.

At the moment, it appears silver output will fall again in 2003 as base metals producers are forecast to further scale back their operations and little new additional capacity is scheduled to come on stream. However, potential increases in Russia (where mining at the giant Dukat mine started in December 2002) and China could alter the outlook.

Scrap supply increased marginally last year, up by 1.2%, to reach 184.9 Moz (5,751 t). An 8% decline in scrap generation in the United States (that was in fact related to abnormally high scrap in 2001) was offset by an increase in shipments of old Maria Theresa Taler coins from the Middle East.

Net **government sales** fell sharply in 2002. The reduction was due to Chinese sales which declined from 68 Moz (2,100 t) in 2001 to 51 Moz (1,600 t) last year. 2002's decline in Chinese sales was, we believe, more related to the low silver price than exhausted stocks (indeed we have revised upwards our estimate of outstanding Chinese stocks). Net sales from other countries were dominated by the United States, where stocks were used to supply the bulk of the US Mint's silver coinage programs.

The market returned to a small level of net implied **disinvestment** in 2002. The implied net investment/ disinvestment number is a residual figure and should be treated as indicative rather than actual. Indeed the small absolute size of this number (20.9 Moz or under 3% of total demand) suggests a lack of commitment on the part of investors rather than a return to wholesale selling. Moreover, the small level of net disinvestment does not necessarily imply a lack of investors in the market - indeed turnover and open interest on the Comex increased sharply last year.

Demand

- Total fabrication fell by 3.5% in 2002 to 838.2 Moz (26,071 t), its lowest level since 1998.
- Jewelry and silverware suffered most, slipping 9% to 259.2 Moz (8,061 t).
- Photographic demand dropped 4%, its third consecutive annual decline, to 205.3 Moz (6,386 t).
- Industrial demand in contrast rose a fraction, partially recovering to 342.4 Moz (10,651 t).
- Coin and medal fabrication rose 3% to 31.3 Moz (973 t), mainly due to US gains.
- Hedging moved to the demand side with the net producer book falling by 24.8 Moz (772 t).

The 3.5% fall in **total fabrication** in 2002 to 838.2 Moz (26,071 t) was primarily the result of the 9% drop in jewelry and silverware offtake which in turn was overwhelmingly due to a slump in Indian demand. In fact, if India were excluded from the global picture, total fabrication last year actually rose by 1%. However, on a non-India basis, total fabrication in 2002 was still some 57.9 Moz (1,800 t) or 7% lower than in 2000. This highlights the extent to which other factors were at work, blocking a stronger recovery from the 2001 slump taking place.

The prime driver of the fall in 2001 fabrication was the 10% collapse in **industrial** offtake, the most important segment of fabrication. The fact that this component rose only just over 1% in 2002 therefore shows the extent to which it has still to recover. But even here India has the power to distort. On a non-India basis, industrial fabrication fell by 13% in 2001 but then rose by a more healthy 4% last year. That it remains substantially below its 2000 peak illustrates how the general slowdown in the world economy and the specific collapse in such industries as IT and telecommunications are still hurting offtake. The start of a healthier recovery last year was mainly the result of an end to and partial reversal of 2001's damaging destocking, for example in the United States, and

Figure 3
World Silver Demand

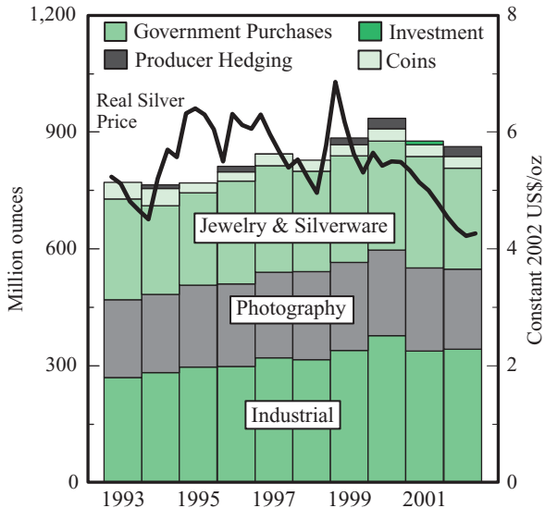
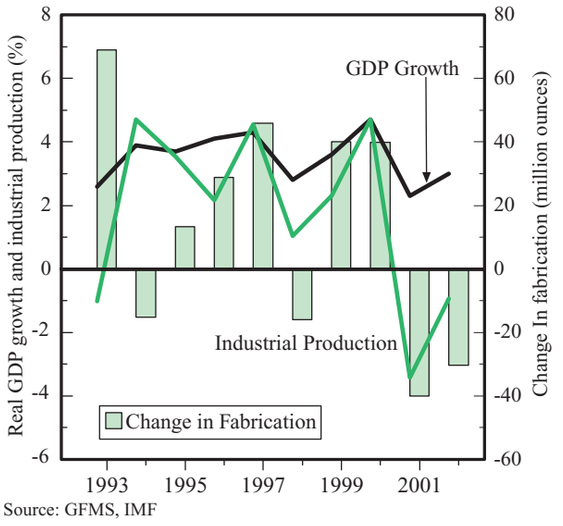


Figure 4
Fabrication Demand and World Economic Indicators



Source: GFMS, IMF

through robust demand for consumer durables in East Asia. The 13% slump in India's industrial demand (chiefly non-traditional quasi-industrial products) in 2002 was mainly due to a quite separate factor, the weakness of its agricultural sector.

This weakness and silver's price volatility were the key contributors to the close to 30% fall in India's **jewelry & silverware** fabrication in 2002. As before, this performance masks improvements elsewhere and, excluding India, this category of fabrication rose by 1% last year (versus the 9% global fall). Much of this gain was concentrated in Thailand and then China, the CIS, Mexico and Turkey. Their gains were due mainly to buoyant jewelry consumption and also to market share gain, through low labor cost advantages, from European producers, the only other major jewelry fabricating region to show a fall last year. The health of jewelry consumption (outside of India) last year was partly due to the swing in fashion in favor of silver though there was also an element of consumers trading down from gold in economically depressed times. This robustness, however, did not extend to silverware whose consumption is again estimated to have fallen sharply, chiefly through ongoing secular changes to consumer spending patterns.

Photographic demand for silver fell by 4% in 2002 to 205.3 Moz (6,386 t). This was its third consecutive annual decline which could be taken as a sign that the decline has now become structural due to digital inroads. This is most pronounced in Japan (whose offtake fell by 7% last year) though it is also important in North America and in Europe. Outside of these regions, silver nitrate consumption is faring better, in some cases rising. The fall in photographic demand last year, however, was also the result of cyclical or one-off factors such as the sluggish world economy, a terrorism derived reluctance to travel, especially in the United States, and an uncomfortably hot summer in Japan.

The final sector of fabrication, **coins & medals**, rose by 3% last year to 31.3 Moz (973 t). This was primarily the result of higher US bullion coin fabrication which offset that country's lower commemorative minting and the decline in European fabrication, in particular German output.

Producer hedging switched to the demand side of the balance in 2002 as a result of the 24.8 Moz (772 t) cut in the net hedge position. Given that 2001 saw modest levels of net hedging, the combined swing from that year to 2002 for this component stands at 43.7 Moz (1,359 t). This left the global hedge book at end 2002 at 72.4 Moz (2,253 t). The decline in hedging in 2002 was mainly the result of a collapse in the open options positions. This was chiefly a function of producers having taken out so many options contracts in fourth quarter 2001 when the market was in backwardation. This options change more than offset the small addition to producers' forward positions, a good chunk of which were added during the second quarter of 2002 when prices were firmer.

2. Silver Prices

- The annual average silver price rose over 5% in 2002 though the $4.60 reached remains low historically.
- The short-termism of investors, heavy Chinese selling towards $5 and weak fabrication largely explain the market's inability to hold on to gains achieved through speculative activity and supportive gold moves.

Silver prices missed out on much of the hefty gains that gold saw last year, rising just 5% year-on-year, though they fared better than many base metals which saw price declines. Silver's gain on an intra-year basis was even smaller at under 2%. This should not be taken as a sign that prices were stable since average volatilities actually reached a three year high. This also helped generate a quite wide trading range but only within 2002; silver prices over the last three years have been quite stable, seeing the smallest trading range of the four main precious metals.

Despite the 2002 rise, silver prices remain low historically; excluding 2001, the last time the annual average was lower than 2002's was in 1993. In real (dollar) terms, the situation is yet more brutal; (again excepting 2001), the annual average has not been lower this side of World War II.

The situation as regards prices in other currencies in 2002 was mixed. On the producer side, Australian dollar prices, for example, only just managed a rise year-on-year and fell intra-year whereas silver in Mexican peso terms rose not far off 10% year-on-year. Similarly on the consumer side, euro and yen prices fell noticeably intra-year but rupee prices rose more than dollar prices both intra-year and year-on-year.

Silver lease rates saw two distinct phases last year. The first was the volatile collapse that occurred in January 2002 as the squeeze, which had begun at end-

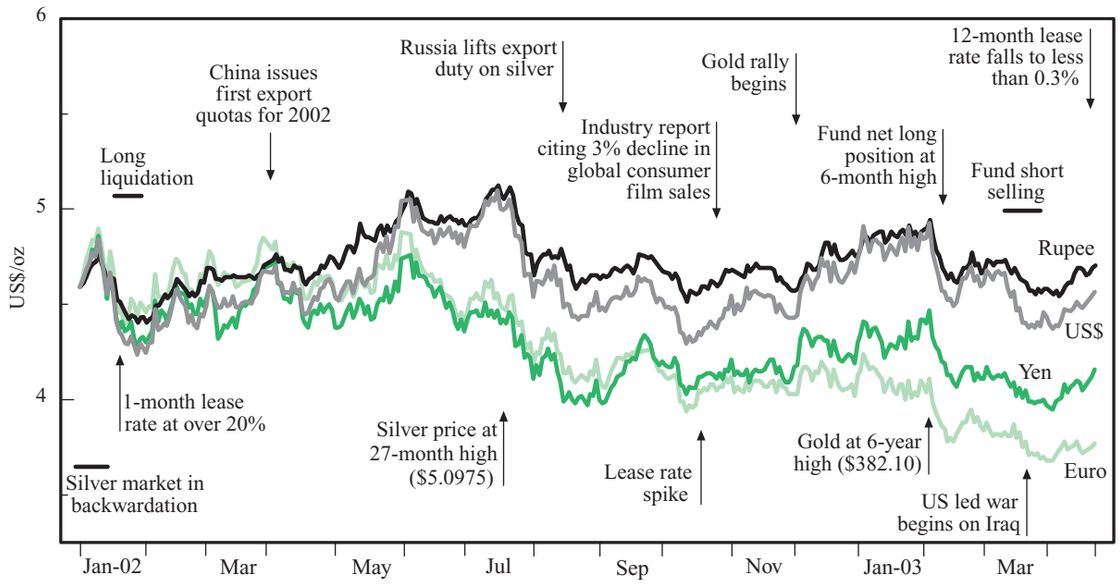
US$ Silver Price

	1972	1982	1992	2002
Annual Average	1.677	7.922	3.946	4.599
Maximum	2.031	11.110	4.335	5.098
Minimum	1.374	4.901	3.648	4.235
Range:Average	39.2%	78.4%	17.4%	18.8%

The Silver Price in Other Currencies in 2002

	US$/oz	Euro/kg	Rupee/kg	Yen/10g
Annual Average	4.599	156.7	7,934	184.9
Change y-o-y	5.3%	-0.1%	6.9%	8.5%
Maximum	5.098	174.4	8,655	206.6
Minimum	4.235	140.1	7,395	168.7

Figure 5
London Silver Market: Spot Price
US$/oz; other currencies reindexed to 2nd January 2002



November 2001, fell apart. This took the 3-month rate, for example, from over 10% to under 1% in less than a fortnight. The second phase, characterizing the remainder of the year, was a generally steady slide with periodic brief spikes. This left rates by year-end at near 'give away' levels, especially at the short end with 3-month silver only just holding above 10 basis points. The picture, however, was not that rosier further up the curve with 12-month rates down to around 30 basis points. The fact that it was the short end which had collapsed to levels below which it would be hard to go any lower provided a good pointer to one of the main drivers of the slide in lease rates, weak fabrication demand. It is at the shorter end where fabricator borrowing tends to be heaviest.

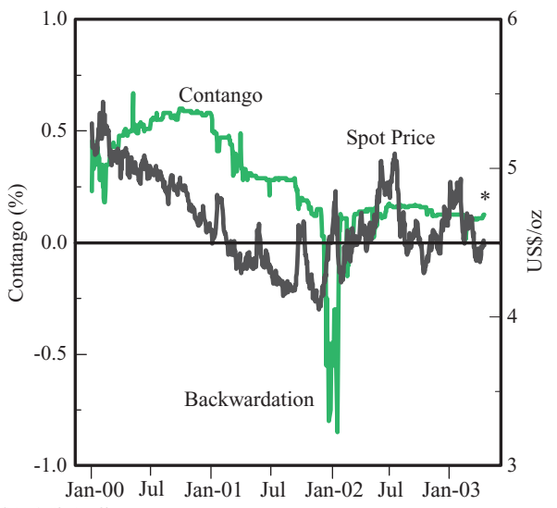
Market Analysis

The year as a whole was dominated by three key forces. One of the most important was investors' activity (often in sympathy with gold) which was largely responsible for the year's high price volatility whilst their short-termism made it hard for the market to hang on to the gains made on occasions. This was reinforced by the two other key factors, a pick up in Chinese selling towards the $5 mark and generally weak fabrication.

2002 began, however, with a heavy fall whose prime cause was quite separate from the above. December 2001 and early January 2002 saw a sharp rally, mainly due to a lease rate squeeze which compelled shorts to cover positions. Once this had run its course and in the absence of supportive fundamentals, the abrupt collapse followed. It is of note that prices did not sink back to pre-squeeze levels. On this basis, the squeeze could be regarded 'a success' and it was feared this might encourage further such activity. The main reasons this was not the case for the rest of 2002 was that there was never any real need to defend the $4 barrier and, secondly, speculative participants had plenty of other opportunities to play the market.

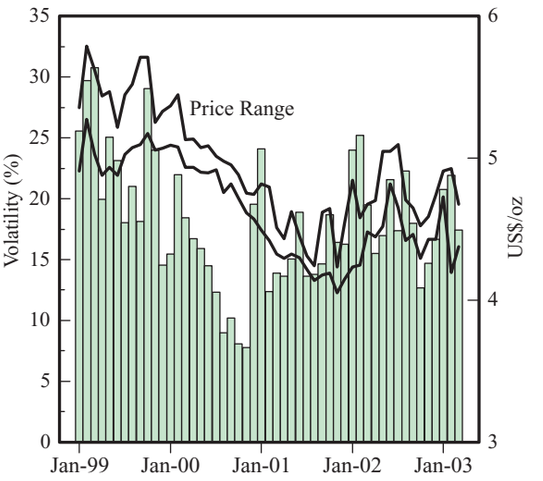
Speculative activity certainly played a key role for the rest of the year. The funds on Comex, for example, sold heavily from mid-July through to mid-October and this was clearly a key force behind that period's price collapse. Others groups showing interest in silver during 2002 included small investors on Comex and US retail investors. It is difficult to argue the metal was a strong direct beneficiary of geopolitical, let alone macro-economic, concerns. Investor interest was instead more the product of the favorable

Figure 6
London Spot Price and 3-month Contango



* to 17th April

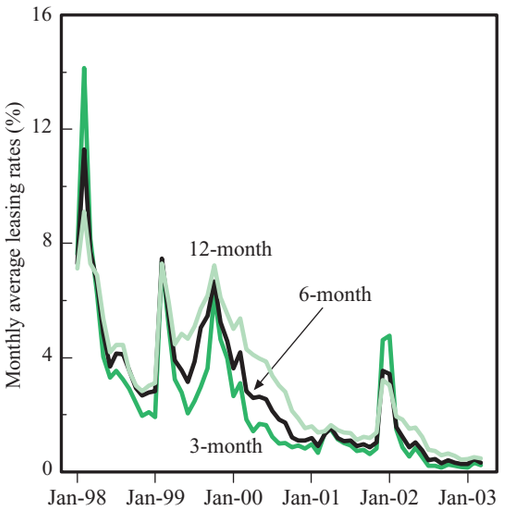
Figure 7
Daily Silver Price Volatility
Based on London fixings (30-day rolling average)



Volatility (US$ price)
Based on London fixings (30-day rolling average)

1998	1999	2000	2001	2002
37.3%	23.3%	13.4%	14.9%	18.4%
Q1-02	Q2-02	Q3-02	Q4-02	Q1-03
22.4%	17.4%	19.4%	14.5%	20.0%

Figure 8
Silver Leasing Rates



speculative climate that spilled over from the impact of these two factors on gold. It was no coincidence that the timing of the gold and silver rallies was broadly the same and it would be hard to argue silver led the way.

An important disparity between the two is that when investor interest waned in gold over the late summer, prices tended to drift sideways whereas in silver, a heavy collapse ensued. This was partly the result of different types of investors being involved in each. Gold seemingly attracted a fair number of longer term 'buy and hold' investors, not solely motivated by the volatile 'war premium' but also by longer term macro-economic issues. In contrast, silver appeared to be of interest just to short term, highly speculative players, willing to sell any dip and buy into any rally and so exaggerate moves triggered by other forces.

Mention should also be made of exchange rates as there were times, the Spring rally for example, when silver price gains and dollar weakness coincided. It is perhaps best, however, to view this as overspill from gold's moves which were partly exchange rate driven.

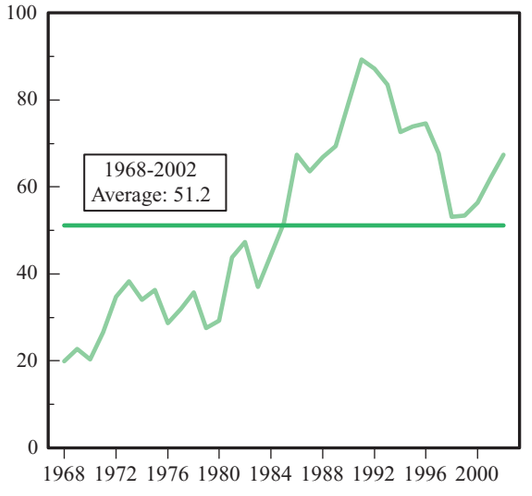
A perhaps more important reason for silver not being able to hold on to its gains was the far smaller amount of de-hedging than that seen in gold. This made up over 10% of last year's gold demand but for silver, while hedging moved to the demand side, it made up less than 3% of the total.

Another factor specific to the unwinding of silver's gains was sales from Chinese government stocks. Total disposals from this source last year were in fact a little lower than in 2001 (though still substantial). But the acceleration in the rate of these sales as the price reached the $5 mark in early Summer was critical in turning the market. Similarly, in the fourth quarter when prices fell below $4.40, a marked slow down in Chinese selling helped stop the market sinking further.

The final key area for price sluggishness relates to fabrication demand which last year fell by over 3% (and this follows on from a 4% year-on-year fall in 2001), chiefly as a result of the slowdown in world GDP growth and the price-linked drop of around 23% in Indian demand. Silver also seemed to have fewer end users willing to take metal on dips in the market. In part this is due to silver being less dependent on the price responsive markets. Middle Eastern fabrication, for example, represents less than 2% of global silver demand but around 15% of total gold demand.

So far in 2003, silver prices have continued to move largely at the whim of short term speculators with heavy fund selling and gold's collapse largely responsible for silver's descent from over $4.90 in early January to back under $4.40 by late March. Chinese selling, however, was also again a significant contributory factor. Fabrication certainly did not stand in the way of this fall, nor explain April's modest recovery, as this source of demand has remained weak, a situation that could persist for the rest of the year while the world economy continues sluggish.

Figure 9
The Gold/Silver Price Ratio



Silver Price Forecasting Issues

Over the course of the last three decades, silver has experienced some major fluctuations, with the monthly average nominal price reaching a peak in January 1988 of $39.28 and a trough in March 1993 of $3.65. However, since 1990, for 92% of the time, the average monthly silver price has traded in the $3.50 to $5.50 range. For most market participants, a key unknown is the direction prices will take over the next 5-10 years. Is the market destined to trade in the range bound manner of recent years, with only brief excursions above $5, or will economic growth, a depletion of global stocks or some other factor trigger a new phase for the silver price?

This box touches on the main issues involved in the production of medium to long-term silver price forecasts. When looking at commodity price forecasting, three methodologies are usually considered: a single equation regression of price; time series modelling and a system of structural supply and demand equations, solved for equilibrium price and quantity.

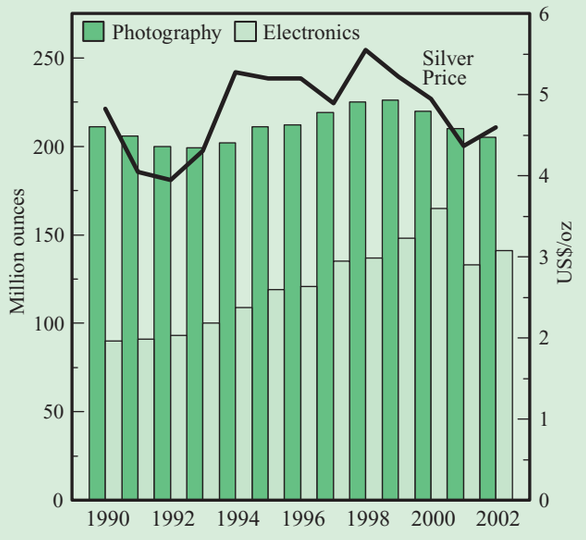
A single equation regression models the silver price as a function of certain external variables. These variables might include economic factors such as GDP or industrial production, the price of competing metals, or lagged silver consumption, production or prices. While this technique yields a single and relatively straightforward equation that may explain silver price movements, it has some important limitations. Specifically, it ignores the structural relationships that underlie the price formation process. A variant of the single equation model is the ARIMA (auto-regressive integrated moving average) model – a time-series methodology that treats price formation as a purely mathematical process. Although this technique has the advantage of simplicity, forecasts can be inaccurate and subject to wide prediction intervals. Moreover, times series techniques provide no information about the fundamental relationships driving prices. This leads to the third option of a system of structural supply and demand equations. These equations, which can be estimated econometrically using historical data, provide useful information in their own right and can also be used to simulate future supply, demand and market clearing prices. This methodology is particularly suitable for the production of long-term forecasts of annual average prices. Annual average prices are perhaps the best indication of the fundamental factors driving the market and are also the output of most interest to those looking at forecasting prices, be they mining company, jewelry manufacturer or industrial user.

So what are the key structural relationships underlying the silver market and how do they influence the price? On the supply side, mine production is obviously the major constituent. However, other factors, in particular scrap response and stock levels are perhaps both harder to predict and also the cause of more price volatility. While the responsiveness of scrap supply to price and economic factors can be estimated from historic data, stock levels (and the price responsiveness of their release) require a different and unique insight. On the demand side, there are a number of key uncertainties and relationships to be analyzed, including the future direction of photographic and electronics offtake and the evolution of the important Indian and Chinese jewelry markets.

Looking at our historical quantitative analyses, the key economic variables influencing silver demand in the electronics sector have been found to be the level of industrial production and lagged silver prices, while photographic demand has been closely correlated with both industrial production and cumulative digital camera sales. Although quantitative econometric equations form a sound basis for forecasting the key elements of silver demand, the forecaster must also make a judgement on whether these relationships will remain unchanged or further develop going forward.

In summary, econometric based systems of silver supply and demand provide the most robust framework for producing medium to long-term silver price forecasts. However, this quantitative technique must be supplemented by information provided through a profound qualitative understanding of the market.

Figure 10
World Photographic and Electronics Demand



3. Investment

- Funds were fairly active in the market last year but this was mostly in the form of short term trading by Commodity Trading Advisors and smaller hedge funds on Comex, which saw a marked rise in turnover and open interest in 2002. There was only a limited amount of activity in the Over-The-Counter and physical markets.

Overview

Fund purchases and sales of silver were a key factor behind the ups and downs of the silver price last year. There was a strong correlation, for instance, between apparent changes in fund positions on the Comex and movements in the metal's price. Of course, this does not necessarily mean that funds alone were always driving the price. Indeed, it was frequently the case that a rise or fall in the price was itself sufficient to prompt fund buying or selling respectively. This indicates something important about the nature of most of the investment demand for silver last year. Namely, that it was predominantly driven by trend following or range trading funds acting via the futures exchange that were looking to trade a position.

Activity was largely centered on short term speculation rather than on long term "buy and hold" strategies based, for example, on investors' views on silver's fundamentals (which were generally perceived to be poor due to the metal's vulnerability to weakness in industrial production). Similarly, there is no conclusive evidence that funds went into silver last year on "safe haven" grounds. GFMS made the point in its recently released *Gold Survey 2003* publication that even in gold (traditionally the safe haven among precious metals), this type of buying was "spotty" in 2002, most investment being driven by short term profit opportunities. Thus, with the exception of some retail investor demand in the United States, the "quality" of much of the new silver investment observed last year was debatable. (It is noteworthy in this regard that silver failed to attract the increased high net worth buyer interest that was a feature of the gold market last year.)

Silver Price and Investment Indicators

	2001 Average	2002 Average	Change y-o-y
Silver Price	4.370	4.599	5%
Contango (3-mth annualized)	2.56%	0.94%	n/a
US$ Libor (3-mth annualized)	3.78%	1.79%	n/a
S&P 500 Index	1,194	994	-17%
CRB Index	206	211	3%
XAU Index	54	69	28%
World Inflation	3.3%	3.4%	n/a
World GDP	2.3%	3.0%	n/a

In fact, the data on implied net disinvestment in Table 1 on page 7 indicates that there was even a small amount of net selling by investors in 2002. (This number is, of course, a residual that is derived from the sum of all the other components of supply/demand rather than independently calculated. As such, it is best viewed as indicative rather than actual.) At 20.9 Moz (650 t) though, this number perhaps best indicates a lack of firm commitment to either side of the market. This is partly because the absolute volume is very low. Compare it, for instance, with the annual average for the same data series (implied net disinvestment) between 1993 and 2000, which comes to a more robust 100 Moz (3,100 t) and when there was no doubt at all about the trend in investors' behavior - they were substantial net sellers! Over the last two years, by contrast, there has been a degree of stability, with no major shifts either in or out of the metal. We suspect that this may be due to the price having remained in a range that favors neither the strategic seller nor the fundamentally-driven buyer. This is not to say that there has been no investor participation in the market. Far from it; Comex data (see next section), for instance, shows that the non-commercial net long position in futures last year hit its highest level since the first quarter of 1999.

Undoubtedly a major influence last year was the performance of the gold price. This stimulated fund activity in silver, in some cases on the expectation that silver's rally would at some point catch-up with gold. Unfortunately for those enthusiasts of the gold:silver ratio trade, this is something that never occurred. Nevertheless, given the uptrend in gold, the low contango and silver's ability to spring surprises it was no mystery that speculation generally took place from the long side. (The important exception to this for some investors and most proprietary traders being when silver approached or exceeded the $5 mark in the May-July period.)

Data on bullion stocks also suggest that investor selling was not much of an issue in 2002. As explained in more detail in Chapter 5, both European dealers' and Comex stocks ended the year higher. This probably reflected more a reduction in lending (itself brought about by producer de-hedging and the weakness of fabricator borrowing) than any significant

London Bullion Market (LBM) and Comex Turnover
(daily averages)

	LBM No. of Transfers	Turnover Moz	Comex Turnover Moz	LBM/ Comex Ratio
Jan-02	355	176	63	2.8:1
Feb	257	109	71	1.5:1
Mar	239	78	41	1.9:1
Apr	230	69	74	0.9:1
May	307	100	55	1.8:1
Jun	262	107	97	1.1:1
Jul	224	73	67	1.1:1
Aug	214	66	67	1.0:1
Sep	184	62	41	1.5:1
Oct	243	68	45	1.5:1
Nov	168	58	77	0.8:1
Dec	208	79	55	1.4:1
Jan-03	216	90	69	1.3:1
Feb	247	108	108	1.0:1
Mar	215	90	52	1.7:1

World's 10 Largest Commodity Trading Advisors, 2002

	CTA Assets (US$ billion)
Campbell & Co	3.7
Graham Capital Mgt	2.3
Quantitative Financial	1.5
John W Henry & Co	1.3
Crabel Capital Mgt	1.2
Sunrise Capital	1.1
Dunn Capital Mgt	1.0
Rotella Capital	0.8
Grinham Managed Funds Pty	0.8
Analytic Investment Mgt	0.7

Source: Zurich Capital Markets 2003
All figures refer to end-December. Data based on entities reporting to the Zurich Capital Markets Database.

World's 10 Largest Hedge Funds, 2002

	Fund Equity (US$ billion)
Orbis Investment Mgt	4.0
Clinton Group	3.7
Millennium Intl Mgt	3.7
Carlson Capital	3.4
Lazard Asset Mgt	3.2
Elliott Mgt Corp	3.0
Marshall Wace Asset Mgt	2.8
King Street Advisors	2.6
Staro Asset Mgt	2.1
Ellington Capital Mgt	2.0

Source: Zurich Capital Markets 2003
All figures refer to end-December. Data based on entities reporting to the Zurich Capital Markets Database.

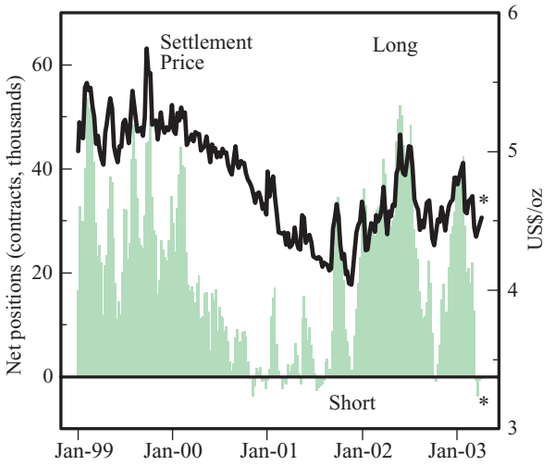
rise in investor holdings. It does nevertheless strongly indicate that there was no major move out of the metal last year by existing private sector holders.

The first quarter of 2003 broadly saw a continuation of the above-described trends. Investment has continued to be concentrated in the short term and via the futures market. Prices were chased up in January and early February but seemingly without too much conviction - silver failed after all to penetrate the $5 level. They were then chased down again as profits were taken and stop-loss sales took place in the second part of February and into March. Once again silver was largely following (albeit weakly) in the footsteps of gold. We very much expect more of the same unless circumstances change sufficiently to justify a more serious assault on the $5 ceiling or, perhaps less likely, a move down towards the $4 mark. In both cases we would expect the consequently changed supply/demand fundamentals for silver to bring about a more considered move out of or into the metal by those large investors who have in the last year or so been conspicuously absent from the market.

Comex

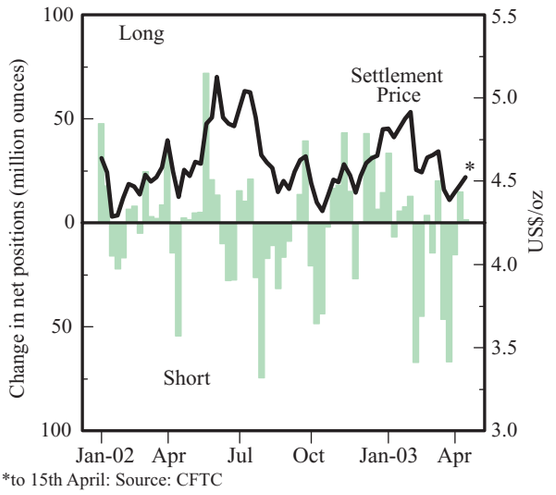
Weak global stock markets and the uncertain geopolitical environment prevalent in 2002 were favorable for speculative investor interest in the commodity, and in particular precious metals, markets. Although these elements were felt more strongly in the gold market, silver was also a beneficiary, with

Figure 11
Comex: Non-commercial Net Open Interest
Weekly Net Positions and Settlement Price



*to 15th April; Souce: CFTC

Figure 12
Comex: Non-commercial Net Open Interest
Changes in Weekly Net Positions



*to 15th April: Source: CFTC

turnover and open interest on the Comex registering increases in 2002. Average daily turnover rose by 21% to 12,542 contracts (equivalent to 62.7 Moz), while the average daily open interest was up by 14% to 81,244 contracts (406.2 Moz). Although both turnover and open interest registered growth, the increase only erased losses incurred during the previous two years. Neither managed to exceed the level achieved in 1999, and turnover was less than two-thirds that recorded in the mid-1990s.

With the exception of a brief small net short in October, funds' positions, as illustrated by CFTC non-commercial reportable data, remained net long of silver throughout 2002. Looking at futures only, funds started the year with a net long of 32,613 contracts - a position that had been rapidly built up during December 2001. This position was maintained at a broadly similar level through the first half of the year, peaking on June 4th at 52,172 contracts, a date when the Comex settlement price reached a full year high of $5.13. From this point, funds unwound their position over the course of the following four months as the associated fall in the Comex settlement price culminated with a second-half 2002 low of $4.29 on October 10th. In comparison to 2001, the net long in 2002 was both larger in absolute terms and perhaps more committed. The average futures position in 2002 was a net long of 27,372 against an equivalent figure for 2001 of 7,284 contracts. The smaller net long in 2001 was essentially a result of a substantial and sustained gross short position in that year, while the larger net long of 2002 was assisted by a much smaller gross short. At 8,775 contracts, the average gross short in 2002 was 64% lower than in 2001, while the average gross long increased by 14% to reach 36,147 contracts.

Net "Fund" Position on Comex(period averages for non-commercial net futures position, tonnes equivalent and settlement price)

		Contracts	Tonnes	Price
1998		25,513	128	5.50
1999		30,153	151	5.22
2000		13,162	66	4.95
2001		7,284	36	4.37
2002	Q1	30,832	154	4.49
	Q2	39,129	196	4.72
	Q3	26,420	132	4.68
	Q4	14,373	72	4.51
2003	Q1	26,593	133	4.67

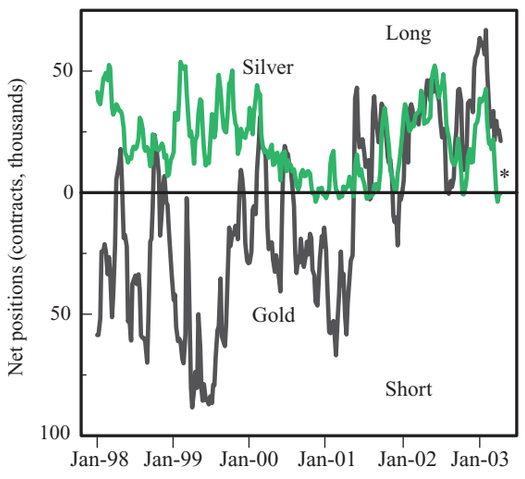
Tocom

In contrast to 2001 - a year when open interest fell sharply and turnover rose marginally, both turnover and open interest recorded healthy increases in 2002. Turnover on the Tocom surged at the end of 2001 and into early 2002, a period that coincided with the full year 2002 peak in yen silver prices. On January 18th turnover on the Tocom silver contract reached 14,199 contracts (the maximum for the year), equivalent to 27 Moz (850 t). Following this early-year spike in activity, turnover subsided, although still maintained a level above that of most of 2001. The average daily turnover for the full year reached 3,779 contracts - 40% higher than the equivalent figure for 2001.

Open interest followed a similar pattern to turnover, peaking in mid January at 23,426 contracts. Open interest did subside from this level in March, but with the brief exception of a sharp dip in early July, remained at elevated levels throughout the year. The average daily open interest on the Tocom rose by 23% year-on-year to reach 19,940 contracts.

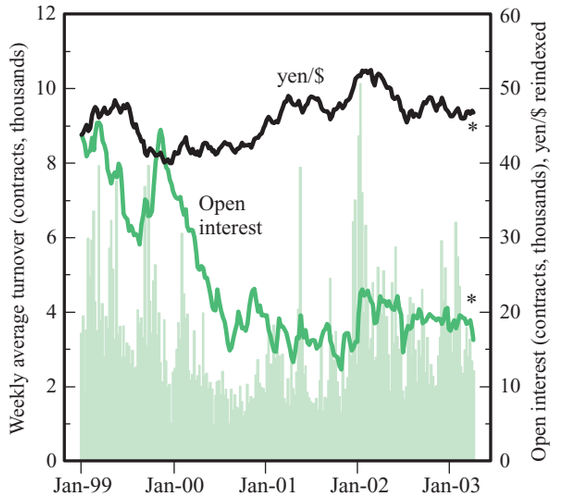
During 2002 the Tocom marginally increased its share of combined Comex and Tocom futures turnover. Combined futures turnover on the two exchanges totalled the equivalent of 17.5 billion ounces in 2002, of which Tocom accounted for 1.8 billion ounces or 11%, against 10% in 2001 and 7% in 1999.

Figure 13
Comex: Non-commercial Net Open Interest
Weekly Net Positions



*to 15th April; Source: CFTC

Figure 14
Tocom Futures Turnover and Open Interest



*to 18th April; Source: Tocom

OTC Market

As was also the case in 2001, last year there was no obvious sign of major investor transactions in spot, forwards or derivatives through the Over-The-Counter (OTC) market. As stated earlier in this Chapter, fund activity was overwhelmingly centered on Comex. This outcome was not all that surprising given the type of funds who were active and also their trading strategies.

Our information is that once again the large macro funds - which are more inclined and able than Commodity Trading Advisors (CTAs) or the smaller hedge funds to use the OTC market - were not heavily involved in silver. When making large bets on price movements such macro funds will generally need a convincing buy or sell story and there were no good arguments available last year to go either heavily long or short. This is not to say that there were no opportunities to trade a range, for example, buying below $4.50 and selling out of these positions as the $5 level was neared. However, it appears as if even these trades were as often or not executed on the Comex rather than through the OTC market and were also individually not on a very large scale. One supposes, nevertheless, that they were at least generally more successful than the typical trend following CTA investor or speculator, who, unless very nimble, risked being caught out by the marked variability in the price trend last year.

Physical Investment

Physical investment in bars and coins was not an important feature of the silver market in 2002. On the other hand, neither was the selling back of existing holdings of bars and coins particularly noteworthy. However, there are two small exceptions to these observations. The first concerns the pick-up in retail demand in the United States last year and in the first quarter of 2003.

For historical reasons, the United States has traditionally seen more investment (and disinvestment) of silver bullion by private investors than nearly all other parts of the world. European investors, for example, almost without exception gravitate towards gold. The same is true for East Asia and most of the Middle East. In the United States though, silver still retains a following and the growing tensions in recent months, above all in the political sphere and mainly over Iraq encouraged some investors to buy physical silver, mainly in the form of Eagle coins (see page 68 for details) but also to a lesser extent 100 oz bars and other bullion products.

The other interesting exception, this time in terms of physical disinvestment, was the continued dishoarding of circulating coins in Europe (this mainly stemming from the changeover from national currencies to the euro) and Maria Theresa Taler coins in the Yemen (see the scrap section in Chapter 5 for more on this).

4. Mine Supply

- Mine production declined modestly last year by just less than 1% to 585.9 Moz (18,224 t).
- Primary silver mines contributed 27% of the total, or 161.0 Moz (5,008 t), an 8% increase from the previous year. Silver by-product generated in other categories declined, gold (-10%), lead/zinc (-3%) and copper (-1%).
- Cash production costs at primary silver mines fell sharply to $2.31/oz, cash margins widened by 68%.
- The global hedge book was 26% lower from the previous year due to a collapse in open options positions.

Top 20 Silver Producing Countries

Ranking 2002	Ranking 2001		Output (Moz) 2001	Output (Moz) 2002
1	1	Mexico	90.8	91.7
2	2	Peru	86.0	88.8
3	3	Australia	63.3	66.8
4	4	United States	52.6	46.4
5	5	China	46.7	44.9
6	7	Canada	40.7	44.0
7	8	Poland	38.0	38.9
8	6	Chile	43.4	34.9
9	10	Russia	20.8	25.0
10	9	Kazakhstan	24.3	24.9
11	11	Bolivia	13.7	14.5
12	14	Sweden	8.8	9.4
13	13	Morocco	9.1	8.5
14	12	Indonesia	9.3	8.2
15	15	Argentina	5.6	4.3
16	16	South Africa	4.1	3.7
17	17	Turkey	3.7	3.7
18	18	Japan	2.6	2.6
19	19	Iran	2.6	2.5
20	22	Greece	2.0	2.4

Top 20 Silver Producing Companies

Ranking 2002	Ranking 2001	Company Name	Country	Output (Moz) 2001	Output (Moz) 2002
1	1	Industrias Peñoles	Mexico	51.7	52.7
2	3	BHP Billiton	Australia	33.0	44.5
3	2	KGHM Polska Miedz	Poland	37.4	38.3
4	4	Grupo Mexico	Mexico	22.1	19.6
5	6	Barrick Gold	Canada	15.5	17.8
6	5	Rio Tinto	UK	17.7	17.2
7	9	Coeur d'Alene Mines	USA	10.9	14.8
8	6	MIM Holdings	Australia	13.8	13.2
9	7	Cia. de Minas Buenaventura	Peru	12.2	11.7
10	12	Noranda Inc.	Canada	10.0	11.3
11	10	Volcan Cia. Minera SA	Peru	10.7	10.9
12	8	Pasminco	Australia	11.8	9.5
13	15	Hecla Mining Company	USA	7.4	8.7
14	16	Boliden AB	Sweden	7.4	8.5
15	11	Codelco	Chile	10.4	8.2
16	17	PanAmerican Silver	Canada	6.9	7.8
17	13	Comsur	Bolivia	7.8	7.6
18	14	Societe Metallurgique d'Imiter	Morocco	7.7	7.1
19	20	Luismin SA de CV	Mexico	5.8	5.9
20	21	Soc. Minera Corona	Peru	5.1	5.6

Mine Production

- Despite higher output from the world's top three silver producing countries, global mine production declined by just under 1%, the largest annual drop since 1994.
- Lower production at copper mines combined with closures in the lead/zinc and gold sectors left silver by-product reduced from all three categories.
- US production fell 12% while output in Chile was down by a significant 20%. Growth in Russia (20%) and Canada (8%) partly offset the decline

Silver mine production edged slightly lower in 2002, slipping from the record levels set in 2001 to finish the year at 585.9 Moz (18,224 t), a decline of just less than 1%. Although the fall was modest it represented the largest annual drop in output since 1994. Europe was the only region in the Western World to record an increase in production. The Americas, Asia and the African regions all reported output reductions. Elsewhere there were offsetting gains in Russia and Kazakhstan.

The top five producing countries ranking (see table above) was unchanged last year with Mexico at the head of the group, and for the third consecutive year recording higher output. A part of the increase in Mexico's production was due to a rise at the world's largest silver producer, Industrias Peñoles. Nevertheless, strong growth in Peru, where volumes were boosted by the first full year of operations at the giant Antamina mine, left only 2.9 Moz (91 t) between the two. The United States held its fourth place ranking despite a sharp drop in production, meanwhile, Canada and Poland moved up the table as Chile slipped from 2001's sixth to last year's eighth largest producer. As regards the significant declines in the United States and Chile, "demand-led" production cuts at some of the copper operations explained part of the fall. In addition, the closure of the McCoy/Cove gold mine in Nevada compounded the drop in the United States. (During the last decade that mine on average yielded 9.1 Moz (283 t) of silver per year.) Russia strengthened its position with extra output from the start-up of the Lunnoye silver/gold deposit in the Magadan region in June last year, while Indonesia and

Table 2
World Silver Mine Production
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Poland	29.4	27.6	31.6	30.6	33.8	36.0	35.9	36.7	38.0	38.9
Sweden	8.9	8.1	8.0	7.7	8.5	8.6	8.9	9.5	8.8	9.4
Greece	1.9	1.4	1.4	0.5	1.2	1.4	1.3	1.0	2.0	2.4
Spain	5.9	5.7	4.0	3.3	2.1	1.5	3.1	3.8	2.2	1.2
Romania	1.5	1.4	1.4	1.4	1.4	1.2	1.2	1.1	1.2	1.0
Bulgaria	3.1	1.8	1.4	1.1	1.0	0.8	0.7	0.6	0.8	0.8
Yugoslavia (former)	1.7	1.2	1.9	2.9	2.1	1.8	1.0	1.0	0.7	0.7
Portugal	1.2	1.0	1.2	1.1	1.1	1.0	0.9	0.7	0.7	0.6
Ireland	0.4	0.5	0.5	0.5	0.4	0.3	0.5	0.8	0.7	0.6
Czech & Slovak Republics	0.5	0.4	0.3	0.2	0.3	0.3	0.3	0.2	0.2	0.2
France	0.4	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Italy	0.2	0.5	0.5	0.3	0.1	0.1	0.1	0.0	0.0	0.0
Norway	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Other	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Europe	55.3	50.0	52.6	50.0	52.1	53.3	53.7	55.3	55.5	55.9
North America										
Mexico	71.2	71.2	72.6	81.3	86.9	91.6	75.2	89.7	90.8	91.7
United States	52.9	47.6	50.2	50.5	70.1	66.2	62.7	63.3	52.6	46.4
Canada	28.3	23.8	40.0	39.9	39.0	36.4	37.5	37.7	40.7	44.0
Total North America	152.4	142.6	162.8	171.7	195.9	194.2	175.4	190.8	184.0	182.1
Central & South America										
Peru	53.7	56.0	61.4	63.3	66.8	65.1	71.7	78.4	86.0	88.8
Chile	31.2	31.6	33.5	36.8	35.1	43.1	44.4	39.9	43.4	34.9
Bolivia	10.7	11.3	13.8	12.3	12.4	13.1	13.6	14.1	13.7	14.5
Argentina	1.4	1.2	1.2	1.0	1.1	2.2	3.3	3.0	5.6	4.3
Honduras	0.8	0.9	1.0	1.2	1.5	1.5	1.6	1.7	1.6	1.8
Brazil	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.3	0.3	0.2
Dominican Republic	0.5	0.3	0.7	0.5	0.4	0.2	0.1	0.0	0.0	0.0
Other	0.5	1.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2
Total Central & South America	99.5	103.1	112.3	115.9	117.8	125.8	135.3	137.5	150.8	144.8
Asia										
Indonesia	2.9	3.1	7.7	7.6	8.1	10.0	8.6	8.4	9.3	8.2
Turkey	2.3	2.1	2.1	2.9	2.9	2.8	3.5	3.5	3.7	3.7
Japan	4.4	4.3	3.2	2.9	2.8	3.0	3.0	3.3	2.6	2.6
Papua New Guinea	3.1	2.5	2.1	1.9	1.6	1.9	1.9	2.4	2.2	2.1
India	1.6	1.6	1.2	1.1	1.6	1.7	1.9	1.8	1.7	1.9
Thailand	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.7
Saudi Arabia	0.5	0.5	0.5	0.5	0.5	0.4	0.3	0.3	0.3	0.3
Philippines	1.1	1.0	1.1	0.8	0.6	0.6	0.6	0.7	1.1	0.3
Malaysia	0.5	0.4	0.4	0.3	0.3	0.2	0.1	0.0	0.0	0.0
Other	2.0	2.5	2.5	2.3	2.5	2.7	2.6	2.7	2.7	2.8
Total Asia	18.4	18.3	21.0	20.7	21.0	23.5	22.8	23.3	23.8	22.5
Africa										
Morocco	7.6	8.3	6.6	6.4	8.4	9.8	8.9	9.3	9.1	8.5
South Africa	6.3	6.2	5.7	5.5	5.2	5.1	4.9	4.6	4.1	3.7
Namibia	2.3	2.0	2.1	1.4	1.2	0.4	0.0	0.5	0.6	0.6
Zambia	0.6	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
Zimbabwe	0.8	0.7	0.7	0.3	0.3	0.2	0.2	0.1	0.1	0.1
Other	0.7	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
Total Africa	18.2	17.9	15.8	14.2	15.7	16.1	14.5	15.1	14.4	13.5
Oceania										
Australia	37.0	33.6	29.6	32.5	35.6	47.2	55.3	66.2	63.3	66.8
New Zealand	0.8	0.8	1.0	1.0	1.0	0.8	0.8	0.7	0.9	0.9
Fiji	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Oceania	37.9	34.4	30.6	33.5	36.7	48.1	56.1	67.0	64.3	67.8
Western World Total	381.7	366.2	395.0	406.0	439.2	461.0	457.7	489.1	492.8	486.6

Table 2
World Silver Mine Production
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Other Countries										
China	31.7	33.8	34.7	36.5	43.0	43.4	44.2	48.1	46.7	44.9
Russia	25.0	24.0	23.5	24.4	20.9	19.5	19.8	20.2	20.8	25.0
Kazakhstan	26.0	22.0	20.9	15.5	14.1	13.8	16.0	20.5	24.3	24.9
Uzbekistan	2.2	2.1	2.1	2.2	2.5	2.6	2.0	2.0	1.7	1.6
Armenia	0.5	0.5	0.5	0.9	1.0	1.0	1.0	1.1	1.2	1.3
Mongolia	0.8	0.9	0.9	0.9	1.0	1.1	1.0	1.1	1.1	1.1
North Korea	1.8	1.7	1.7	1.3	1.2	1.0	0.8	0.7	0.6	0.5
Tajikistan	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.2
Total Other Countries	88.2	85.1	84.5	81.9	83.9	82.6	85.2	93.7	96.5	99.3
World Total	**469.9**	**451.4**	**479.5**	**487.9**	**523.1**	**543.6**	**542.9**	**582.8**	**589.2**	**585.9**

Argentina both lost ground. The closure of Mt. Muro affected the former, while in Argentina losses were primarily due to a reduction in silver generated at the Alumbrera copper-gold mine. However, there was some offset supplied from extra output at Coeur d' Alene's Martha mine. The acquisition of Yamana's Martha and the start-up of operations at Cerro Bayo in Chile last year, saw Coeur's output surge by 36% to reach 14.8 Moz (461 t). Hecla Mining and Pan American Silver also reported impressive gains with silver volumes up 17% and 12% respectively from the prior year. BHP Billiton reported the biggest year-on-year change in absolute terms - output was up a staggering 11.5 Moz (358 t). The extra volume reflected higher processing rates and grades at the world's biggest silver producing mine, Cannington, in Australia. Production at the operation was up 27% year-on-year at a record 38.2 Moz (1,188 t). The result saw BHP Billiton replace KGHM as the world's number two silver producer.

Analysis of the sources of silver mine production shows that just less than three-quarters of output was generated as a by-product of other metals. Primary silver mines increased their share of total production last year having supplied 27% of world output (up from 25% in the previous year).

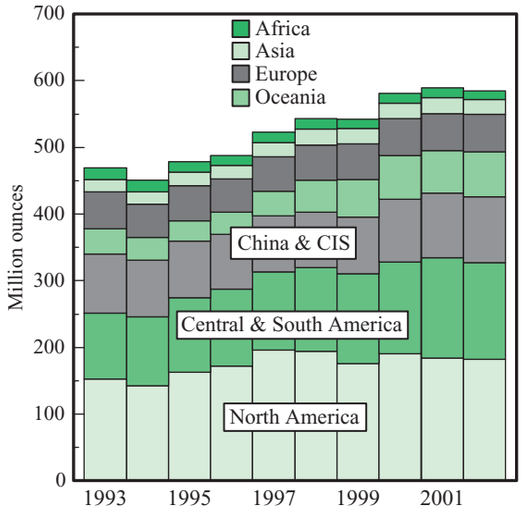
Output in all of the other categories declined. Mine closures were partly responsible for the drop in by-product at gold operations, which fell 10% to 79.5 Moz (2,473 t). Likewise lead/zinc mine closures impacted silver production volumes, which decreased 3% to 189.5 Moz (5,895 t). Lastly, producers curbed copper production and despite higher output at Antamina, silver from this source was 1% lower at 148.1 Moz (4,606 t).

North America

A significant drop in mined output from the United States cancelled out production increases in both Canada and Mexico leaving silver in North America down a modest 1% at 182.1 Moz (5,665 t). In **Mexico**, the world's biggest silver producer, output was up by just less than 1% to reach 91.7 Moz (2,852 t). The bulk of the increase was due to higher production from Industrias Peñoles, where production was up 2% from the previous year at 52.7 Moz (1,638 t). At the company's Fresnillo mine alone, production was some 9% higher at 31.2 Moz (972 t). In addition Francisco I. Madero in its first full year of production contributed 1.3 Moz (41 t) to the total. On the other hand, output slipped at La Encantada, which is approaching the end of its life and at Rey de Plata activities remained on hold (operations were suspended in November 2001 due to the low zinc price). The combined loss in production from these two mines totaled 2.9 Moz (91 t). In recent news Peñoles announced the shutdown of productive operations at the El Monte mine, beginning March 1st of the current year. Again low zinc prices were cited as the primary reason behind the action taken. Other closures in the country included the Avino silver mine, which after 28 years of continuous operations was forced to close in 2001 due to low metal prices. Meanwhile, in the same year, Grupo Frisco's San Felipe and San Francisco mines also finished mining operations. In their last productive year these three mines added 1.0 Moz (34 t) to Mexico's total.

The informal mining industry accounts for roughly 17% of the country's total and last year estimates suggest that output from this sector was modestly higher at 15.3 Moz (476 t). Miners benefited from a

Figure 15
World Silver Mine Production



9% increase in the domestic silver price year-on-year (compared to the 5% rise in dollar terms) and by an impressive 15% increase in the intra-year silver price in local currency terms, which was a strong incentive to increase production.

In the **United States**, silver production was down sharply at 46.4 Moz (1,455 t). The 12% decline represented the second consecutive fall in the country and has taken output to levels last measured in 1994. Much of the drop last year can be accounted for by the closure of Echo Bay's McCoy/Cove gold mine in Nevada. Production at the mine was completed on March 31st, 2002 and the property is now in full reclamation mode. As a result, output at the mine was some 5.0 Moz (155 t) lower than the previous year. There were also noteworthy declines of silver by-product generated at some of the country's copper mines. At Kennecott Utah Copper's Bingham Canyon mine output was 0.8 Moz (25 t) lower year-on-year. The fall was primarily the result of lower ore throughput associated with the June 2001 closure of the North concentrator and low ore grades. Reductions here were compounded by production cut backs at Asarco's Mission mine in Arizona. In both cases low copper prices were cited as the motivation behind the rationalization.

Concerning primary silver operations in the United States, there was also evidence of some production curtailments in response to low metal prices. At Lucky Friday, for example, operators Hecla reduced the level of mining activity during 2002 to approximately 50% of full production, and this left output some 38% lower at just over 2.0 Moz (62 t). Meanwhile at Greens Creek, located on Admiralty Island, near Juneau, Alaska, output was narrowly lower at 10.9 Moz (339 t). Lower grades at the maturing mine impacted results although this was partially offset by an 11% increase in ore throughput.

Mine production in **Canada**, in contrast, actually rose 8%, or by roughly 3.3 Moz (103 t) to 44.0 Moz (1,386 t). Over half of the country's silver is generated at gold mines, with the balance coming from lead/zinc and copper mines in roughly equal proportions. As regards the driver behind last year's growth, record output at Barrick's Eskay Creek gold mine lifted silver production 15% from 2001 to 17.8 Moz (552 t) - the rise was primarily due to higher mining and processing rates. Meanwhile, at Noranda's Kidd Creek copper unit, production was up a noteworthy 28%. Mine closures had little impact on the country's total production last year. The Sullivan mine, for example, closed in December 2001 after 91 years of production, but in its last year of operation only generated less than 0.5 Moz (14 t) of silver. In the medium term, however, further closures of such operations as Nanisvik, Selbaie and Ruttan should see silver generated at zinc and copper mines in the country slide at a more marked rate.

Central and South America

Peru, Bolivia and Chile account for more than 95% of Central and South America's total production. Last year, a sharp decline in output from Chile offset moderate growth in Peru and Bolivia to leave the region's total down 4% at 144.8 Moz (4,503 t). In **Peru**, the biggest of the three and the world's number two producer, output was 3% higher at 88.8 Moz (2,761 t). A noteworthy contribution to the rise was made by the new polymetallic Antamina mine, which started production in October 2001 and accounted for 6.1 Moz (190 t) of silver - a 58% increase from the previous year. At Pan America Silver's Huaron mine, meanwhile, the first full year of operation was reported totaling 4.5 Moz (141 t), an increase of 1.6 Moz (51 t). In addtion, at the giant Yanacocha mine (the world's second largest gold producing mine) silver output was up some 23% at 1.9 Moz (58 t). The increase was primarily the result of higher grades and mining rates at the mine and also the extra output from the new Quinua deposit, Yanacocha's fifth open pit mine to come on stream. Negating some of the impressive

output rises described above there was lower production at, amongst others, Tintaya. Decreased production last year reflected the decision by operators BHP Billiton to temporarily reduce production at the operation following the deterioration of the global copper markets. At Quiruvilca output fell by roughly 23% to 2.5 Moz (78 t) and was largely the result of a drop in silver grades as the more silver-rich veins in the upper parts of the mine were depleted. In addition there were unconfirmed reports of mine closures in the country. In particular, the low zinc and copper prices over the last two years has left many of the small to medium scale operators struggling to maintain profitability.

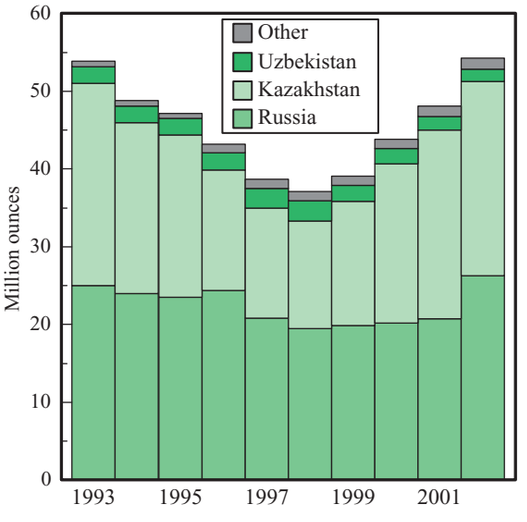
Output in **Chile** dropped back by a substantial 20% to 34.9 Moz (1,085 t), with the bulk of the losses coming from copper and gold mines. With respect to silver generated at copper operations both BHP Billiton and state-owned Codelco reduced copper output in response to the weak market. At the former's Escondida mine output was consequently down 28% from 2001 at 2.3 Moz (72 t). Cuts at Codelco's Chuquicamata, meanwhile, left the company's total silver production 22% lower at 8.2 Moz (254 t). By-product silver from gold mines also decreased last year with lower output from La Coipa leading the way. Lower silver grades at the mine resulted in a 41% or 5.0 Moz (156 t) decline in production. This was compounded by the cessation of mining at El Indio and to a lesser extent the suspension of mining at Refugio. New primary mine, Cerro Bayo, however, offset a part of the recorded losses. Operations officially started at Coeur d'Alene's high grade silver/gold mine on April 17th, 2002, approximately one month ahead of schedule, and by the end of last year it had contributed over 1.8 Moz (57 t) of silver.

Higher output at Comsur's lead/zinc Porco mine contributed to the 6% increase in silver production in **Bolivia**. Output at Porco was some 54% higher than the previous year at 1.7 Moz (53 t), meanwhile, a 15% rise in toll refined material at the Huari Huari plant (representing a large part of the informal mining sector within the country) further bolstered production which was measured at 14.5 Moz (451 t). Declines, on the other hand, were measured in **Argentina** where levels fell 23% to reach 4.3 Moz (135 t). Output from Coeur's new Martha mine (they acquired the mine in April last year from Yamana Resources and immediately started transporting ore to the company's Cerro Bayo plant, located approximately 270 miles to the northwest) was not sufficient to negate losses at the Alumbrera joint venture copper-gold mine.

Europe

Europe was one of the few regions to record an increase in silver production last year with most of the growth coming from Poland and Sweden. In its sixth consecutive year-on-year rise, Europe's total in 2002 was measured at 55.9 Moz (1,739 t), representing roughly 10% of global production. **Poland** is the most important producer accounting for close to 70% of the region's total. The bulk of the country's output is sourced from copper mines operated by the world's third largest silver producer KGHM Polska Miedz. Last year the company's three underground mines yielded just over 38.3 Moz (1,192 t), a modest 2% increase from the previous year. Elsewhere there were mixed results. In **Sweden**, and despite the closure of Boliden's Laisvall mine in 2001, silver production in the country was recorded some 7% higher at 9.4 Moz (293 t). In contrast closures in **Spain** and **Ireland** resulted in a significant drop in measured output. In Spain, the closure of Boliden's Los Frailles left production down 1.0 Moz (32 t) at 1.2 Moz (36 t). Meanwhile, the nine month suspension of mining at Tara in Ireland (due to the weak market and the low price of zinc coupled with the mine's poor productivity) contributed to the 22% drop, although higher output at Lisheen offset some of the losses.

Figure 16
CIS Silver Mine Production



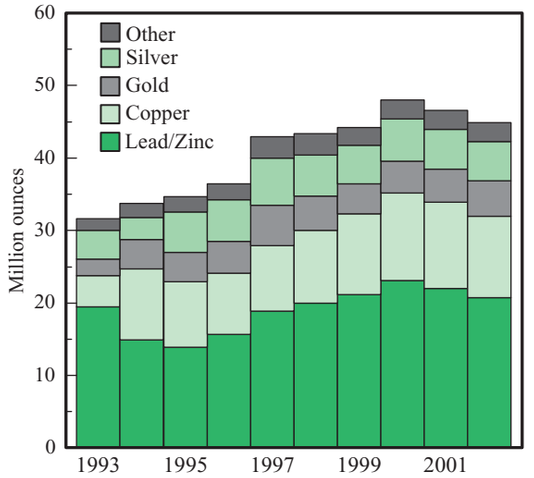
CIS

Silver production increased for the fourth consecutive year from the countries that constitute the Commonwealth of Independent States (CIS). Last year a surge in output from Russia helped lift the region's total 10% year-on-year to reach 53.0 Moz (1,645 t).

A part of the sharp rise in **Russian** silver output can be explained by the start-up of activities at Polymetal's Lunnoye silver/gold deposit in the Magadan region. According to company reports production reached commercial capacity in June last year and 12-month silver output at the mine stood at 2.6 Moz (81 t). In addition Bema Gold's Julietta mine began production in September 2001 and last year added roughly 1.6 Moz (50 t) of silver to the country's total. The extra 4.2 Moz (130 t) of "new" silver from these operations combined to leave Russia's total up 20% at 25.0 Moz (776 t).

Kazakhstan also recorded an increase in silver output, although the rise was fairly modest when compared to the remarkable growth measured during the preceding three years, which on average saw output rise 21% per year. Nevertheless production in 2002 was estimated at 24.9 Moz (775 t) representing a robust 3% increase from the previous year. All of the country's silver output is generated at base metal operations and over the last few years targeted expenditure at Kazakhmys (Kazakhstan's biggest copper producer) and Kaztsink (the largest lead and zinc producer) has resulted in significant improvements in output.

Figure 17
Chinese Silver Mine Production
By source metal



Kazakhmys alone produced 21.7 Moz (674 t) of silver granules, up from the 21.0 Moz (654 t) reported in 2001. Increases were largely achieved thanks to upgrades and better labor productivity and organization. Concerning the medium term prospects for further increases in production volumes, the company is developing several new mines and deposits, which amongst others include, Nurkazgan Artemyevskiy and Yubileino-Snegirikhinskiy.

China

It is now emerging that the surge in imported copper and zinc concentrates in 2001 into **China** and the maintenance of these high levels in 2002 was primarily a result of the inability of local mine production to keep up with domestic demand. Indeed, estimates suggest that for the last two years copper, lead and zinc production in the country has actually declined. Mine closures were thought to have been the main reason behind the fall. This was in particular an issue for the lead/zinc mines last year where, on the heels of the Nandan accident, there was a tightening of regulatory control. As a result, a number of mines, which were illegal, or with environmental protection and safety problems, were forced to either close or cut back production. Current estimates for silver output in China consequently show a 4% decline in 2002 with output slipping to 44.9 Moz (1,396 t).

Oceania

Australia, the world's third largest silver producing country and by far the most important producer in the Oceania region recorded a noteworthy 5% increase in production volume, which left output at 66.8 Moz (2,077 t). Much of the growth reflected a stellar performance at the world's largest silver producing mine, Cannington. Output at BHP Billiton's giant silver-lead-zinc mine surged 27% year-on-year to reach 38.2 Moz (1,188 t). The rise was due to the combination of higher milling rates (up 18% year-on-year) and a 5% increase in grade. Higher production was also reported at Pasminco's Century mine although this was offset somewhat by a fall in output at the company's Rosebury operation, which was 29% lower, when compared to the previous year, at 2.1 Moz (65 t). Furthermore, in June Pasminco (which is now being run by administrators) sold the Broken Hill operation to Perilya who promptly reduced mining rates, primarily in response to the high operating costs. As regards the smaller contributors in the region, output in **New Zealand** increased 7% to 0.9 Moz (29

t). Meanwhile in **Fiji**, lower production at the country's only formal gold mine left output in the country moderately reduced at 0.1 Moz (2 t).

Asia

Silver output in Asia fell moderately last year to reach 22.5 Moz (701 t). There were declines reported in all of the major producers in the region but in tonnage terms losses were concentrated in Indonesia and the Philippines. Concerning **Indonesia**, the closure of Aurora's Mt. Muro gold mine in July 2002, left output at the mine some 43% lower year-on-year at 1.9 Moz (60 t). However, higher silver grades at the copper-gold Grasberg mine offset some of the decline to leave full year output in the country down by a more moderate 1.1 Moz (35 t) at 8.2 Moz (254 t). In the **Philippines**, on the other hand, silver production collapsed with volumes roughly 74% lower than in 2001. Lepanto's Victoria mine alone reported an 80% drop in silver production - largely the result of the closure of its copper flotation plant in 2002. There were further losses following the cessation of activities at Bulawan in the first half of last year and the closure of Manila and Maricalum's mining units in 2001.

On a more positive note, and despite a 5% fall at the country's only primary mine, **Turkey** maintained output at 3.7 Moz (114 t). Moderate gains were posted in **Japan** with output levels narrowly higher at 2.6 Moz (81 t). Lastly, it is worth mentioning the close to four-fold rise in output recorded in **Thailand**. The country's first commercial gold mine, Chatree, started production in November 2001 and last year activities generated 0.7 Moz (22 t) of silver by-product.

Africa

Africa's biggest silver producing mine is located in **Morocco** and alone accounts for roughly two-thirds of the continent's total silver output. The primary Imiter mine is operated by Société Métallurgique d'Imiter (SMI), a subsidiary of the ONA Group. Last year production at the mine slipped by a substantial 8% to 7.1 Moz (220 t). Along with the reduction in by-product silver generated at lead and zinc mines, total production in the country was recorded at 8.5 Moz (263 t), a 7% decline from 2001.

South Africa is the only other substantial producer in the region and here there were also reductions in mined silver volumes. Preliminary estimates suggest that output declined around 8% to 3.7 Moz (116 t). The bulk of the losses were associated with the reduction in copper, lead and zinc production in the country; gold output actually grew moderately last year - the first time since 1993.

Outlook

Despite a number of mine closures and production curtailments, silver mine production remained broadly stable last year with global output measured at 585.9 Moz (18,224 t), a 0.6% decline from record levels reported in the previous year. A part of the reason for the modest decline can be explained by the large number of projects that the industry has had to absorb over the past couple of years. Huaron, Antamina, San Sebastian, Cerro Bayo, Martha, Lunnoye, Julietta and La Colorada all came on steam in late 2001 and during 2002, adding nearly 22 Moz (684 t) of silver to last year's total. In contrast, production from the set of mines closed, or in the last stages of operation in the corresponding period, was some 14.7 Moz (456 t) lower.

Just looking at openings and closures, one would have expected that world silver output last year should have actually increased. However, the "demand-led" copper production cuts at, amongst others, Escondida, Tintaya, Mission and Chuquicamata, combined with the fall in output from China, were key factors which conspired to leave global output moderately lower.

Current estimates suggest that there could be a further reduction in output in 2003. For instance, a number of producers have already announced that output will continue to be curbed at a number of copper operations. In addition, there is little new capacity expected to come on stream. Indeed, where extra output is expected the impact on silver supply will be negligible. For example, Codelco is set to raise copper output due to the commissioning of the El Teniente expansion. Meanwhile, in Namibia the Skorpion zinc project is expected to come on stream in the second quarter of this year. However, the processing methods to be employed at both these projects do not recover any silver. On the other hand, at Anvil's Dikulushi copper mine in the Democratic Republic of Congo the first ore was delivered to the plant in October 2002 and silver generated at the mine in the current year should be close to 1.1 Moz (34 t).

Notwithstanding these observations, it is worth highlighting a couple of factors that could leave output higher than suggested above. In Russia, Polymetal announced that in December operations at the giant Dukat mine had commenced. Ore is apparently being mined from both open pit and underground sources and silver concentrate is being produced. This concentrate

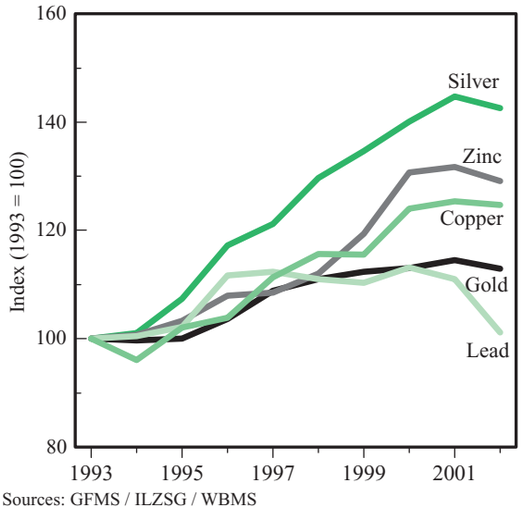
is reportedly being stockpiled for future export to refining facilities. At full capacity the mine could generate up to 16.0 Moz (500 t) of silver per year. While only a fraction of this is expected in the current year there is the possibility that production volumes will be much greater than anticipated.

Similarly in China there is scope for additional volumes of silver supply. In particular, four leading Chinese zinc smelters have agreed to a plan to halt concentrate imports for the remainder of the year due to low treatment charges and a shortage of concentrates on the international market and this move will encourage higher domestic mine production. In addition, copper imports will be more expensive following the cancellation of a tax waiver. Again this will act to boost local mine production, although as cautioned earlier, it is too early to estimate the full impact that these developments could have on silver supply in 2003.

Silver Output by Source Metal
Million ounces

	2001 output	% of total	2002 output	% of total	Change y-o-y
Primary	148.6	25%	161.0	27%	8%
Lead/Zinc	195.1	33%	189.5	32%	-3%
Copper	149.7	25%	148.1	25%	-1%
Gold	88.4	15%	79.5	14%	-10%
Other	7.5	1%	7.9	1%	5%

Figure 18
Mine Production



Sources: GFMS / ILZSG / WBMS

By-Product Analysis

Over 70% of the world's mined silver is generated as by-product in the extraction of lead, zinc, copper and gold. The table above shows the split of output by source metal. Most importantly, the categories used for the purpose of this analysis are defined on a revenue basis. So, for example, the polymetallic Antamina mine is classified as a copper mine while Cannington falls into the primary producers group.

In 2002, a noteworthy feature of the split was that despite low silver prices output from **primary** mines actually increased a significant 8% to reach 161.0 Moz (5,008 t). The biggest contribution to the rise came from Cannington in Australia where higher processing rates and grades resulted in a staggering 27% increase in output to 38.2 Moz (1,188 t). Elsewhere, Mexico also provided considerable support with output at Peñoles' giant Fresnillo mining unit some 9% higher year-on-year at 31.2 Moz (972 t).

Mine production of both **lead** and **zinc**, on the other hand, fell in 2002 and as a consequence silver generated in this category dropped 3% year-on-year to 189.5 Moz (5,894 t). For lead, the decline at over 8% was particularly sharp and was the second consecutive fall, following a more than 1% contraction in 2001. The response of the zinc producers to the record low prices in real terms has been less marked, with global production falling by around 2% last year to 282.1 Moz (8,775 t).

Perhaps not surprisingly, given the by-product nature of much lead and zinc production, a number of common themes emerged in 2002. The most important of these is the structural decline in lead and zinc concentrate production due to reserve exhaustion. A number of these mines had high lead values, which accelerated the decline in lead mine production last year. This trend is particularly noticeable in Europe, where lead and zinc output fell by 25% and 13% respectively following the permanent closure of the

World Mine Production of Source Metals
Thousand tonnes

	1998	1999	2000	2001	2002	Change y-o-y
Lead	2,992	2,966	3,047	2,992	2,742	-8%
Zinc	7,565	8,065	8,830	8,919	8,775	-2%
Copper	12,285	12,756	13,269	13,716	13,508	-2%
Gold (tonnes)	2,542	2,574	2,591	2,623	2,587	-1%

Sources: ILZSG, WBMS, GFMS

Los Frailes (Spain) and Laisvall (Sweden) mines. The temporary closure of Europe's largest lead/zinc operation - Tara - (Ireland) also contributed to the decline.

Last year saw the demise of a number of well-established lead/zinc mines in Canada due to reserve exhaustion, most notably Teck Cominco's Sullivan and Polaris mines. In the United States, the decline in production was more a response to continued low prices and the strength of the US dollar for much of 2002. Lead mine production was affected by lower output at Doe Run's Missouri operations and Grupo Mexico's Tennessee operations, which also hit zinc production.

The other major factor that has affected lead mine production is that since the Cannington mine was commissioned in the late 1990s, no lead mines of any size have come on stream. The situation facing zinc is somewhat different, with Red Dog, Century and more recently Antamina coming on stream over the past few years.

The decline in mine production did little to improve the price for either metal as the average annual LME cash price for lead and zinc fell by 5% and 12% to $453/t and $779/t respectively. Weak demand and the overhang of LME inventories adversely affected the price, a problem that is particularly acute in the zinc market. Despite the continued growth in Chinese demand, global lead consumption fell by 2% last year. There was a sharp fall in demand for lead batteries from the telecommunications and IT sectors. Global zinc consumption growth was positive in 2002 at around 3%, however this was heavily dependent upon the 10% surge in usage in China.

Average Prices of Source Metals

	1998	1999	2000	2001	2002	Change y-o-y
Lead ($/t)	528	503	454	477	453	-5%
Zinc ($/t)	1,023	1,077	1,128	888	779	-12%
Copper ($/t)	1,653	1,575	1,814	1,581	1,558	-1%
Gold ($/oz)	294	279	279	271	310	14%

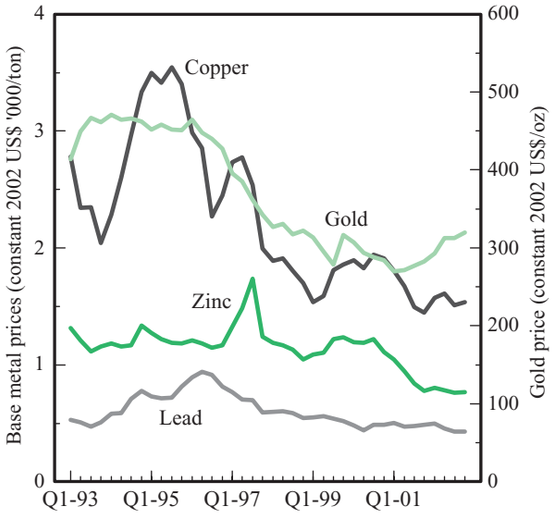
Sources: LME, GFMS

The average annual **copper** price fell by just over 1% in 2002 to $1,558/t. Its superior performance compared to lead and zinc was based in part on the high level of copper imports in China, in response to strong industrial production and infrastructure expenditure. In addition, a recovery of demand in the CIS, contributed to a decline in exports from this source.

Nevertheless the relatively low level of prices caused a number of production cutbacks, which contributed to a greater than 1% fall in mine production according to the latest estimates from the World Bureau of Metal Statistics. Some of the decline was attributable to pre-emptive action by BHP Billiton and Codelco at their Chilean operations. As a result silver from global copper sources was around 1% lower than the previous year at 148.1 Moz (4,606 t). The fall would have been greater had it not been for the additional by-product silver generated in Peru. The rise predominately reflected the increase in output from the new (copper/zinc) Antamina mine as it ramped up to full capacity.

Silver produced at **gold** mines fell by 10% to 79.5 Moz (2,473 t) due largely to a sharp decline in the United States and Chile as a result of lower grades and mine closures. In the former, the important McCoy/Cove operation completed mining activities in March last year and as a result by-product silver dropped by 77% year-on-year to 1.5 Moz (46 t). In Chile the cessation of mining at El Indio in the middle of last year and the suspension of activities at Refugio in 2001, contributed to the country's fall. Meanwhile, at La Coipa, higher gold output (+64%) but a drop in silver by-product (-41%) compounded the country's decline.

Figure 19
Source Metal Prices (real terms)



Production Costs

Average cash costs, measured by the sub-set of primary silver mines where cost data is available, declined 23% year-on-year to reach $2.31/oz. It is worth mentioning that in this year's *World Silver Survey* the sample size of costed production is somewhat smaller than that presented in previous editions. In the past the analysis has attempted to capture the cost of silver production at not only primary mines but also at gold operations where significant volumes of by-product silver is generated. However, the difficulty in restating the results from a co-product to a by-product basis (revenues from secondary metals are deducted from operating costs) has resulted in a shift in focus to concentrate on costs at primary operations.

Last year there was a marked improvement in the economics of mining silver. In fact, all but two mines reported a reduction in cash costs year-on-year while only one operation had costs higher than the average spot price. Furthermore, the addition of three high-grade, low-cost mines to the group dragged the weighted average down further. The lower average production price combined with the higher silver price, which was up over 5% compared to 2001's average, resulted in a 68% widening of cash margins.

The lowest cost mine in the sub-set (see the table below) was Coeur d'Alene's new Cerro Bayo operation in Chile (including ore feed from the company's Martha mine in Argentina). Low unit operating charges were also reported at Hecla's new San Sebastian unit in Mexico, where costs came in at just over a $1/oz. Significant gold credits at both operations partly explained the remarkably low costs.

Total production costs for our sub set (including depreciation, depletion and amortization) declined close to 20% year-on-year to reach $3.20/oz.

Silver Mine Production Costs

		2000	2001	2002
Cash costs:	highest	$5.02	$5.14	$5.15
	lowest	$2.20	$2.17	$0.38
	weighted average	$3.19	$3.01	$2.31
Average spot price		$4.95	$4.37	$4.60
% output with costs > spot price		7.2%	14.8%	3.1%
Sample size (million ounces)		69.8	74.5	81.3

Producer Hedging

- Net outstanding producer hedge positions declined by 24.8 Moz (772 t) during 2002.
- The fall was fully attributable to a collapse in options positions - forward contracts actually increased modestly from the prior year.

Last year witnessed a dramatic decline in outstanding producer positions, which left the total hedge book some 24.8 Moz (772 t) lower from the prior year-end. Taken in combination with the fall in mine production, the total supply from the mining industry was therefore significantly lower than in 2001(when there was some growth in positions). Last year producers generated a net 561.1 Moz (17,452 t) of supply to the physical market, an 8% or 47.0 Moz (1,462 t) decline year-on-year.

As regards the net decline in the hedge book, the drop was entirely due to a sharp fall in open options positions, which, to a large extent, had been put in place at the end of the December quarter 2001 during a period of backwardation in the market. With the silver price a full 5% higher year-on-year and at times trading at above $5/oz, producers moved away from the more defensive options strategies and instead locked in higher prices with forward sales agreements (particularly in the second quarter). The increase in forward contracts was not, however, sufficient to negate the collapse in options and overall the book contracted by 26% year-on-year.

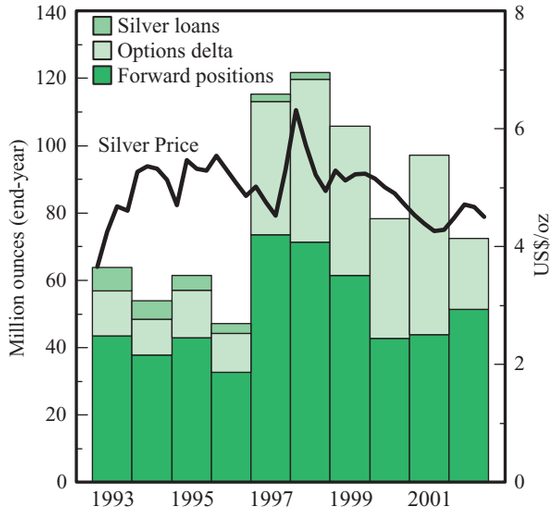
It is necessary, however, to add an immediate caveat to any commentary drawn from changes in the producer hedge book. Specifically, it is more than likely that the data used to calculate the global position does not reflect all silver hedging transactions. Part of the reason for this is that a substantial part of silver hedging is generated by producers of other metals, who tend not to place much emphasis on disclosure of their activities as they relate to (often relatively unimportant) by-products. This is particularly true for the large base metals producers. Also, a number of silver producing companies operate from countries where there is often no obligation to disclose details of hedging activities (producers in Peru, Mexico and Kazakhstan, for example, would fall into this category).

Despite the statistical challenges in the analysis of the hedge book it is worth mentioning that the companies who do provide details on their hedged silver volumes (or lack of hedged metal), accounted for

close to 50% of global mine production. The data discussed here therefore can be regarded as broadly indicative of the market trends.

For this edition of the *World Silver Survey* GFMS has improved and updated its hedging analysis, and has input all transactions into the Brady Trinity™ integrated trading and risk management system. In terms of coverage, we analyze the hedging activity of the 18 silver mining companies that report their risk management positions and we enter each trade into the system by instrument and year of expiry. In contrast to the gold market, silver producers' hedging activity is concentrated in the near years, with, for example, 93% of the options deals expiring by the end of 2004. Moreover, the vast majority of options transactions are vanilla puts and calls, with only a small percentage of barrier or non-vanilla options (a situation somewhat different to that of gold). As mentioned elsewhere in this chapter, silver producers' hedging positions, both in nominal and delta-adjusted terms, declined in 2002. This decline was concentrated in the options book, with the nominal volume of sold calls and purchased puts both declining by around 60%. Using the Brady Trinity™ technology, accurate deltas have been calculated for each trade on a year-by-year and instrument-by-instrument basis. The results of this analysis shows the average net delta on calls sold by mining companies was 0.264, whilst the equivalent delta for purchased put options was 0.435. Taking the nominal options position in 2002 of 19.1 Moz (594 t) for purchased puts and 48.2 Moz (1,499 t) for sold calls, the total net delta-adjusted options position was 21.0 Moz (653 t).

Figure 20
Producer Hedging: Outstanding Positions



Concerning the details of the decline in the producer book last year, the fall as described above, was entirely reflected by a collapse in the open options positions. In fact the delta adjusted figure dropped by a staggering 61% from the prior year, representing a decrease of approximately 32.3 Moz (1,006 t). Offsetting this sharp reduction, producers added around 7.5 Moz (234 t) to their collective forward positions taking the total to 51.4 Moz (1,599 t). The divergent effects of these changes left the total book down 26% year-on-year at 72.4 Moz (2,253 t) (see Figure 20 above).

In 2001 the build up witnessed in options positions was not a gradual process. Importantly, most of the growth was measured in the final three months of the year. This coincided with a period of backwardation in the market (lease rates were higher than Libor and therefore forwards attracted a negative premium). Under such conditions producers were unsurprisingly reluctant to add to their forward sales and instead, bought and sold options, tying in secured minimum revenue levels through buying put options and generating premium through the selling of calls.

Twelve-month Hedge Conditions*

	2000	2001	2002
Spot price	$4.95	$4.37	$4.60
Libor	6.9%	3.9%	2.2%
Lease rate	3.4%	1.5%	1.2%
Contango	3.4%	2.4%	1.0%
Forward price	$5.12	$4.47	$4.64
Premium	$0.17	$0.10	$0.04

*12 month averages

The short term nature of the options contracts meant that by the end of last year many of the open positions built up in 2001 had either expired or been closed out. Producers did not, however, aggressively replace these contracts. Instead they added ounces to forward positions. In fact, it was no surprise that the biggest quarterly increase to forward contracts was measured in the second quarter. The average spot price in the three months to June was $4.72/oz, moreover, it breached the $5/oz level at the end of May, representing considerably stronger prices than it had been possible to lock in throughout the preceding nineteen months.

5. Supply from Above-ground Stocks

- Supply from above-ground stocks fell in 2002 by nearly 27 Moz (840 t) to reach 252 Moz (7,840 t), equivalent to around 30% of all the silver supplied to the market last year, the balance provided by new mine production.
- There were no net sales out of private bullion stocks in 2002 due to producer de-hedging offsetting a small amount of dishoarding by investors. Government sales declined and scrap supply increased modestly.

Summary

Silver supply is derived from two sources: new mine production and existing above-ground stocks of bullion and fabricated products. Last year, some 30% of the market's requirements - equivalent to around 252 Moz (7,840 t) - were met by recycled above-ground stocks, the balance being provided by newly mined silver. The table below shows the contribution made by each of the components of above-ground stocks supply in 2001 and 2002.

Supply from Above-ground Stocks
Million ounces

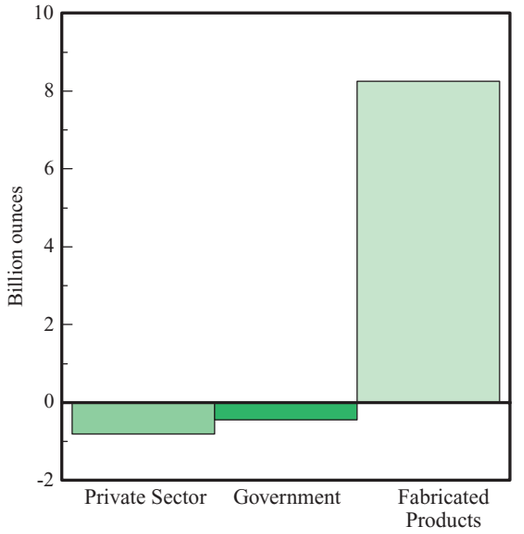
	2001	2002
Implied Net Disinvestment	-9.5	20.9
Producer Hedging	18.9	-24.8
Net Government Sales	87.2	71.3
Sub-total Bullion	96.6	67.4
Scrap	182.7	184.9
Total	**279.3**	**252.3**

At 67.4 Moz (2,096 t), supply from existing bullion stocks was approximately 29.2 Moz (908 t) lower year-on-year in 2002. One of the reasons for the decline was a fall in the level of supply from government inventories. As explained below, this reduction was chiefly due to lower Chinese official bullion sales. In addition, supply from privately held stocks declined. This was entirely due to producers' trimming their hedge books compared to the small growth in positions that took place in 2001. (Producer hedging is covered in more detail on page 28 in Chapter 4.) By contrast, there was swing back to a modest amount of implied net disinvestment from the tiny net investment seen in 2001.

That the average silver price rose and supply from above-ground stocks fell in 2002 was no coincidence. Although at times bullion sales were a negative factor for silver, this was not a constant feature of the market last year. It was generally more of an issue at times of higher prices when, for instance, there was a tendency for government sales to increase. More important perhaps in terms of price determination (and this was also true the previous year) was the softness of fabrication demand for the metal (see Chapter 7). Indeed, it was because the price was low and there were few opportunities to off-load bullion stocks at attractive levels that inventories fell by as little as they did in 2002. For example, according to GFMS' analysis, the main supplier of official bullion to the market - China - was only an important seller last year when silver was approaching the $5.00 mark. Similarly, private sector holders have shown little appetite to divest themselves of bullion holdings when the metal's price has been under pressure. And, one imagines that those with large positions, such as Mr Buffett, acquired at prices close to or even above $5/oz, would require still higher prices before they would voluntarily liquidate their holdings. This is particularly so if the original motivation for purchasing silver included viewing the commodity as some kind of hedge against potential declines in equity prices.

As the table opposite shows, supply from scrapped fabricated products last year was broadly stable. The increase at 2.2 Moz (63 t) was not large enough to impact on the price level. In the past, it would have been correct to assume that, as the above-ground stock of fabricated products becomes larger, there is a "natural" tendency - all other things remaining equal - for supply from this source also to grow. It is possible,

Figure 21
Changes in Above-ground Stocks, 1993-2002



however, that this assumption will no longer be correct in future. The reason lies with expected changes in the composition of the stock of fabricated products and the very different rates of recycling of its various components. In essence, this stems from the eventual reduction in demand expected from photography - spent fixer solutions and x-ray film being by far the largest source of recycled metal. At some point in the future, therefore, the absolute level of supply from scrap may begin to decline even as the above-ground stock of fabricated silver continues to grow, increasingly dominated as it will be by jewelry and industrial products, which have far lower rates of recycling.

It is worthwhile putting last year's level of supply from above-ground bullion stocks (private plus government owned) into a longer term context. Over the ten years from 1993-2002, annual supply from this source has averaged 128 Moz (3,990 t). During this period, bullion stocks have been reduced by 843 Moz (26,220 t) and 440 Moz (13,680 t) from the private and official sectors respectively (see Figure 22). At the end of 2002, where did this leave the absolute level of above-ground silver bullion stocks?

As we have explained in previous editions of the *World Silver Survey*, it is very difficult to be certain about the form and whereabouts of the nearly 40,800 Moz (or 1.27 million tonnes) of silver that has been mined over time. What we can be sure of is that a substantial percentage of the silver that was once fabricated or minted into coins has been effectively "lost" and will never come back to the market. The difficulty the analyst has is that, depending upon what assumptions are made, this percentage can vary considerably with obvious implications for the imputed size of existing global bullion stocks (1% of cumulative historical mine production equates to 401 Moz after all!). An alternative way of addressing the issue is to measure those silver bullion stocks that can be more easily identified and which are arguably closest to the market. This also has the advantage of at least providing a figure for the minimum size of global bullion stocks. Estimates for identifiable bullion stocks have been included in the *World Silver Survey* and these are discussed in detail in the following sections and also shown in the figure opposite.

Figure 22
Identifiable Bullion Stocks

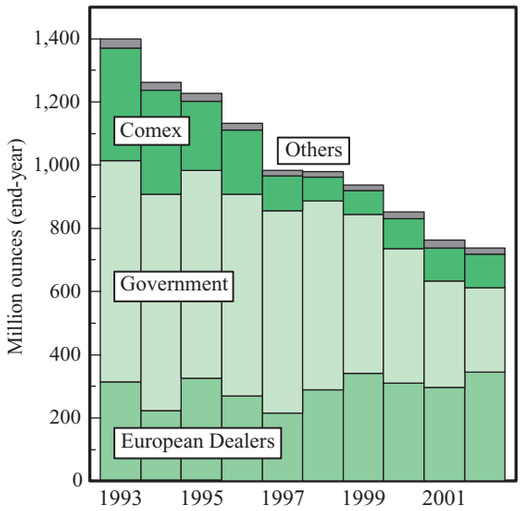
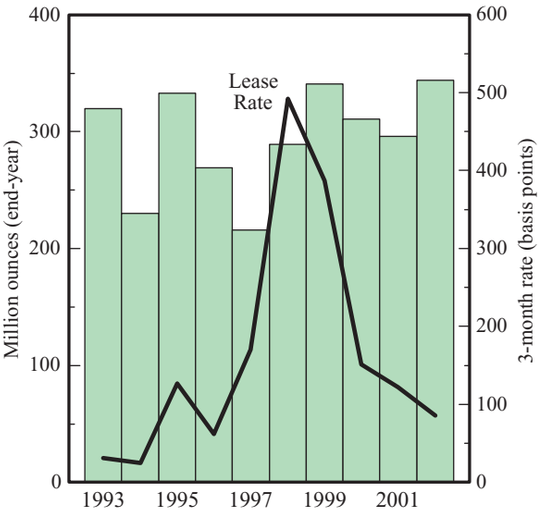


Figure 23
Bullion Stocks in Dealers' Vaults in Europe

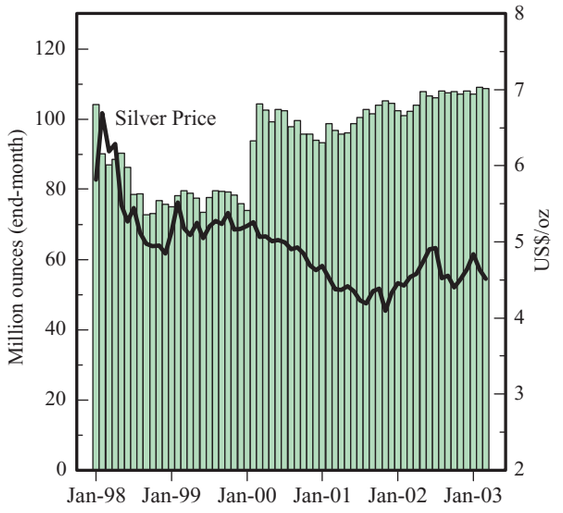


Identifiable Bullion Stocks

Figure 22 shows that identifiable bullion stocks amounted to some 737 Moz (22,900 t) at the end of 2002. Last year, the total fell by about 26 Moz (810 t).

By the end of last year, identifiable bullion stocks had fallen to around half of their level a decade earlier. The decline in identifiable bullion stocks over the last ten years of 720 Moz (22,400 t) in fact accounts for about 56% of the total decline in bullion stocks over the 1993-2002 period (i.e. 1,284 Moz or 39,940 t, basis GFMS' summary supply/demand data as shown in Table 1 on page 7). The balance of 44% or 564 Moz (17,540 t) would have come from unrecorded private or government holdings that are outside our identifiable bullion stocks universe and therefore not reliably measurable.

Figure 24
Comex Warehouse Stocks



There are three main components to the identifiable bullion stocks series: European dealers' vault stocks (data on which is obtained via a private survey conducted by GFMS), Comex inventories and GFMS' proprietary data on changes in government holdings. These three and the smaller fourth element (described as "Others" in the table) are commented on below.

Identifiable Bullion Stocks
Million ounces

	end-2001	end-2002
European Dealers	296	344
Comex	105	108
Government	338	267
Others	24	18
Total	**763**	**737**

European Dealers' Stocks

GFMS' proprietary data on European dealers' vault stocks shows that after two successive years of decline these increased substantially in 2002. The rise of some 48 Moz (1,490 t) was mostly seen in the first and third quarters, with stocks falling slightly in the fourth.

At 344 Moz (10,700 t), stocks at the end of 2002 had climbed back to the level last recorded at the end of 1999. As stated above, the weakness of fabrication demand, especially in India, was a key reason why inventories grew. Another reason, we suspect, for the high level of stocks in Europe is price. The low silver price last year and, perhaps, in particular, the lack of selling opportunities for those holders with a propensity to sell, meant that there was some room for stocks to grow. On the other hand, it is unlikely that the rise in stocks reflected growth in investors' physical holdings. Our information is that fresh investor buying of bullion was very limited in 2002 (see Chapter 3). It is more likely that the growth in dealers' stocks was due to, firstly, an increase in fabricators' inventories held with them (in turn, partly the result of higher forward purchases by the trade, as well as weak final demand) and, secondly, to some silver that was removed from the lending market by one or more large holders being returned to the vaults (perhaps coincidentally, this also ties in with the reduction in producer hedging, which would have led to silver being returned to lenders).

Comex Silver Stocks (end period)
(Million ounces)

	Q1	Q2	Q3	Q4
2001	96.7	98.7	101.5	104.5
2002	102.2	106.6	107.5	108.0
2003	108.7			

Comex Stocks

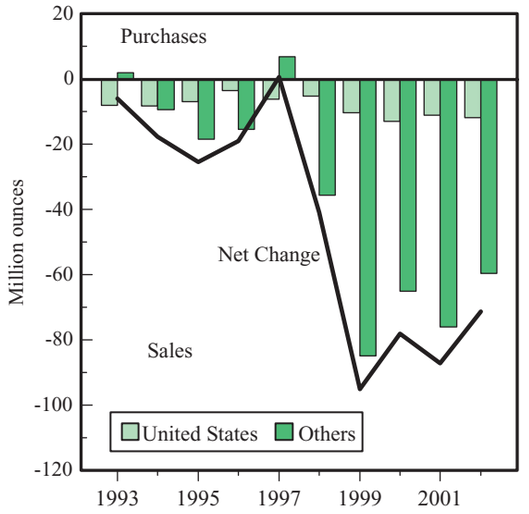
The total quantity of registered and eligible silver stocks held in Comex depositories came to 108.0 Moz (3,359 t) at the end of 2002 compared to a figure of 104.5 Moz (3,250 t) at the end of the previous year. The increase of 3.5 Moz (109 t) was relatively trivial compared to the large rises seen in 2000 and 2001, which together saw stocks climb by 28.5 Moz (886 t) over the two-year period.

The other noticeable trend in 2002 besides the switching of metal between different depositories, was a fall in the proportion of registered bullion as opposed to eligible silver bars. At year-end, the former amounted to 62.3 Moz (1,938 t) whereas the latter totalled 45.7 Moz (1,421 t). The comparable figures for registered and eligible stocks at end-2001 had been 69.8 Moz (2,171 t) and 34.7 Moz (1,079 t) respectively.

Government Stocks

At the end of 2002, government stocks are estimated by GFMS to have totaled around 267 Moz (8,300 t), compared to a revised 338 Moz (10,520 t) at end-2001. (Figures have been revised due mainly to a reassessment of Chinese government holdings and, to a lesser extent, larger official coin stocks in Europe than were formerly allowed for.)

Figure 25
Changes in Government Stocks



Net sales out of government stocks were reduced in 2002. GFMS estimate that they fell last year to 71 Moz (2,200 t), compared to 87 Moz (2,700 t) and 78 Moz (2,400 t) in 2001 and 2000. If last year's sales rate were maintained in future, government stocks would be exhausted by the end of 2006.

Chinese sales are estimated to have totalled 51 Moz (1,600 t) last year. This figure is well down on the 68 Moz (2,100 t) of net official sales that GFMS estimate took place in 2001. We believe that the reduction owed more to the low silver price and a consequent lack of selling opportunities rather than stocks having been exhausted. Indeed, a reappraisal of the outstanding level of Chinese official holdings is the main reason for the upwards revision to government stocks referred to above. (See the special section on page 34 for more on Chinese stocks.)

Net sales from other countries (i.e. excluding China) came to a little under 20 Moz (600 t) in 2002. Around 60% of this figure was accounted for by the United States, which has used official stocks to supply the US Mint's silver coinage programs. Coin sales by the US Mint required just over 13 Moz (400 t) last year and most of the raw material required came from stocks that had been transferred to the US Mint out of the National Defense Stockpile. It seems that this source has now been exhausted (assuming the 0.66 Moz reported as held at end-September 2002 was consumed in the fourth quarter). The US Mint still holds some custodial silver reserves on behalf of the US Treasury

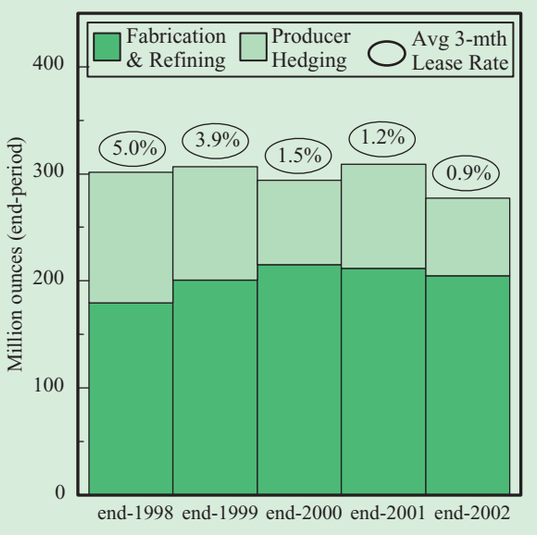
Silver Borrowing

Silver borrowing demand is estimated to have fallen in 2002. This decline was due to two main factors. First, a reduction in producers' hedge positions of 24.8 Moz (772 t), which is described in Chapter 4. And second, a slump in fabrication related borrowing. The latter was mainly due to lower raw material demand from manufacturers and, specifically a drop in the amount of silver held on a consignment basis for e.g. the Indian market. It also was partly in response to the spike in leasing rates that had occurred at the end of 2001 and which continued into January 2002.

As regards lending of silver, this had been reduced at the end of 2001, resulting in the above mentioned spike in leasing rates. However, this in turn led to a substantial inflow of silver into the London market and eventually the pressure on rates was eased as more metal was made available for lending. Furthermore, 2002 saw lending boosted by the increased level of speculative long positions, which, in particular, resulted in more liquidity being available at the shorter end of the market.

The combination of plentiful supply and soft borrowing demand not surprisingly resulted in a downward trend in leasing rates during the year. Average rates in 2002 were also lower than they had been in 2001 - 3-month metal coming in at 0.9% compared to 1.2% in the previous year. Indeed, borrowing costs across all tenures were at the lowest levels seen since 1996.

Figure 26
Silver Borrowing



Chinese Bullion Stocks

In last year's *World Silver Survey,* we briefly discussed the history behind the build up of official sector stocks in China. As we stressed at that time, our view (and one that is widely supported in China itself) is that for many years China was a surplus producer of silver (see Figure 27 below) and built up considerable stocks, both officially (held by the People's Bank of China (PBOC)) and what GFMS has termed "quasi-officially" (typically held by smelters and miners because there was little opportunity cost to them of holding idle stocks).

The first signs of this changing occurred in the mid-1990s when it was indicated to us by the PBOC that they no longer wished to purchase any more silver because of what they perceived to be sufficient, if not excessive, stocks. The first exploratory sales from these official stocks started in 1998 and rose sharply in the following years. At the same time, flows from what we have termed "quasi-official" stocks began to pick up (as the industry was, *de facto*, released from PBOC controls).

To understand how we derive some of our data on China, it is helpful to examine elements of the GFMS methodology which give rise to these numbers. A key aspect of our research is to measure available supply to a market as accurately as possible. This usually involves estimating mine supply, scrap and net inflows/outflows of bullion plus other sources of metal (in the case of China, for example, the silver contained in imported base metals concentrates). The total available metal can then be "allocated" to one of two things, fabrication or stock building (or depletion).

GFMS are confident that the historical measures of these flows are reasonably accurate, although the margin of error is somewhat larger than it is for other estimates (for example, Canadian mine production). In the context of this focus box, however, it is not the magnitude of these flows that is of primary concern. Rather it is the size of stocks and it is the estimation of these that is particularly difficult.

The reasons for this are threefold. Firstly, GFMS have only been systematically collecting data on the Chinese market since the early 1990s, so information before this time is far more uncertain, both in terms of the flows and stock levels. Secondly, stocks have been built up both officially and "quasi-officially" over the years, complicating the process of estimating their collective size. Finally, China was on the Silver Standard until 1935 and measures of how much metal from that era was in private and public hands at the time of the foundation of the modern Chinese state is subject to a large margin of error (estimates of the mobilization of these stocks over the past 50 years is also subject to potentially sizeable errors).

Based on the ongoing flows of silver out of China in 2002, GFMS have revised upwards our estimates of stocks. As with previous data on stock levels (*not* the flows), these numbers should be treated with caution. Anecdotal evidence from a recent field trip does, however, point to multiple depositories still holding large quantities of the metal.

Figure 27
Chinese Mine Production and Fabrication Demand

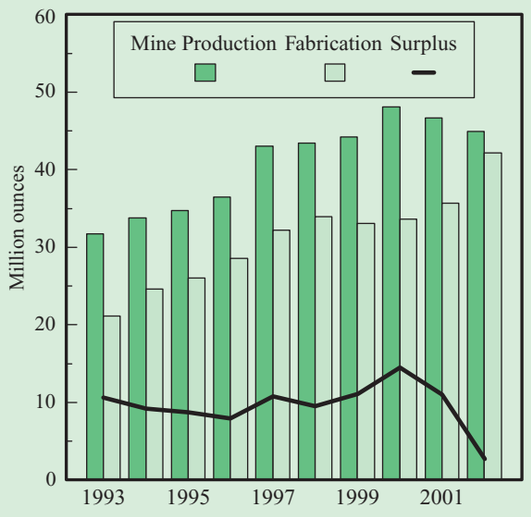
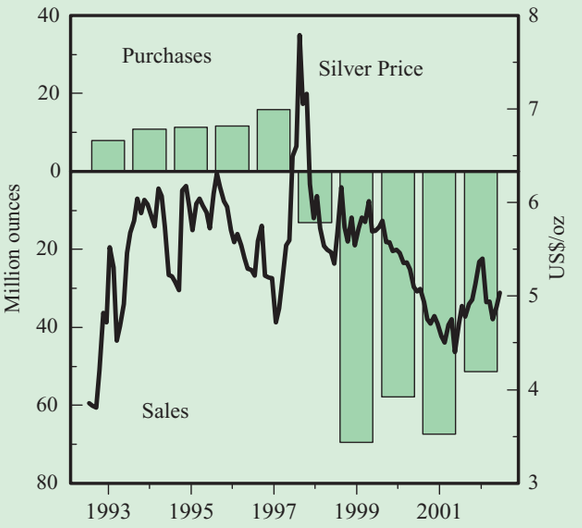


Figure 28
Chinese Government Purchases and Sales



but it is our understanding that these are currently not available for the Mint's coin programs. As a result, since the fourth quarter of 2002 the US Mint has had to source silver from the open market.

Excluding the United States and China, other sales totaled 8 Moz (250 t). This number has two main components, firstly, government bullion stock sales from the former Soviet Union and, secondly, the melting of demonetized coins in Europe. The latter continued to be important last year and will still be so in 2003, largely because of the public handing in coins denominated in the old national currencies, which have been supplanted by the euro.

Other Stocks

Other identifiable bullion stocks, not included in the sections above, consist of those inventories registered on the Tokyo Commodities Exchange (Tocom), the Chicago Board of Trade (CBOT) and Japanese trade stocks, which are reported to the Ministry of Trade and Industry. These stocks collectively make up the "Others" category in Figure 22 and, in aggregate, fell by 24% to around 18 Moz (560 t) at the end of 2002.

Scrap

Scrap supply increased by 1.2% in 2002, rising by 2.2 Moz (68 t) to a total of 184.9 Moz (5,751 t).

The most important markets for scrap are the United States, Japan, Germany and the United Kingdom. It is therefore necessary to have an understanding of fabrication offtake in those markets (refer to Chapter 7) to properly appreciate the factors that can influence changes in the levels of scrap that feed back into these markets each year.

Taking a broader perspective, the issues that pertain to the recycling industry also apply to scrap silver recovery. These include increasingly stringent regulations governing waste disposal and material recycling, product "cradle to grave" liability and advances in the technologies employed by the recycling industry. Waste management is an important issue for the photographic industry. Photographic processing solutions containing more than, say, 5 parts per million of silver are typically classified as a hazardous material (as in the United States).

Of course, economics also play a part and the 5% rise in the silver price last year would have helped lift the marginal returns earned by recyclers as well as shift the cost-benefit balance for those holding onto silver-bearing waste material. For example, several recyclers contacted by GFMS advised that hospitals tend to accumulate waste X-rays when there is a cost of disposal due to low silver prices. However, regular readers of the *World Silver Survey* will be familiar with the fact that the historical correlation between price and scrap supply is less than +0.5 and relatively small price movements do not have a major impact on scrap volumes, particularly in developed economies. Of course, in more price sensitive markets where silver is held in jewelry or silverware form, namely India, a higher price level tends to, *ceteris paribus*, result in a higher level of scrap.

European scrap was essentially flat last year, rising just 1% year-on-year to 45.3 Moz (1,410 t). This supply has in fact been remarkably stable for many years - over the last decade, the difference between the highest and lowest annual figures represents just 13% of the annual average for this period. (This compares to a corresponding figure of 26% for the global total.)

Part reason for this stability is that, in Europe, scrap shows little response to price moves within the broad band silver has been trading recently. Some refiners have commented that prices over $8 would be needed to see a significant surge in volumes. It might have been expected that the successful drive to cut silver use per application where possible (by substitution to non-precious, product miniaturization or lower loadings) would have reduced silver scrap. However, this has been countered by tighter environmental legislation

Figure 29
World Scrap Supply

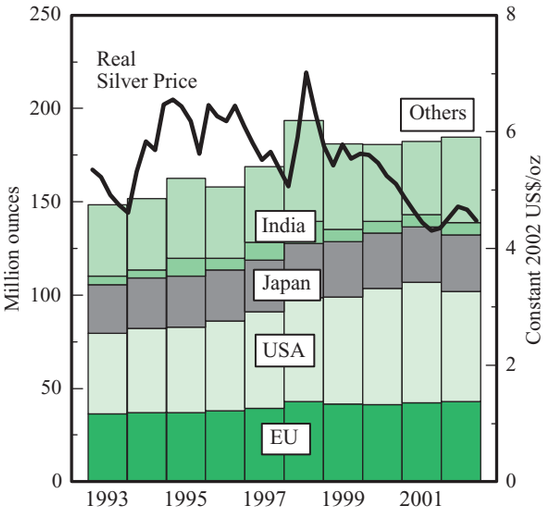


Table 3
Supply of Silver from the Recycling of Old Scrap
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Germany	15.8	15.4	14.8	15.4	16.1	16.4	16.1	16.7	16.8	16.7
United Kingdom	7.3	7.9	7.4	7.6	8.4	10.8	11.5	10.9	11.1	11.8
France	4.0	4.2	4.7	4.5	4.3	4.1	4.0	3.5	3.9	3.9
Italy	2.7	2.8	3.2	3.5	3.4	4.7	3.4	3.4	3.5	3.6
Austria	1.9	1.9	2.0	1.8	1.8	1.8	1.7	1.6	2.0	1.9
Netherlands	1.1	1.3	1.1	1.3	1.3	1.3	1.3	1.4	1.4	1.4
Sweden	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.0
Norway	0.8	0.8	0.8	1.0	1.0	0.8	0.9	1.1	0.7	0.7
Belgium	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6
Denmark	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5
Portugal	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.4	0.5
Spain	0.3	0.3	0.4	0.5	0.5	0.4	0.4	0.4	0.4	0.4
Czech & Slovak Republics	0.8	0.7	0.7	0.9	0.8	0.7	0.6	0.6	0.5	0.4
Finland	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4
Switzerland	1.5	0.6	1.6	1.7	0.8	0.4	0.3	0.3	0.3	0.3
Other	1.1	1.2	1.1	1.2	1.2	1.2	1.2	1.1	1.1	1.2
Total Europe	40.6	40.3	41.1	42.5	42.7	45.9	44.6	44.2	44.8	45.3
North America										
United States	43.2	45.2	46.0	48.4	51.8	55.7	57.4	62.4	64.5	59.2
Mexico	2.3	2.3	4.8	2.4	4.3	10.6	2.4	2.1	1.9	1.8
Canada	1.3	1.3	1.7	1.8	1.6	1.9	1.6	1.4	1.4	1.4
Total North America	46.7	48.7	52.5	52.6	57.7	68.3	61.4	65.9	67.8	62.4
Latin America										
Brazil	1.9	1.9	1.9	1.9	1.6	1.6	1.8	1.5	1.6	1.0
Argentina	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6
Chile	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4
Other	0.8	0.7	0.7	0.7	0.7	0.9	0.9	0.8	0.8	0.8
Total Latin America	3.8	3.8	3.8	3.8	3.4	3.7	3.7	3.4	3.5	2.8
Middle East										
Saudi Arabia & Yemen	0.8	1.9	3.0	1.3	3.2	2.1	7.5	2.3	0.8	7.2
Egypt	1.0	0.9	0.8	0.7	0.3	0.4	0.3	0.9	1.1	1.3
Turkey	2.0	2.3	2.3	1.9	1.6	1.7	1.4	1.3	1.3	1.3
Other	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.3	0.4	0.3
Total Middle East	4.2	5.4	6.5	4.3	5.5	4.5	9.5	4.8	3.5	10.1
Indian Sub-Continent										
India	4.5	4.5	9.6	6.4	9.6	11.9	6.7	6.4	6.4	6.8
Other	0.2	0.2	0.3	0.2	0.3	0.5	0.4	0.4	0.5	0.5
Total Indian Sub-Continent	4.7	4.7	9.9	6.6	10.0	12.4	7.0	6.8	6.9	7.2
East Asia										
Japan	26.2	26.9	27.3	27.1	27.8	29.2	29.5	29.8	29.9	30.2
South Korea	2.9	3.0	3.3	3.4	3.6	7.8	5.3	5.3	5.4	5.5
Taiwan	0.8	0.7	0.7	0.7	0.8	0.8	0.9	0.9	0.9	0.9
Thailand	0.3	0.3	0.3	0.4	0.8	1.0	0.4	0.3	0.4	0.5
Singapore	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Hong Kong	0.3	0.3	0.3	0.3	0.4	0.5	0.4	0.4	0.4	0.4
Indonesia	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.4	0.3
Vietnam	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3
Philippines	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Malaysia	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total East Asia	31.5	32.4	33.2	33.2	34.7	40.8	37.9	38.2	38.4	38.8
Africa										
Morocco	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Other	0.7	0.6	0.7	0.7	0.5	0.6	0.6	0.6	0.5	0.5
Total Africa	1.1	1.0	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.0

Table 3
Supply of Silver from the Recycling of Old Scrap
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Oceania										
Australia	2.4	2.5	2.5	2.3	2.3	2.4	2.4	2.4	2.4	2.3
Total Oceania	2.4	2.5	2.5	2.3	2.3	2.4	2.4	2.4	2.4	2.3
Western World Total	135.1	138.7	150.7	146.3	157.4	179.1	167.6	166.9	168.4	170.2
Other Countries										
CIS	9.7	9.0	7.7	7.4	7.1	8.8	7.7	7.9	8.1	8.5
China	3.7	4.1	4.3	4.5	4.6	5.8	5.9	6.0	6.2	6.3
Total Other Countries	13.4	13.1	12.0	11.9	11.7	14.6	13.6	13.9	14.3	14.8
World Total	**148.5**	**151.9**	**162.7**	**158.2**	**169.1**	**193.7**	**181.2**	**180.8**	**182.7**	**184.9**

such as EU directives on recycling. Given that the EU has some of the tightest such controls, it is possible that the relocation of fabrication to low labor cost countries will act to reduce the volume of silver being recovered. Scrap supplies from photography have yet to show much of a decline due to digital inroads.

The above relates solely to scrap generated within the continent. However, as it is home to several major refineries, Europe receives considerable volumes of silver scrap and these imports rose significantly last year, for example from Saudi Arabia/Yemen.

The level of recycling in the **United States** fell by a little over 8% last year. However, the decline owed more to the increase in scrap volumes the year before, during which time a significant amount of industrial inventory was effectively cleaned out. In 2002, there was, in broad measure, no repeat of this development and so scrap supplies from this source declined sharply. In contrast, recycling of ethylene oxide (EO) catalysts was higher last year, largely as a result of the decommissoning of at least one plant.

Scrap volumes in **India** are estimated to have risen only slightly in 2002, up by 6% to 6.8 Moz (210 t). This is a somewhat surprising result given that the average rupee silver price rose by 7% year-on-year and the 8,000 rupee/kg price level, a key psychological price level, was breached for extended periods of time (the effect on demand is discussed in more detail in Chapter 7, suffice to note that, when the price rose above this level in the middle of the year, imports and demand fell sharply). Furthermore, one might have expected more distress selling, especially from the rural areas affected by the droughts and in certain places the floods.

It is perhaps even more surprising that a common view in the Indian market is that scrap volumes actually fell last year, the result of stocks amongst the farmers having been depleted over the past few years as they were forced to dishoard due to successive poor monsoons and droughts. In the context of 2001's record offtake and the price level last year, we feel that this is not highly probable. Indeed, if scrap were to have fallen last year, this would imply that fabrication demand fell even more sharply than we have indicated in Chapter 7, and this does not seem likely (the GFMS methodology counts sales of old silver for cash as supply so that, all other things being equal, lower scrap implies lower fabrication demand).

Japanese scrap is thought to have increased marginally last year. Unlike in India, scrap in Japan is not particularly price responsive, and volumes are more a function of legislation and the growth in the above-ground stock of finished product.

GFMS estimate that **Chinese** scrap rose by just under 2% last year. Estimating volumes is complicated by the fact that the reporting system in China has never properly discriminated between silver produced from mining activity (be it in the form of locally mined output or imported concentrates) and from old fabricated products.

Shipments of old Maria Theresa Taler coins from **Saudi Arabia** and the **Yemen** increased, with over 6.5 Moz (190 t) of these scrap silver coins exported to Europe in 2002. The Maria Theresa Taler coin was first minted in the 18th century, with around 390 million produced since 1751. The Taler, which has until recently been accepted in the Yemen and parts of Africa as a medium of exchange, is becoming increasingly "demonetized", leading to the coins' export as scrap.

6. Silver Bullion Trade

- For the third year in a row, flows of silver out of China, primarily to India, continued to affect both regional and global trade patterns. However, shipments from the mainland did fall slightly year-on-year.

Europe

Europe is one of the largest importers of silver bullion with the United Kingdom and Switzerland dominating the trade in the metal. This stems in part from its structural deficit - total European fabrication demand in 2001 stood at 216.7 Moz (6,740 t) which heavily outweighed the supply from its mine production, 55.9 Moz (1,738 t), scrap of 45.3 Moz (1,410 t) and dishoarding. However, imports also occur as a result of Europe being home to the major physical bullion trade hubs of London and Zurich and also home to some of the largest refineries which take in mine production from all over the world to produce bullion bars and other products. These two functions in turn mean that bullion exports from Europe are substantial.

The surge in London lease rates, which occurred at the end of 2001, led to a sharp rise in bullion imports from the United States. Over two months, either side of the New Year, a total of 16.3 Moz (506 t) was either flown or shipped across the Atlantic to the United Kingdom. During this time frame, imports from Switzerland increased in spectacular fashion (although these were concentrated in December). However, during the second quarter this trade quickly subsided and in fact during the July to August period no US bullion was imported and this contributed to a 3% annual fall in UK imports from the United States. In terms of the material shipped from the United States it was revealing that, on occasion, a considerable volume of grain was exported, which confirmed the weakness of US industrial demand. Elsewhere in North America, trade from Mexico posted the largest decline last year (in volume terms), falling by 69% or 10.6 Moz (329 t) to 4.8 Moz (150 t), the lowest level of Mexican imports since 1993. Turning to South America, import volumes were also markedly lower last year. In particular, trade with Peru and Chile was lower by 15% and 52% respectively. Turning to this year, UK imports in January rose to their highest level in twelve months, as a result of 13.0 Moz (405 t) of Spanish material, thought to be scrapped Peseta coins, following the adoption of the euro.

Last year, UK exports were dominated by just two destinations, namely India and Belgium. The weakness in Indian demand (see below and Chapter 7) was the principal reason behind the close to one-third decline in total UK silver bullion exports last year. The 56% decline in trade with India took the volume of shipments to this country to their lowest level since 1999. Conversely, during October 2002 exports to India were at their highest level since June the previous year. Offsetting part of this decline was a near doubling in shipments to Belgium (back to the level of two years ago) as the United Kingdom appeared to take market share from the United States and, to a lesser extent, Poland. Elsewhere, direct shipments were made for the first time to Sri Lanka, amounting to 3.0 Moz (94 t).

Figure 30
UK Bullion Imports

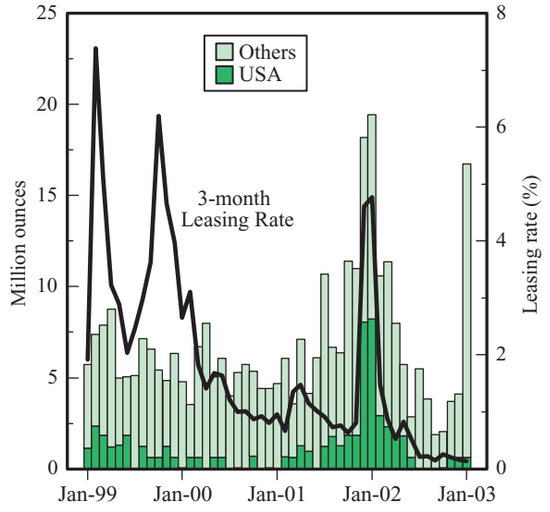
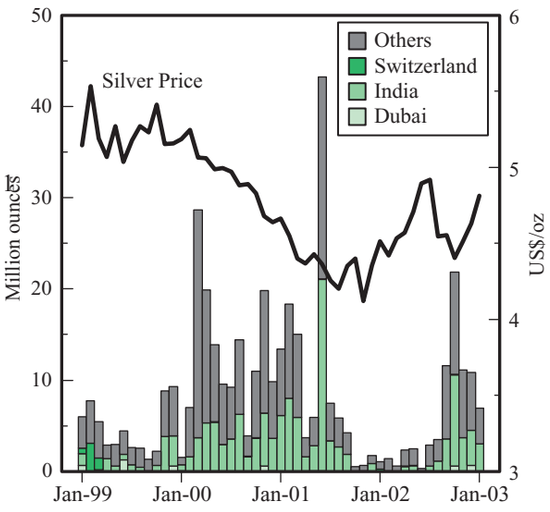


Figure 31
UK Bullion Exports



Official **Italian** bullion imports fell a substantial 18% in 2002 to 48.1 Moz (1,497 t) with inflows from Germany and Switzerland heavily down year-on-year. The drop in imports was most marked in the third quarter, registering a 35% decline year-on-year.

A good chunk of the decline was due to the 5% fall in national fabrication demand to 52.8 Moz (1,642 t). However, as can be easily seen, the scale of the two falls appear to bear little resemblance to each other. On this occasion, the discrepancy cannot really be explained by changes in the unofficial segment within 2002 alone as there are few signs to suggest these inflows remained anything but minimal (they were last significant in 2000). However, it is possible that there was some overhang from previous years when a simple supply and demand exercise for Italy suggested a persistent surplus of silver. A second factor helping plug the gap caused by apparently insufficient imports was an estimated sharp rise in the contribution from imported scrap (domestically generated scrap in contrast was far more stable).

North America

North America is both an important producer and consumer of silver. In terms of mine production, for instance, its share of world supply was close to 31% in 2002. Also, about one-quarter of global fabrication demand last year took place in the region. North America is, however, a net exporter of silver to the rest of the world because total domestic supply from mine production, scrap and government sales exceeds fabrication demand - in 2002 by close to 58 Moz (1,800 t).

Within the region there are large differences in terms of national supply/demand or import/export balances. Put simply, the United States is a substantial net importer of silver whereas in both Mexico and Canada the picture is dominated by exports of "surplus" local mine production, much of it in fact to their common giant neighbor.

Due to lower domestic mine production and scrap supply and a modest recovery in fabrication demand, the local market deficit in the **United States** increased last year by more than 40% to nearly 60 Moz (1,900 t). Not surprisingly this was accompanied by a sharp rise in imports, particularly from Mexico, and a fall in export volumes. Bullion imports climbed to 138 Moz (4,290 t), nearly 55% of them sourced from Mexico and close to 35% from Canada. On the export front, volumes declined but only by about 3.5 Moz (110 t). Indeed, at 23.5 Moz (730 t) they remained at a historically high level. One of the reasons for this was continued large shipments to the United Kingdom. Although down year-on-year these were still substantial and concentrated in January in response to the spike in silver leasing rates that had begun towards the end of 2001. In addition, there was a substantial rise from a low base in US exports to Mexico.

As indicated above, last year there were some important changes in **Mexico's** bullion trade. Exports, which had been stable at around the 2,500 t mark in both 2000 and 2001 leapt to over 3,400 t in 2002 (all this growth occurring in shipments to the United

Figure 32
Official Italian Bullion Imports

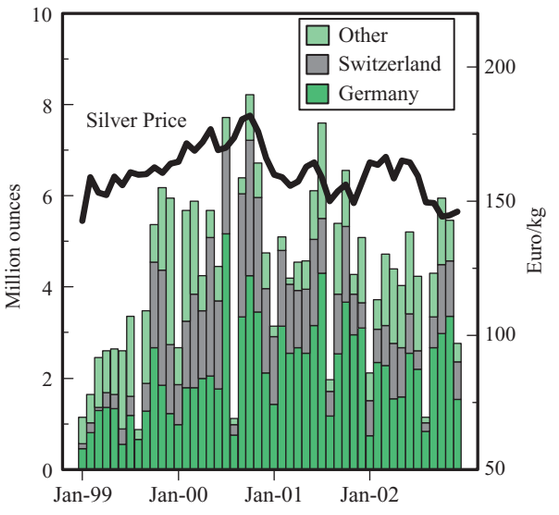


Figure 33
US Bullion Exports

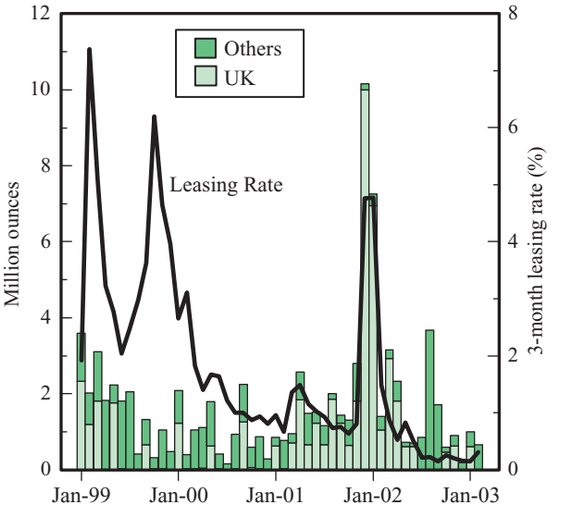
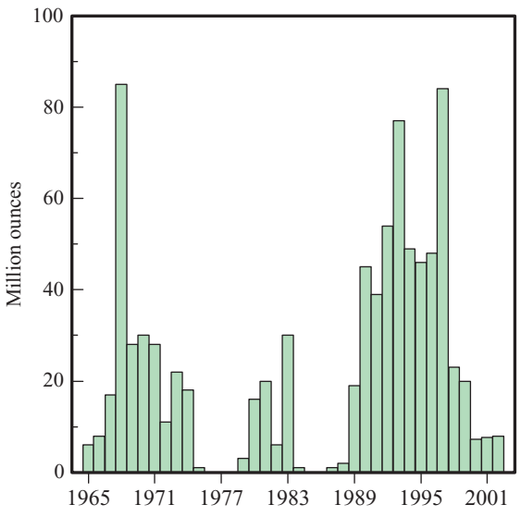


Figure 34
Dubai Bullion Imports



States). Meanwhile, Mexican imports in 2002 increased significantly, as hinted above, almost all of them sourced from the United States.

Finally, bullion exports from **Canada** (which are overwhelmingly to the United States) were higher in 2002, most of this presumably the result of growth in domestic mine production.

Middle East and Indian Sub-Continent

Import statistics from the Istanbul Gold Exchange show the volume of silver shipped into **Turkey** rose sharply in 2002, up by 134% to reach 4.5 Moz (140 t). This is partially a reflection of marginally reduced availability from local mine supply, but the vast majority of this increase relates to the strong rise in local fabrication demand. As detailed in Chapter 7, the rise in fabrication and imports in 2002 must be seen against the context of the extremely poor economic and currency situation prevalent in 2001.

Falling fabrication demand and an increase in scrap availability resulted in a drop in bullion imports into **Egypt** for a second year. The currency devaluations of 2001 have meant that domestic prices have risen to a greater extent than international prices, but unlike gold, silver scrap has not been exported to any noticeable extent.

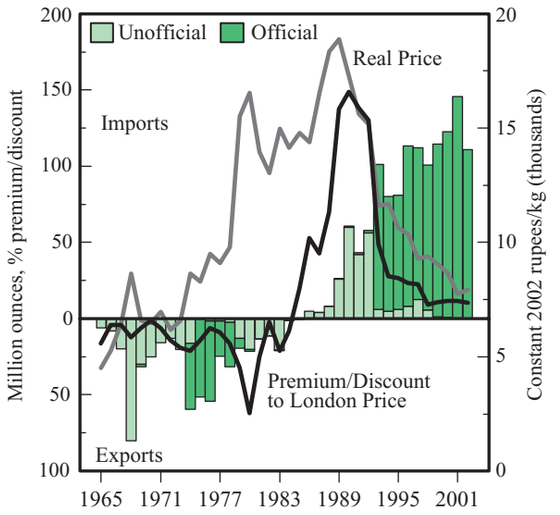
Other countries in the Middle East are not substantial consumers of silver, in sharp contrast to their marked importance as regards gold. The only area where involvement is significant is **Dubai's** role as an entrepôt for silver bullion, mostly for transshipment to India. The flows to this market via Dubai are thought to have grown slightly in 2002 with much of the additional volumes being sourced from China. However, as shown in Figure 34, the Emirate's total imports remain a fraction of previous levels.

Silver imports into **India** for *domestic consumption* fell sharply in 2002, down by 25% to 109 Moz (a touch under 3,400 tonnes). As the table opposite shows, this needs to be seen in the context of what was a record year in 2001 when around 146 Moz (over 4,540 tonnes) was imported. Furthermore, imports last year were well up on the average level seen throughout the 1990s, this in spite of difficult conditions for the metal (see Chapter 7 for more on this).

According to GFMS data, Open General Licence (OGL) imports are the only significant source of supply to the domestic market, with shipments by Non-resident Indians (NRIs) having all but disappeared (the reasons for the sharp decline in imports under the Special Import License (SIL) have been discussed at length in previous *World Silver Surveys*). Replenishment silver imports (non-duty paid silver for the export sector) rose sharply in 2002, up by close to 200% year-on-year to 4.9 Moz (150 t).

Import duties remained unchanged throughout the year, at 500 rupees per kilogram. Significantly, and in sharp contrast to gold, the rate of duty was not changed at the time of the 2003/4 budget. The last few months

Figure 35
Net Indian Bullion Imports and Exports



Indian Bullion Imports
Million ounces

	1998	1999	2000	2001	2002
OGL	93.3	108.9	121.9	145.5	109.2
NRI	0.1	0.1	0.1	1.1	0.1
SIL	1.4	1.4	0.1	0.0	0.0
Replenishment**	0.3	3.0	0.9	1.7	4.8
Sub-total	95.1	113.3	123.0	148.3	114.1
Unofficial	5.8	1.2	0.8	0.4	0.0
Total Imports	100.9	114.5	123.8	148.7	114.1
Local premium*	9%	11%	12%	12%	10%

*percent above London price at the official exchange rate

** imports of silver bullion for manufacture and export

have shown what a profound impact changes in duty can have on imports and the pattern of shipments. In the case of gold, the reduction of duty on numbered, metric weight bars (in India the market standard has for many years been the unnumbered ten tola bar which weighs 116.63 grams) has seen an almost complete shift away from tolas to kilobars. Not surprisingly, the reduction in duty (by 60%) has stimulated gold imports at a time when demand was particularly weak (it has to be said that the fall in the gold price has also been an important recent stimulus). Unfortunately for the silver trade, the white metal is not high on the political or economic agenda and it seems unlikely that duty on imports will be changed in the near term.

While import duties affect the absolute level of imports into India, other forms of local taxes have profoundly affected the internal trade in silver. In fact, tax competition between states (sales-tax and octroi rates across states are not uniform) has resulted in a most peculiar pattern of trade within the country.

Based on GFMS field trips, we estimate that the bulk of the bullion trade internally is actually still unofficial. For example, in the past, Mumbai in Maharashtra State used to attract around 80-90% of Indian silver imports because it was the premier bullion trading centre and a predominant fabrication centre as well. However, rising sales tax and octroi (a local tax) in the state meant that most of the official imports eventually shifted to low sales tax centers around the country.

The main beneficiary of this in the early years was Ahmedabad with its low sales tax, and at one time that city accounted for almost all of the silver (and gold) imports coming into India. However, since it was neither a major consuming nor manufacturing center, most of the bullion imported was smuggled into other states (for example, a substantial portion of gold and silver imported into Ahmedabad eventually flowed into Mumbai illegally).

Initially, the disparity in sales tax between Ahmedabad and the rest of the country was substantial, which is why so much metal was shipped via that city. However, this changed dramatically when Jaipur (in Rajasthan) introduced a new system for bullion imports, the so-called 'green channel'. This system allowed traders or groups of traders to pay a lump sum tax of Rs.2.5 crore against which they could import as

Figure 36
Indian Bullion Imports

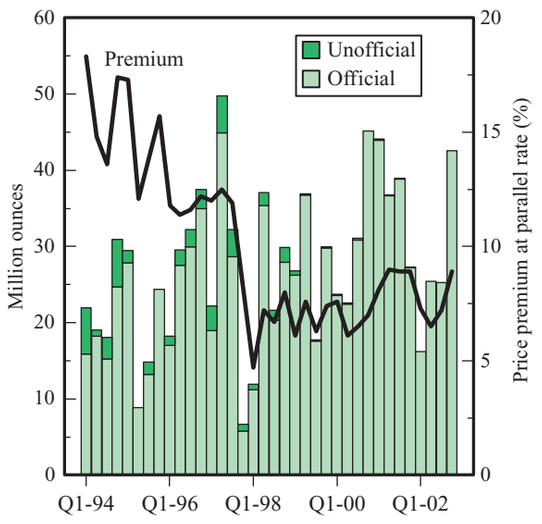
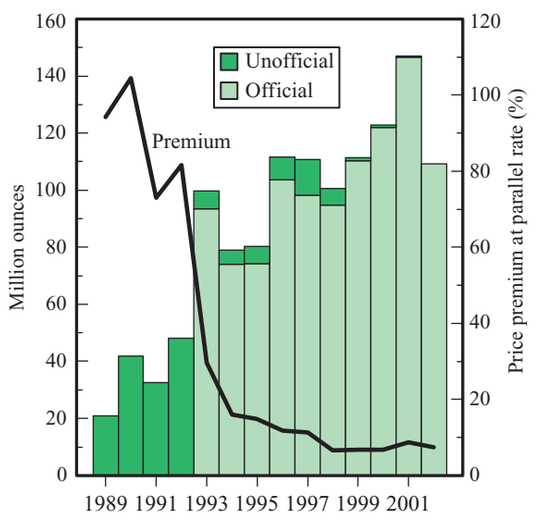


Figure 37
Indian Bullion Imports



much gold as they liked. The incentive was, of course, to import ever higher quantities to reduce the effective marginal tax rate.

Because of this inter-state tax arbitrage, attempts have been made over the past few years to introduce uniform VAT (value added tax) throughout India. In the 2003/4 budget it was announced that uniform VAT would be introduced from April 1st 2003, but this was postponed yet again (it is worth remembering that the introduction of uniform VAT had already been postponed twice before this). In the meantime, some centers continue to attract imports due to lower taxes (in spite of a number of states introducing a uniform sales tax rate of 1% in February of this year). It seems probable that differential tax rates will continue to be the primary determinant of where in India silver is imported.

GFMS estimate that around 50% of India's silver requirements last year were met through imports of Chinese silver (both directly and indirectly via Hong Kong). This is a continuation of a trend first seen in the latter stages of 1998 and which picked up considerable steam in the following two years (see the East Asia section below for more on Chinese and Hong Kong trade flows). Other important sources of supply include Europe (the United Kingdom being the second largest supplier of silver to India after China) the CIS, Australia and Dubai.

East Asia

China was yet again an important supplier of silver to the international market in 2002. As already noted above, this is a continuation of a trend first identified by GFMS in 1998.

It is remarkable that in spite of a considerable body of evidence to the contrary, it is still argued in certain quarters that the flow of metal out of China is not related to stock depletion. This is *not* to say that there are no other sources of silver. Indeed, as GFMS have been at pains to point out in past *World Silver Surveys*, the flow of silver out of China comes from three main sources. Firstly, China is a surplus producer of silver from domestic mining. In other words, the production of silver from all mining activity in China (primary and by-product recovery) is greater than fabrication demand and this surplus is available for export. Secondly, China recovers a substantial quantity of silver from imported concentrates (copper, lead and zinc primarily). This adds to the above-mentioned surplus and is also available for export. Finally, we believe that there are still considerable stocks of silver in China which have been drawn down and exported.

One indication of the extent of the domestic surplus of silver is the fact that the authorities have regularly increased export quotas over the past few years. In fact, in the space of just two years, the export quota has almost doubled to over 71 Moz (around 2,200 tonnes). Recent announcements suggest that the quota for 2003 will be reduced to just over 55 Moz (around 1,720 tonnes).

A particularly interesting development over the past two years has been the extent to which the official Chinese and Hong Kong trade data has been playing catch up with the reality on the ground. For instance, Chinese export statistics reported that only 6 Moz (188 t) was exported in 2000, a year in which GFMS estimate many multiples of this were, in reality, shipped out. Official exports rose rapidly the following year, reaching all of 38.6 Moz (around 1,200 tonnes) and last year the data shows that over 64 Moz (2,000 t) was shipped, a figure that we would suggest is far closer to the actual volume. The bulk of the exports are recorded as going to Hong Kong, although most of this is destined for export purposes, primarily to India and other countries in East Asia such as Thailand, Indonesia and Taiwan.

Hong Kong trade data has also been catching up. Total recorded imports of only 9.3 Moz (288 t) in 2000 rocketed to 49.5 Moz (1,540 t) in 2001 and just over 45

Figure 38
Singapore Bullion and Semis Imports

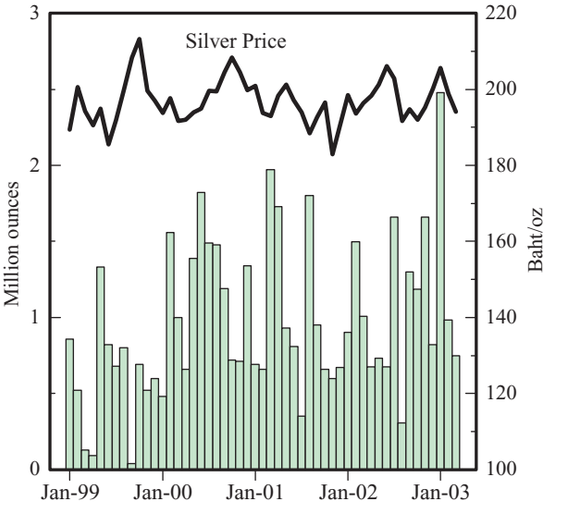
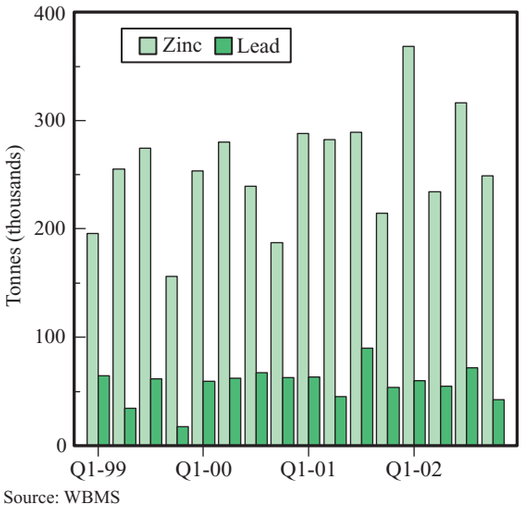


Figure 39
Korean Lead and Zinc Concentrate Imports



Source: WBMS

Moz (1,400 t) in 2002. What is particularly revealing is that the export data shows shipments of 1,408 t in 2000, somewhat higher than recorded imports! The bulk of this was destined for India. Last year, official exports stood at 40.4 Moz (1,256 t), slightly lower than in 2001.

It is crucial to note that GFMS believe that this data still only captures a subset of the actual flows taking place. In 2002, for example, we estimate that actual shipments out of China to the rest of the world (both directly and indirectly via Hong Kong) would have been around 20% higher than those shown in the Chinese trade data.

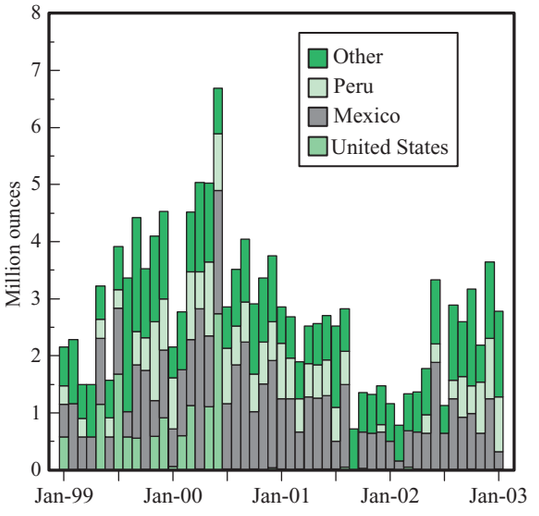
South Korean bullion imports increased last year by around 20% year-on-year. Whilst this represents a sizeable change, it is even more surprising when taking into account a near 30% increase in silver extracted from concentrates refined by the two main smelters. Given that the growth in local demand for silver, primarily from the electronics sector, was approximately half of the rise in silver supplies, it followed that fine silver exports also rose.

Official bullion imports into **Singapore** rose slightly in 2002. The 5% year-on-year increase was a part reversal of the fall in the previous year, when data suggested that imports fell by 15%. Given the discrepancies that exist within official statistics, it is also worthwhile examining the export volumes from the main silver supplying countries to Singapore. This data shows that such shipments increased by just over 30% in volume terms. The main two source countries, China and South Korea, accounted for three quarters of total shipments to Singapore in 2002, rising by just over 70% in comparison to the previous year. Perhaps coincidentally, official Singaporean fine silver imports last year totaled 12.4 Moz (386 t) whilst exports to Singapore were around 12.5 Moz (390 t).

An examination of silver bullion flows in East Asia would be incomplete without spending some time focusing on **Thailand**. The Thai silver jewelry manufacturing industry is one of the biggest in the world, coming after India and Italy in volume terms. Official Thai bullion import data for last year shows that around 60% of silver bullion came from China (most likely via Hong Kong) and South Korea and total silver imports were 30.9 Moz (960 t), up by 23% over the previous year. However, GFMS believe that the official statistics cannot be taken at face value, and require adjustments to reflect our knowledge of bullion flows based on information from research contacts within the region. We understand that a sizeable quantity of silver is smuggled into the country, mainly to avoid paying VAT of 7%. This bullion finds its way into Thailand via neighboring countries such as Malaysia, although its origin is, again, typically Chinese and South Korean.

An interesting development over the past year or so has been the emergence of Thailand as an entrepôt market for silver (as well as gold). Silver is shipped in and stored in bonded warehouses before being exported, mainly to India.

Figure 40
Japanese Bullion Imports



7. Fabrication Demand

- Total fabrication demand fell by 3.5% to 838.2 Moz (26,071 t) last year. Total offtake has now declined for two consecutive years, mostly reversing the gains recorded in 1999 and 2000.
- Surprisingly the biggest contributor to the 30.3 Moz (942 t) fall in fabrication demand was not sluggish economic growth impacting on industrial and photographic demand for silver. In fact the single biggest factor was a 29 Moz (900 t) fall in jewelry demand in India. Total Indian offtake fell by 35.5 Moz (1,104 t) year-on-year.
- Industrial demand for silver rose slightly by 1.3% to 342.4 Moz (10,651 t), representing 41% of total fabrication demand. Increases in North America, Asia and the Middle East more than offset falls in India and Europe.
- Photographic demand fell for the third year running. The 4% drop was a result of softer demand, in particular the consumer sector, which was affected in part by the soft economy and the weakness of the tourist industry.
- Jewelry and silverware demand fell by 9.4% to 259.2 Moz (8,061 t). Much of the loss was in India though European offtake also fell. In contrast, fabrication rose in East Asia, North America, the CIS and Middle East.

The tie between silver and economic activity is strong, given that around two-thirds of total silver fabrication is in the industrial and photographic sectors. This differentiates silver from gold where an element of investment is present in the purchase of jewelry and bars (jewelry accounted for nearly 70% of total gold demand last year). Sluggish economic activity in the world's major economies had a material impact on total fabrication offtake in 2002. This was quite marked in Europe where fabrication on the jewelry side was also hit by market share loss to low labor cost producers. However it was a particular set of economic circumstances in India that accounted for most of the decline in global fabrication offtake. In fact, without India, world fabrication would have risen.

In contrast to India, 2002 fabrication demand grew by 3% in East Asia and by 5% in North America. Growth in Japanese industrial demand and Thai jewelry demand accounted for much of the former's increase while higher Mexican jewelry fabrication and US industrial demand explain much of the latter change. Photographic offtake was broadly flat year-on-year in North America but down significantly in Europe and Japan.

Figure 41
World Silver Fabrication (by category)

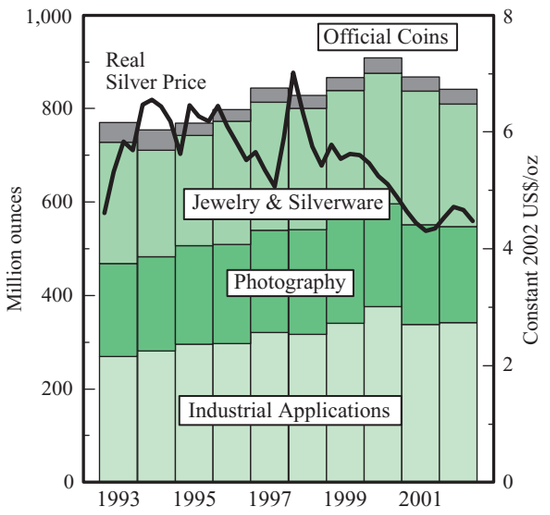
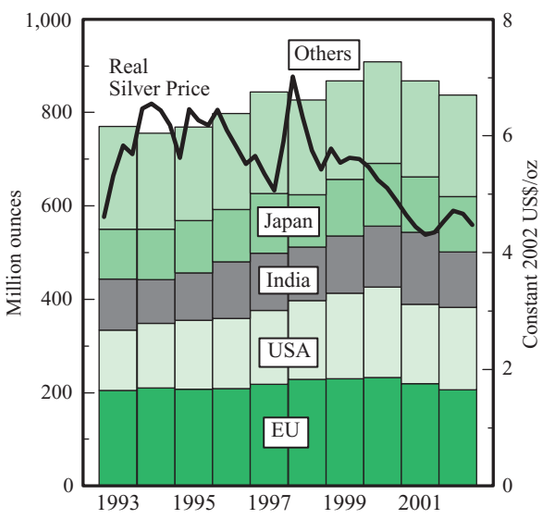


Figure 42
World Silver Fabrication (by region)



Industrial Applications

- Total industrial demand rose by 1.3% in 2002 to 342.5 Moz (10,651 t) though this remains substantially lower than 2000's 376.3 Moz (11,705 t).
- There were sizeable gains in Japanese and US demand, in part due to restocking, but this was countered by heavy losses in India.

The industrial use of silver in **Germany** in 2002 was essentially flat, slipping less than 1% to 21.2 Moz (660 t). Around three quarters of German demand in this category is accounted for by electrical and electronics end uses, contacts in switches for example. Local sales for electrical uses were steady as destocking plus losses in the depressed construction sector were roughly balanced by gains in automotive. The other main consuming sector, machine tools, was stable. Automotive end uses have been a bright point for demand as the increasing complexity of cars has boosted silver use and outweighed last year's 3% decline in German car production.

The weakness of the construction sector hit exports to other European markets such as France and Italy while the relocation of other end users, chiefly to Asia, also hit offtake. Relocation of consumers has yet to be a significant feature in Germany though this is expected to become more an issue over the next few years. This, at some point, will then put pressure to move fabrication to the new consuming countries.

Figure 43
Main Components of Industrial Applications

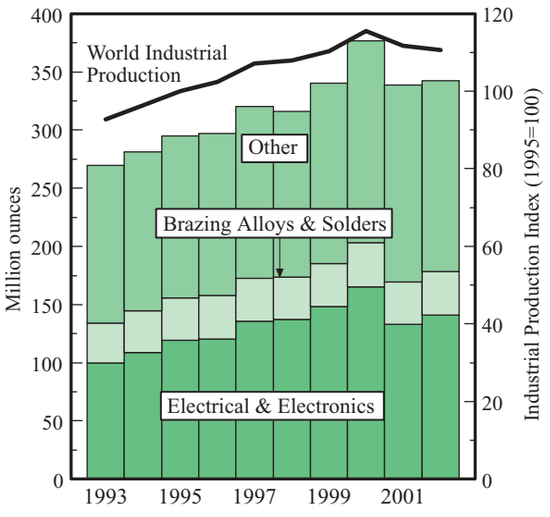
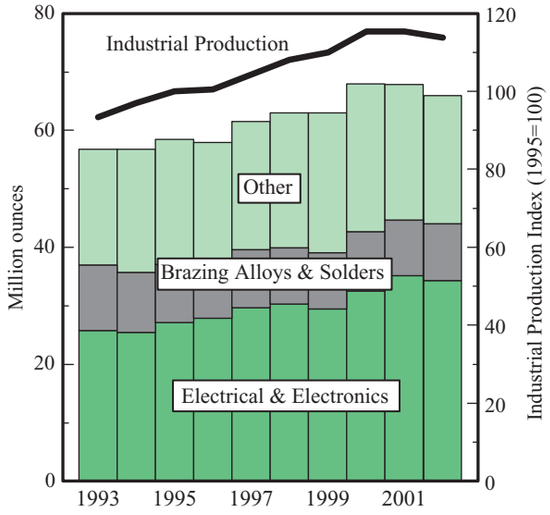


Figure 44
EU Industrial Fabrication



Brazing alloys in Germany recovered strongly in 2002. In a similar fashion to contacts, there was buoyant consumption from the automotive sector which outweighed poor demand from the depressed construction sector. German output was also boosted by healthy exports to other EU countries. Another example of strength was silver anodes fabrication, in part as the production of DVDs switched from mostly gold to mainly silver last year.

Total industrial silver fabrication in **France** last year fell by 8% to 14.6 Moz (453 t). Much of the decline was due to the heavy losses in the electronics sector, which was hit by the ongoing sluggishness of the IT and telecommunications industries. The electrical sector (by far the most important component of French industrial demand) is also thought to have suffered a fall, though on a much more modest scale, largely as a result of destocking, sluggish demand from switch gear producers and lower exports, for example to Germany.

Italy's industrial silver use was steady at 10.4 Moz (324 t). The demand for silver in gold jewelry alloys fell sharply due to the contraction in gold jewellery fabrication but this was countered by growth in decorative plating. The overall electronics and electrical sector was steady as gains in some areas such as anodes and pastes were balanced by lower use in others such as IT or construction. The automotive sector was again a good end use growth area.

Industrial demand in the **United Kingdom** is estimated to have fallen by over 2% last year. Overall,

Table 4
World Silver Fabrication
(including the use of scrap)
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Italy	56.7	52.1	50.1	52.2	56.5	56.3	62.1	65.4	55.7	52.8
UK & Ireland	28.4	31.2	32.3	34.4	35.5	39.2	39.9	43.2	46.5	44.1
Germany	50.1	54.4	47.6	47.2	47.6	48.4	42.1	40.6	40.5	35.5
Belgium	20.7	21.1	23.4	25.3	27.2	33.8	37.5	35.3	32.1	30.8
France	30.2	28.2	31.1	27.2	28.7	28.7	26.9	29.1	29.2	27.7
Spain	6.1	10.7	9.9	9.3	8.7	8.8	7.5	6.7	5.5	5.2
Switzerland	6.2	7.1	7.3	7.8	9.6	10.7	11.1	9.0	3.5	3.4
Poland	2.3	2.6	3.1	3.0	3.4	3.6	3.7	3.9	3.4	3.2
Greece	3.7	3.9	3.8	4.3	4.5	4.1	4.1	3.3	3.0	2.8
Netherlands	2.1	2.4	3.0	2.5	2.4	2.2	2.8	1.9	1.8	2.1
Norway	1.9	1.6	1.6	1.4	1.5	1.5	3.0	2.9	2.3	1.9
Portugal	2.5	2.0	2.4	2.8	2.9	3.1	3.2	3.5	2.6	1.7
Austria	1.5	1.5	1.6	1.5	1.3	1.4	1.2	1.1	1.1	1.2
Sweden	1.6	1.5	1.4	1.5	1.7	1.4	1.4	1.3	1.0	1.0
Denmark	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0	0.9	0.8
Czech & Slovak Republics	0.7	0.6	0.8	0.7	0.8	0.9	0.8	0.8	1.0	0.7
Finland	0.9	1.0	0.9	1.0	0.9	0.7	0.7	0.6	0.5	0.5
Romania	0.5	0.4	0.3	0.4	0.4	0.5	0.4	0.4	0.4	0.4
Cyprus & Malta	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3
Other	1.1	0.9	0.9	0.9	0.8	0.8	0.8	0.9	0.7	0.7
Total Europe	218.2	224.4	222.9	224.7	235.7	247.3	250.5	251.2	232.0	216.7
North America										
United States	129.9	138.4	148.2	149.5	158.9	169.2	184.2	193.4	169.6	177.1
Mexico	32.0	27.6	17.5	20.8	23.5	21.9	22.7	18.3	17.9	19.0
Canada	2.8	3.1	2.7	2.7	2.8	3.4	3.5	3.0	2.9	3.1
Total North America	164.7	169.1	168.4	173.0	185.2	194.5	210.4	214.7	190.4	199.2
Central & South America										
Brazil	6.9	8.3	9.4	8.4	8.4	8.1	7.7	6.8	6.6	6.4
Argentina	4.1	4.1	3.9	3.8	3.8	3.1	2.7	2.3	1.8	1.9
Peru	0.8	0.9	1.0	1.1	1.1	1.1	1.0	1.0	1.0	1.0
Colombia	1.1	1.1	1.1	1.1	1.1	1.1	0.9	0.8	0.7	0.7
Ecuador	0.5	0.7	0.7	0.7	0.7	0.7	0.5	0.5	0.5	0.5
Chile	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4
Other	0.6	0.5	0.6	0.9	1.3	1.6	1.8	1.1	0.9	0.7
Total Central & South America	14.5	15.9	17.1	16.4	16.8	16.2	15.1	12.8	11.8	11.6
Middle East										
Turkey	6.2	5.4	6.4	6.7	6.9	6.6	6.0	7.4	5.5	7.8
Israel	2.8	3.1	3.4	3.7	4.0	3.9	3.9	3.6	3.3	3.3
Egypt	1.9	2.5	2.2	2.3	2.1	1.9	2.0	2.0	1.8	1.6
Saudi Arabia	0.4	0.3	0.4	0.4	0.6	0.5	0.6	0.6	0.6	0.6
Other	1.9	2.5	2.4	2.6	2.5	2.4	2.5	2.4	2.5	2.4
Total Middle East	13.5	13.8	14.8	15.7	16.2	15.3	15.0	16.3	13.8	15.8
Indian Sub-Continent										
India	108.8	93.9	101.3	122.2	122.9	114.7	121.5	131.0	154.0	118.5
Bangladesh & Nepal	3.9	4.6	5.2	5.8	6.4	5.1	5.8	6.0	6.0	4.8
Other	3.4	2.8	3.8	2.7	4.1	2.8	3.4	3.2	2.1	2.1
Total Indian Sub-Continent	116.0	101.2	110.2	130.7	133.5	122.6	130.6	140.2	162.1	125.4
East Asia										
Japan	107.9	108.4	112.7	112.1	127.2	112.8	122.5	135.0	119.3	118.6
Thailand	38.7	29.1	27.7	27.6	27.1	24.2	26.7	30.2	32.6	35.8
South Korea	15.6	16.4	18.6	18.5	18.6	13.8	16.7	20.6	18.1	19.1
Taiwan	4.8	5.3	5.7	6.4	6.9	6.8	6.7	9.4	8.5	9.0
Indonesia	1.8	2.7	3.1	3.4	4.1	2.7	3.2	3.9	4.3	4.8
Hong Kong	2.6	3.4	3.4	3.7	4.4	3.6	3.9	4.4	3.2	3.4
Myanmar, Laos & Cambodia	1.0	1.0	1.1	1.1	1.0	0.8	0.9	0.8	0.9	1.0

Table 4
World Silver Fabrication
(including the use of scrap)
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Vietnam	0.4	0.5	0.6	0.7	0.7	0.6	0.7	0.7	0.7	0.8
Malaysia	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.6	0.6	0.6
Other	0.4	0.4	0.4	0.3	0.3	0.3	0.4	0.4	0.5	0.5
Total East Asia	173.7	167.5	173.7	174.2	190.6	165.9	182.1	206.1	188.6	193.5
Africa										
Morocco	0.5	0.5	0.5	0.6	0.6	0.6	0.5	0.6	0.6	0.6
Tunisia	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
South Africa	0.6	0.4	0.5	0.3	0.3	0.3	0.3	0.3	0.2	0.2
Algeria	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
Other	0.5	0.5	0.5	0.4	0.3	0.4	0.4	0.4	0.4	0.4
Total Africa	2.0	1.9	2.0	1.8	1.8	1.7	1.7	1.8	1.7	1.7
Oceania										
Australia	7.0	6.3	5.3	5.2	5.2	5.6	5.8	7.0	5.9	5.8
New Zealand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Oceania	7.0	6.3	5.3	5.2	5.2	5.7	5.8	7.0	6.0	5.8
Western World Total	709.5	700.1	714.6	741.7	785.0	769.2	811.2	850.1	806.3	769.6
Other Countries										
China	21.1	24.6	26.0	28.6	32.2	33.9	33.1	33.6	35.7	42.2
CIS	40.7	31.6	28.9	28.2	27.2	25.4	24.3	24.9	25.8	26.4
North Korea	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Other Countries	62.0	56.2	55.0	56.9	59.4	59.3	57.5	58.6	62.2	68.6
World Total	**771.6**	**756.3**	**769.6**	**798.6**	**844.4**	**828.5**	**868.7**	**908.6**	**868.5**	**838.2**

there were two main factors responsible for this outcome. Firstly, the domestic manufacturing base continued to decline last year. Secondly, companies continued to relocate their manufacturing facilities away from the UK, in favor of lower cost countries, in particular south east Asia and eastern Europe. In some cases this has simply led to a greater export focus by domestic manufacturers but, increasingly, those companies shifting their facilities have eventually sourced products from suppliers closer to their new base. For example, these factors accounted for the 12% fall in the solder and brazing alloy market, which took demand back to the 2001 level.

North America

A cursory glance at the data suggests that industrial demand in the **United States** staged a modest recovery last year, after the sharp fall posted in 2001. However, the increase in 2002 industrial demand was related more to stock replenishment, from a particularly low level, than sustained growth in end use markets for silver bearing products.

To understand this outcome, it is worth briefly reviewing the trend over the past three years. In the months leading up to "Y2K", concerns relating to both the continuity and security of supply (should "Y2K" fears be realized) led to a significant increase in demand for silver bearing components (this often involved multiple ordering of the same products), a trend which carried over into early 2000. However, as the year progressed it transpired that, not only were these supply concerns unfounded, but that the terminal markets had started to slow down. As a result, the second half of 2000 and the following twelve months, were characterized by a significant stock drawdown, which had a direct and adverse impact on silver industrial demand.

Last year, therefore, end user manufacturers responded in two ways to the boom and bust cycle of the previous three years by adopting a much more cautious approach to stock management.

Firstly, this involved a significant shift towards "just-in-time" practices. This philosophy affected the ability of fabricators to effectively plan their own requirements, even over the short to medium term (as their customers moved away from providing advance notice of their requirements).

Secondly, those companies who opted to maintain a

EU Industrial Production
Index (1995=100)

1998	1999	2000	2001	2002
108.1	110.0	115.3	115.4	113.8

Source: OECD

basic stock position did so at a significantly lower level than in recent years. As a result, much of the stock replenishment that took place last year was from a drastically low level and as such represented only a modest volume of additional silver demand.

The impact of these developments was compounded by the ongoing relocation of end use fabricators to lower cost countries and the patchy recovery in end use markets. In addition, much of the increase in orders was export driven. This trend can only partly be explained by the shift in manufacturing facilities but instead confirms the fragile nature of the US industrial base.

Turning to the various sectors of fabrication, overall, electrical and electronics demand remained weak last year. The automotive sector staged only a partial recovery in 2002 although demand was healthier from the construction industry (partly related to a switch of investor funds from the stock market to the housing sector), which provided a fillip for the heavy switch industry. One area to account for higher demand last year in the electronics sector, was the use of silver in DVDs, particularly in DVD-9s (for home use). As late as the first quarter of 2002, a substantial amount of DVD production was satisfied by gold, but as the year progressed substitution, in favor of silver, consigned gold to only a minor share of the market.

In contrast, the telecommunications industry, which had been the main casualty of the "Y2K" phenomenon, showed only modest signs of a recovery last year. This impacted not only the contacts industry but also the multi layer ceramic capacitor (MLCC) sector. In addition, silver demand, within this area, was affected by substitution away from silver bearing components, which involved a switch to copper-nickel MLCCs,

United States Industrial Production
Index (1995=100)

1998	1999	2000	2001	2002
117.2	121.9	129.1	124.6	123.7

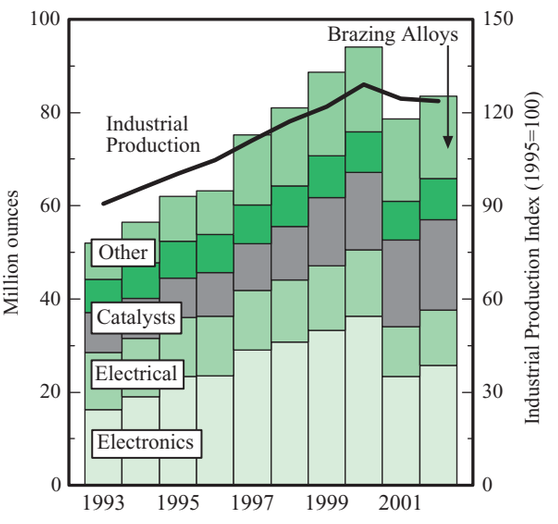
Source: OECD

although this trend was by no means new to last year. Arguably, much of the switch to base metals MLCCs has already been achieved, most notably by larger companies (who have the capital to invest in new infrastructure), leaving small and medium sized operations reliant on silver-palladium components. However, the precious metal composition, within this product range, has remained far from constant. The increase in the palladium price of two years ago led to research to significantly reduce the reliance on this metal. As well as the move completely away from precious metals there was also a drive to substantially increase the share of silver, at the expense of palladium. As a result, last year saw increasing demand for 90% silver MLCCs (i.e. with 10% palladium), in addition to modest requirements for 95% silver dialectics; as little as two years ago, the market was dominated by 70% silver MLCCs. Overall though, it does appear that any future growth in MLCCs is expected to come from base metal products, although their precious metal counterpart should become increasingly silver rich.

The picture emerging from the ethylene oxide (EO) market was less clear last year. Although at least one plant was decommissioned in 2002, it appears that other catalysts were used to their full capacity. However, anecdotal evidence suggests that in early 2003 excess inventory of products has been accumulated and, in contrast to last year, output from EO plants has been, at least temporarily, scaled back.

Elsewhere, it appears that the modest upturn, which

Figure 45
US Industrial Fabrication



was noticeable during the fall, has continued in demand into 2003. However, it also appears to be the case that much of the growth, as was the case last year, has come from exports to overseas markets, particularly in south east Asia, rather than from the domestic market.

India

Indian industrial demand is estimated to have fallen by around 13% in 2002, down from a record 50.8 Moz (1,579 t) the previous year to 44.2 Moz (1,375 t). In spite of this fall, India is still one of the largest users of silver in the world, ranking alongside those industrial giants, Japan and the United States.

By contrast with the United States and Japan, Indian offtake in this category is less "industrial". Indeed, fabrication in hardcore industrial applications like electronics and brazing alloys accounts for only a fraction of total offtake in this category. For example, electrical, solders and brazing alloys are estimated to account for only around 6.6 Moz (205 t) of the total 44.2 Moz (1,375 t) of industrial offtake, a rather paltry 15% (contrast this with Japan, for example, where the ratio is probably around 80 plus %). The "real" industrial versus "other" industrial split is an important dichotomy in the Indian silver market and holds the key to understanding the fluctuations in offtake over the years.

The "other" category of demand in India covers a multitude of different end use applications, ranging from foils for use in the decorative covering of food

Figure 46
Indian Fabrication

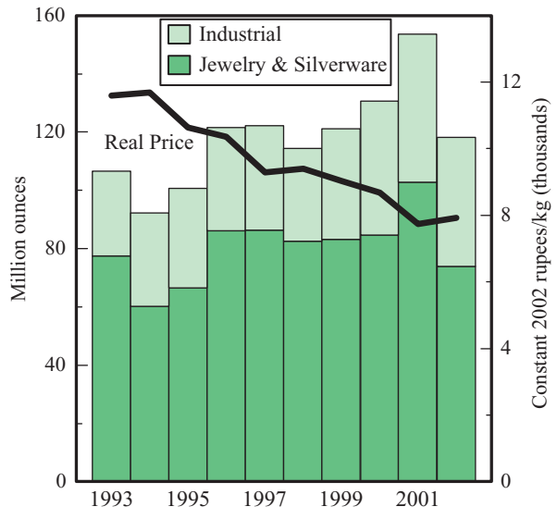
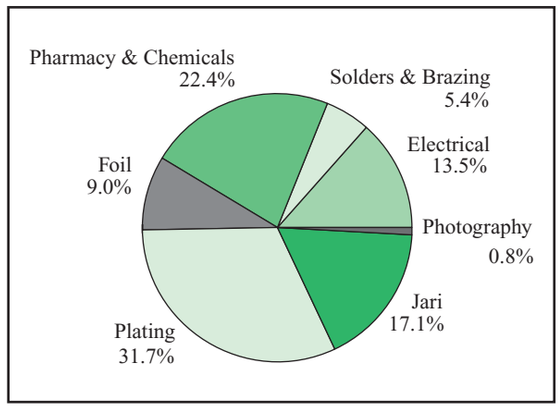


Figure 47
Indian Industrial Fabrication, 2002



(although it may come as a surprise to many western readers, silver and gold foil is used extensively in India for decorating foodstuffs and is actually eaten) to the plating of jewelry and silverware. One other very significant consumer of silver is jari.

Jari is a thread used for saris (the sari is a length of cloth which is wrapped around a woman's body and is one of the most common forms of dress in India. Saris are often described as "the apparel that covers all...yet reveals all") and most is produced in Surat, Gujarat. It is a massive industry, utilizing a variety of materials which include gold and silver. "Real" jari is made of silver and electroplated with gold and is a major status symbol.

As might be expected, the consumption of jari is very much a function of how well the economy is doing and how much people are earning. It will come as no surprise then that GFMS estimate last year jari fabrication fell sharply, by around 18%, from 7.5 Moz (232 t) to 6.1 Moz (190 t) due essentially to the weakness in the agricultural sector.

As we discuss in more detail in the "Jewelry & Silverware" section later in this chapter, the broad consensus is that agricultural output in 2002 fell by around 3% (official estimates for the fiscal year 2002/03 are that it fell by 3.1%) due to the poor rains which adversely affected the kharif (summer) crop. The government's "Economic Survey" has estimated that there was a 13.6% fall in food-grain output to 183.2 million metric tonnes last year, the lowest absolute level since 1996-97.

Table 5
Silver Fabrication: Industrial Applications
(including the use of scrap)
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Germany	18.6	18.0	18.5	17.2	17.8	18.4	18.3	20.8	21.4	21.2
UK & Ireland	11.4	11.7	11.9	12.2	12.5	16.3	15.2	17.6	15.4	15.0
France	11.3	11.6	12.0	11.7	13.4	11.2	11.6	12.3	15.9	14.6
Italy	10.1	10.2	10.6	11.2	11.4	10.6	10.6	10.9	10.4	10.4
Switzerland	5.6	6.5	6.6	6.9	8.6	10.0	10.4	8.3	2.7	2.7
Netherlands	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.5	1.6
Spain	1.8	1.7	1.8	2.0	2.9	3.1	2.7	2.0	1.3	1.3
Poland	0.6	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7
Norway	0.4	0.4	0.4	0.4	0.4	0.4	1.4	1.2	0.7	0.6
Austria	0.6	0.6	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.5
Sweden	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.3
Czech & Slovak Republics	0.5	0.4	0.5	0.5	0.4	0.4	0.5	0.3	0.3	0.3
Belgium	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Other	0.7	0.7	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.6
Total Europe	64.1	65.0	67.0	66.6	71.9	74.6	75.2	77.7	72.3	70.1
North America										
United States	56.3	60.6	65.9	68.2	75.3	81.0	88.6	94.1	78.7	83.5
Mexico	2.6	2.8	2.5	2.6	2.7	3.0	4.3	4.5	3.9	3.8
Canada	0.7	0.6	0.7	0.6	0.6	0.5	0.5	0.5	0.5	0.5
Total North America	59.6	64.0	69.2	71.4	78.7	84.5	93.5	99.2	83.1	87.8
Central & South America										
Brazil	2.5	3.2	3.5	3.3	3.4	3.5	3.2	3.2	3.2	3.2
Argentina	1.3	1.3	1.2	1.2	1.2	1.2	1.0	0.8	0.6	0.6
Colombia	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2
Ecuador	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Total Central & South America	4.5	5.2	5.4	5.2	5.3	5.4	4.8	4.6	4.5	4.5
Middle East										
Turkey	1.2	1.1	1.2	1.2	1.4	1.3	1.2	1.4	1.1	1.3
Israel	0.8	0.9	1.0	1.0	1.0	1.0	0.9	1.0	0.8	0.8
Egypt	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Middle East	2.2	2.1	2.3	2.4	2.5	2.5	2.3	2.5	2.1	2.2
Indian Sub-Continent										
India	29.0	32.1	34.1	35.5	36.0	31.9	37.9	46.1	50.8	44.2
Other	0.6	0.5	0.6	0.5	0.7	0.5	0.6	0.5	0.3	0.3
Total Indian Sub-Continent	29.5	32.6	34.8	36.0	36.7	32.4	38.5	46.7	51.1	44.5
East Asia										
Japan	45.8	51.1	53.6	52.1	59.4	52.8	60.8	72.1	55.4	59.1
South Korea	8.4	10.0	11.9	11.9	12.3	11.2	12.2	15.7	13.4	14.6
Taiwan	4.2	4.7	5.2	5.8	6.3	6.2	6.3	8.8	8.0	8.7
Hong Kong	1.6	2.4	2.5	2.8	3.4	3.0	3.3	3.9	2.7	3.0
Indonesia	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
Total East Asia	60.4	68.6	73.6	73.1	82.0	73.7	83.0	101.1	80.1	85.9
Africa										
Morocco	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2
South Africa	0.5	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1
Other	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Africa	0.8	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.5	0.5
Oceania										
Australia	2.0	2.2	2.4	2.3	2.1	2.3	2.4	2.5	2.1	2.1
Total Oceania	2.0	2.2	2.4	2.3	2.1	2.3	2.4	2.5	2.1	2.1
Western World Total	223.3	240.4	255.5	257.5	279.7	276.0	300.3	334.8	295.7	297.6

Table 5
Silver Fabrication: Industrial Applications
(including the use of scrap)
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Other Countries										
China	14.9	17.3	18.2	19.1	20.3	20.7	20.9	21.9	22.3	25.6
CIS	31.9	24.0	21.9	21.1	20.6	19.6	18.8	19.6	20.1	19.3
Total Other Countries	46.8	41.3	40.1	40.1	41.0	40.4	39.8	41.5	42.3	44.9
World Total	**270.1**	**281.7**	**295.6**	**297.6**	**320.7**	**316.3**	**340.0**	**376.3**	**338.1**	**342.4**

The weakness in the agricultural sector has also had negative implications for all of the "other" industrial uses in India. For example, GFMS estimate that foil fabrication collapsed last year, although this was due to a combination of price, lower incomes and the ban on gukta (a tobacco based chewing product that contains silver) in certain states.

By contrast, fast growing sectors like telecoms, software and durable goods exports have all contributed to strong "real" industrial demand (data released at the time of the 2003/04 budget pointed to industrial production having risen 6.1% (fiscal year-on-year) compared to just 3.3% the previous year). As a result, GFMS estimate that electronics/electrical, solders and brazing alloy offtake increased last year, by around 4 and 5% respectively.

Although "real" industrial offtake in India is still relatively low, there is every indication that this is likely to grow in the future. For example, India already plays host to the third largest optical media manufacturer in the world (the company has been an original equipment manufacturer for Sony and Samsung) which uses a substantial quantity of silver in various recording devices. The South Koreans also have a dominant presence in India and, increasingly, products are being made predominantly from locally sourced materials (for example, LG claims that its products have over 70% localized components and, in color televisions, this rises to 95%).

Global Billings
(semiconductor shipments per year, millions)

	World	Americas	Europe	Japan	Asia
2001	138.6	35.4	29.9	32.7	39.4
2002	140.7	31.3	27.8	30.5	51.2
Change	2.1	-4.2	-2.1	-2.2	11.7
Change%	2	-12	-7	-7	30

Source: SIA

East Asia

Japanese industrial uses of silver rose by close to 7% in 2002, reaching 59.1 Moz (1,840 t), 3.7 Moz (117 t) higher than a year earlier. However, offtake was still significantly below the record levels seen in 2000 (when demand peaked at 72.1 Moz or 2,243 t), and was also lower than in 1999.

Electronics uses of silver rose sharply last year, albeit from a relatively low level in 2001 (when demand fell sharply in the aftermath of the pricking of the technology bubble). GFMS estimate that electronics and electrical uses of silver rose by over 10% last year, driven primarily by uses in the fomer, to 29.4 Moz (913 t). 2002 was a curious year for the Japanese electronics market, especially those supplying precious metals containing components to the large manufacturers. Although the year started slowly, by June demand had rocketed and, in certain applications, offtake rose to record highs (this was seen in gold too, with gold bonding wire production rising to the highest monthly level ever in June). Production of paste and powder was particularly strong and one of Japan's largest manufacturers reported to GFMS that their production had doubled in the second quarter of the year. The precise reasons for this are difficult to determine, but there does appear to have been an element of stock building of finished products which peaked mid-year. In what appears to something of a contradiction, the Japan Electronics and Information Technology Industries Association reported that for the calendar year 2002, PC shipments declined 11% in

Japanese Non-Photographic Nitrate and Contact Production
Million ounces

	1999	2000	2001	2002
non-photo nitrates	13.7	17.1	12.0	14.0
contacts	9.5	11.5	7.9	8.6

units (to 10,661,000), suggesting that the growth was not seen in the area of PCs. GFMS information is that this decline was more than offset by growth in other areas, including demand from the automobile industry and rising production of PDAs, minidisks, LCD televisions and DVD players.

Elsewhere, output of contacts rose by around 10% year-on-year for very much the same reasons as the rise in overall electronics demand. Total Japanese vehicle production rose by over 4% in 2002 which, coupled to stronger demand from specific areas like those mentioned immediately above, offset weaker demand related to the 6.5% fall in new housing starts (contacts/switches and relays are used widely in buildings) and the overall decline in the production of consumer durables. The ongoing weakness in the construction sector also contributed to falling nitrate use in mirrors as well as in health applications (for example, silver containing anti-bacterial glazes).

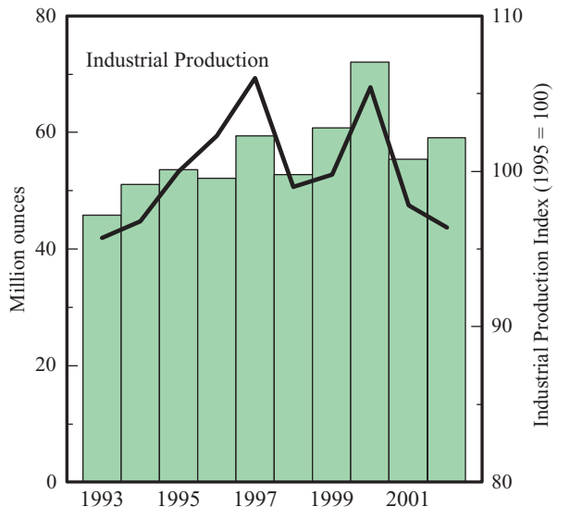
Japanese Industrial Production
Index (1995=100)

1998	1999	2000	2001	2002
99.0	99.8	105.4	97.8	96.4

Source: OECD

GFMS estimate that Japanese production of solders and brazing alloys fell by well over 4% last year. Falling consumer durable production, the secular move of production facilities offshore and lower new building starts all contributed to the decline. One clear indicator of the decline in this segment is the fact that on an indexed basis, taking the year 2000 as 100, production of refrigerating machines and appliances in 2002 came in at just 91.

Figure 48
Japanese Industrial Fabrication



The data points towards silver oxide production having risen in 2002 after a sharp fall the previous year. Our information is that output could have risen by as much as 20% last year as demand for batteries in particular surged (for use in PDAs, minidisk players and so on).

The lower palladium price contributed to a 2.8% increase in Japanese dental demand in 2002. One of the main constraints on the domestic market over the past five years was the rapidly rising price of palladium. This served to push the price of the main alloy, Kinpara 12, which contains 40% silver, outside of the range covered by health insurance and patients and practitioners migrated to other materials. Lower palladium prices and higher insurance cover have contributed to the rise in offtake seen over the past year.

Chinese industrial offtake is estimated to have risen sharply in 2002, up by close to 15% to 25.6 Moz (795 t). As we have made clear in previous *World Silver Surveys*, the liberalization of the Chinese market has made the collection of statistics considerably more difficult. This difficulty has been compounded by two factors. Firstly, the flow of metal from the mainland to Hong Kong and secondly, the fact that local demand tends to be met from the primary source and data on these transactions is not collected systematically.

As we discuss in more detail in Chapter 6, since 1998, China has been a substantial supplier of silver to the international market, primarily to Hong Kong. Coupled to this, most domestic producers of silver now completely by-pass any centralized body when it comes to supplying metal to fabricators. Although it was hoped at one time that the Huatong Nonferrous Metal Wholesale Market would become the primary trading center for silver, through which offtake and price discovery could be monitored, this has not turned out to be the case (for a variety of reasons, including the thorny issue of value added tax).

Both of these factors have made it more difficult to determine with a high degree of certainty just how much metal is available for manufacturing in China itself and where it is going to, a cornerstone of the GFMS methodology. Current estimates are, therefore,

being benchmarked off data series collated at a time when the People's Bank of China was the sole official supplier of silver to the market. Although these figures were always incomplete and GFMS made adjustments to account for direct movements of metal into the market for example, they were a good indication of the state of play. At the time of writing, we are confident that the estimates appearing in the *World Silver Survey* are accurate but, as part of our ongoing field work in China, we will be endeavoring to ensure that this is indeed the case.

All of the main categories of industrial demand are thought to have increased. There have been two main drivers underpinning this. Firstly, domestic and export demand has been rising and secondly, higher local content in final products such as computers and air-conditioners has stimulated fabrication of silver containing intermediate products such as plating salts and contacts.

Data released by various statistical agencies points to some of the key areas where demand has been particularly strong. For example, automobile production rose by around 40% last year (domestically made motor vehicles increased by 36.5 percent year-on-year to reach 2. 937 million units during the January-November period of 2002) and ever increasing amounts of the inputs are now domestically produced (including silver containing products like switches and contacts). Current local content requirements on vehicle manufacturers range from 40% to 80%, although China has agreed to eliminate local content requirements immediately after it accedes to the WTO.

Elsewhere, production of air-conditioners, both for the local and exports markets, rose sharply last year, boosting demand for brazing alloys. Preliminary data suggest that output of refrigeration equipment increased by over 30% year-on-year and, in contrast to the 1990s when considerable amounts of alloys were imported, increasing volumes are now being manufactured locally. Ethylene oxide (which is produced by the direct oxidation of ethylene by air or oxygen in the presence of a silver oxide catalyst) production also rose due to rising demand for products in which it is used (for example textiles, detergents, solvents, polyurethane foam, medicines, adhesives etc). Data available at the time of writing points to the production of chemical fibers having risen by as much as 20% year-on-year (to October 2002). Rising demand for products like polyester textile fibers and various molded consumer products has seen production and, hence, demand for silver catalysts rise.

Korean Industrial Production
Index (1995=100)

1998	1999	2000	2001	2002
106.2	131.9	154.0	156.7	165.1

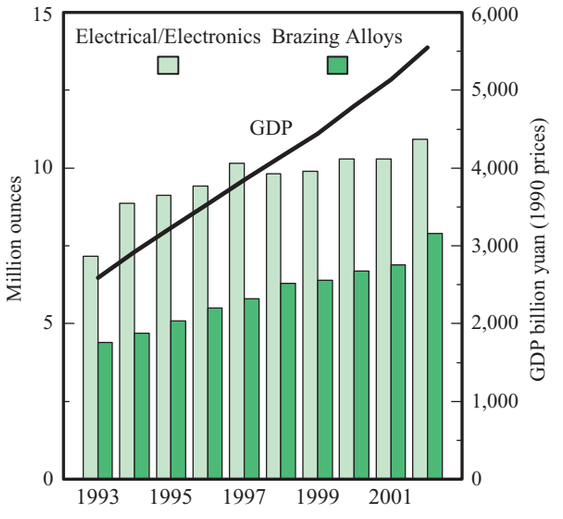
Source: OECD

A mild recovery in the electronics sector helped **South Korean** industrial demand rise by a reasonable 9.0% year-on-year. This reflects a similar story as in other East Asian countries that have large electronic industries, such as Taiwan and Japan.

Robust demand for durable consumer goods such as fridges or televisions and electronic devices such as mobile phones, network hardware or semiconductors, helped the large Korean manufacturers raise production output to near record levels (Samsung Electronics reported that it increased sales by 25% last year, particularly in the Telecommunications Networks Division). This has a flow-on effect for silver use in electrical contacts, switches and relays.

The "tech-bust" of April 2000 in some ways signaled the end of a near six-year run of strong growth for the electronics industry. GFMS estimate that a record 8.6 Moz (268 t) of silver were used by the Korean electronics sector in 2000. Last year's level of 8.2 Moz (255 t) is only 5% down from that peak and points to the fact that robust consumer goods demand as well as a 7% rise in the number of vehicles manufactured were important factors in the past year

Figure 49
Chinese Industrial Uses of Silver



The Main Uses of Silver

Silver's unique properties include its strength, malleability and ductility, its electrical and thermal conductivity, its sensitivity to and high reflectance of light and, despite it being classed as a precious metal, its reactivity which is the basis for its use in catalysts and photography. This versatility means that there are few substitute metals in most applications, particularly in high-tech uses in which reliability, precision and safety are paramount.

Industrial

Silver is the best electrical and thermal conductor of all metals and is hence used in many electrical applications, particularly in conductors, switches, contacts and fuses. Contacts provide junctions between two conductors that can be separated and through which a current can flow, and account for the largest proportion of electrical demand.

The most significant uses of silver in electronics are in the preparation of thick-film pastes, typically silver-palladium for use as silk-screened circuit paths, in multi-layer ceramic capacitors, in the manufacture of membrane switches, silvered film in electrically heated automobile windshields, and in conductive adhesives.

The ease of electro-deposition of silver from a double-alkali metal cyanide, such as potassium silver cyanide, or by using silver anodes accounts for its widespread use in coating. Silver solutions are made up of a cyanide, a carbonate, silver and a brightener. The silver is usually added as the single salt, silver cyanide, or the double salt, potassium silver cyanide. Various forms of silver are used as anodes and may be in the form of plates, bars, rods, grain or in custom-designed shapes. The plating thickness of some items, such as fuse caps, is less than one micron although the silver then tarnishes more easily, and coatings of two to seven microns are normal for heavy duty electrical equipment.

Silver is used as a coating material for compact disks, whilst in 2002 digital video disks also switched to a silver coating.

The unique optical reflectivity of silver, and its property of being virtually 100% reflective after polishing, allows it to be used both in mirrors and glass coatings, cellophane or metals.

Many batteries, both rechargeable and non-rechargeable, are manufactured with silver alloys as the cathode. Although expensive, silver cells have superior power-to-weight characteristics than their competitors. The most common of these batteries is the small button shaped silver oxide cell (approximately 35% silver by weight) used in watches, cameras and similar electrical products.

Silver, usually in the form of mesh screens but also as crystals, is used as a catalyst in numerous chemical reactions. For example, silver is used in formaldehyde catalysts for the manufacture of plastics and, to an even greater extent, in ethylene oxide catalysts for the petrochemical industry.

Silver is employed as a bactericide and algicide in an ever increasing number of applications, including water purification systems in hospitals, remote communities and domestic households.

The joining of materials (called brazing if done at temperatures above 600º Celsius and soldering when below) is facilitated by silver's fluidity and strength. Silver brazing alloys are used widely in applications ranging from air-conditioning and refrigeration equipment to power distribution equipment in the electrical engineering sector. It is also used in the automobile and aerospace industries. Bearings electroplated with high purity silver have greater fatigue strength and load carrying capacity than any other type and are hence used in various high-tech and heavy-duty applications.

Photography

The photographic process is based on the presence of light-sensitive silver halide crystals, prepared by mixing a solution of soluble silver, usually silver nitrate, with a soluble alkali metal halide such as sodium chloride or potassium bromide. These grains are then suspended in the unexposed film. The effect of light on the silver halide disturbs the structure of this compound, rendering it selectively reducible to metallic silver by reducing agents called developers. The resulting negative image is converted to the positive by repeating the process under specific conditions. Photographic film is used in radiography, the graphic arts and in consumer photography. Photographic film manufacturers demand very high quality silver.

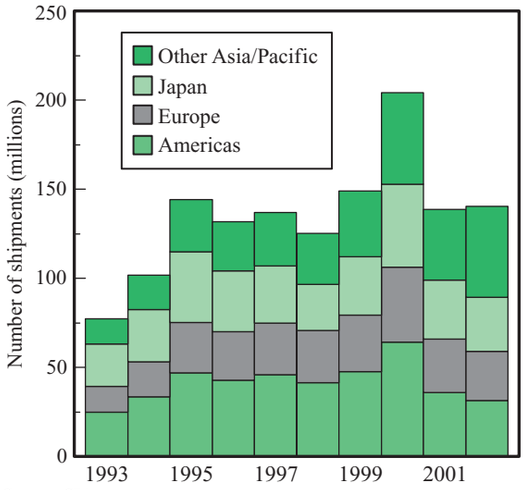
Jewelry and Silverware

Silver possesses working qualities similar to gold, enjoys greater reflectivity and can achieve the most brilliant polish of any metal. Consequently, the silversmith's objective has always been to enhance the play of light on silver's already bright surface. Pure silver (999 fineness) does not tarnish easily but to make it durable for jewelry, it is often alloyed with small quantities of copper. It is also widely used with base metals in gold alloys. Sterling silver, at a fineness of 925, has been the standard of silverware since the 14th century, particularly in the manufacture of "hollow-ware" and "flatware". Plated silverware usually has a coating of 20-30 microns, while jewelry plating is only 3-5 microns.

Coins

Historically, silver was more widely used in coinage than gold, being in greater supply and of less value, thus being practical for everyday payments. Most nations were on a silver standard until the late 19th century with silver coin forming the main circulating currency. But after the gold rushes, the silver standard increasingly gave way to gold. Silver was gradually phased out of regular coinage, although it is still used in some circulating coins and especially in American, Australian, Canadian and Mexican bullion coins for investors.

Figure 50
Global Semiconductor Billings



Source: SIA

for silver demand. These factors also helped the quantity of silver used in plating solutions, pastes and chemicals increase last year by just over 8% year-on-year.

Looking at the other main sub-category of South Korean silver industrial demand, brazing alloy production experienced another good year of growth. This was underpinned primarily through exports with Korean brazing products continuing to sell well to Japan and the United States.

Industrial offtake for **Taiwan** rose by 8.0% in 2002, mainly due to impressive growth in the production of optical disk storage devices such as CDs and DVDs. The global market for DVD products did not grow by much in 2002 but expanded rapidly last year due to the popularity of HDD-equipped DVD recorders and the more widespread inclusion of DVD drives in personal computers. In tandem with higher levels of production of discs, Taiwanese manufacturers have also been active in lowering their costs by developing their own raw materials in substitution of imported products such as silver plating salts from Japan.

In a broader context, silver offtake in Taiwan was also well supported by continued strength in sales of consumer durables, motor vehicles and telecommunication devices such as mobile phones. Obviously, these products contain numerous electronic components containing silver, such as capacitors, contacts and relays. For example, the Taiwanese vehicle industry, while only one-tenth the size of South Korea's, expanded by an impressive 24% last year, in terms of number of units produced.

Photography

- Global photographic fabrication fell by 4% to 205.3 Moz (6,386 t), its third consecutive annual decline.
- US demand was flat while Japanese and European offtake fell by 7% and 6% respectively
- Much of the overall drop was due to digital inroads though the sluggish world economy and the effect on tourism from fears of terrorism also contributed.

Production of silver nitrate in the **United States** for photographic end uses is estimated to have increased by 0.4% last year to 65.8 Moz (2,046 t). However, the small rise in output should be put into perspective; demand had fallen sharply in 2001 and last year's very modest growth still left production a long way short of the level attained in 2000.

Furthermore the rebound in fabrication last year was to some extent driven by restocking rather than a genuine improvement in the underlying demand for photographic products. Indeed, given the weakness of consumption in some important market segments, silver nitrate demand would otherwise have fallen in 2002.

The soft economy combined with a reluctance to travel (at least by air) following the events of September 11th, 2001 depressed demand for paper and, especially, film from the consumer sector. At the margin, film sales have also been affected by the increasing popularity of digital cameras. (Kodak estimates that US consumer film sales volume slipped by 3% in 2002.) Furthermore, production of silver nitrate for graphic arts end uses continued to be eroded by the advance of all-digital systems. In particular, the specialized microfilm business reportedly experienced further large falls in silver demand. Against this, there was a modest rise in medical x-ray film consumption last year. Also, the use of silver for motion picture films has broadly remained stable. The vast majority of this demand is for motion picture films not television; the latter has for many years been dominated by video format.

The other important reason why growth in silver nitrate demand was so limited in 2002 stems from changes in corporate procurement policies, which have led to some relocation of production outside of the United States. For example, Agfa closed a medical X-

Table 5a
Silver Fabrication: Electrical and Electronics
(including the use of scrap)
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
United States	28.6	31.6	36.0	36.3	41.9	44.1	47.1	50.6	34.1	37.6
Japan	20.9	22.5	23.9	22.7	25.8	23.7	30.0	36.7	26.6	29.4
Germany	11.3	10.9	11.9	11.6	11.9	12.2	12.2	14.3	15.7	15.6
China	7.2	8.9	9.1	9.4	10.2	9.8	9.9	10.3	10.3	10.9
France	5.0	5.4	6.1	6.3	7.7	6.7	6.8	7.3	11.0	9.9
South Korea	4.5	5.3	6.4	6.4	6.5	6.0	6.6	8.6	7.6	8.2
Taiwan	2.9	3.3	3.6	4.2	4.7	4.8	4.8	7.0	6.5	7.2
UK & Ireland	4.5	4.6	4.7	5.0	5.1	6.8	5.7	6.8	4.9	5.3
India	2.4	2.6	3.0	3.2	4.2	4.2	4.5	4.8	4.7	4.7
Hong Kong	1.2	1.8	1.9	2.2	2.7	2.5	2.9	3.5	2.5	2.8
Italy	3.2	2.7	2.7	3.3	3.2	2.9	3.0	3.1	2.8	2.8
Mexico	1.2	1.2	1.1	1.1	1.2	1.3	2.9	3.1	2.6	2.6
Brazil	1.0	1.5	1.6	1.4	1.4	1.4	1.3	1.3	1.3	1.3
Turkey	0.9	0.8	0.9	0.9	1.0	0.9	0.8	0.9	0.7	0.8
Australia	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6
Netherlands	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5
Switzerland	2.8	3.5	3.8	4.1	5.5	7.3	7.5	5.3	0.4	0.4
Austria	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Romania	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Egypt	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Spain	1.0	0.9	0.9	0.9	0.9	1.0	1.0	0.3	0.0	0.0
World Total	**100.0**	**109.0**	**119.2**	**120.5**	**135.4**	**137.2**	**148.5**	**165.5**	**133.2**	**140.9**

Table 5b
Silver Fabrication: Brazing Alloys and Solders
(including the use of scrap)
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
United States	7.2	7.7	8.0	8.2	8.4	8.6	9.0	8.7	8.3	8.7
China	4.4	4.7	5.1	5.5	5.8	6.3	6.4	6.7	6.9	7.9
Japan	3.8	4.7	4.8	5.1	5.0	4.2	4.2	4.4	3.5	3.3
Germany	4.5	4.0	3.5	2.9	3.1	3.1	3.0	3.2	2.8	3.1
UK & Ireland	2.3	2.3	2.3	2.3	2.3	2.4	2.2	2.3	2.6	2.3
Italy	1.7	1.9	2.1	2.1	1.9	1.7	2.0	2.1	2.0	2.1
India	1.5	1.6	1.9	2.1	1.6	1.5	1.6	1.8	1.8	1.9
South Korea	0.8	1.0	1.2	1.2	1.1	0.8	0.8	1.0	1.2	1.4
Switzerland	1.8	1.8	1.8	1.7	1.7	1.6	1.5	1.6	1.3	1.3
Taiwan	0.7	0.8	1.0	1.1	1.1	1.0	1.0	1.2	0.9	1.0
Spain	0.4	0.3	0.3	0.6	0.9	1.0	1.1	1.1	1.0	1.0
France	1.8	1.4	1.3	1.4	1.4	1.0	0.9	1.0	0.9	0.9
Brazil	0.6	0.8	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7
Australia	0.6	0.6	0.7	0.7	0.6	0.7	0.7	0.8	0.6	0.6
Mexico	0.9	1.0	0.9	0.9	0.9	1.0	0.6	0.6	0.5	0.5
Canada	0.4	0.4	0.5	0.4	0.4	0.3	0.3	0.3	0.3	0.3
Netherlands	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2
Austria	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Israel	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
World Total	**33.9**	**35.6**	**36.9**	**37.3**	**37.4**	**36.6**	**36.7**	**38.0**	**36.0**	**37.5**

New Uses of Silver

A critical issue for silver moving forward is that it must maintain and, in fact, increase its competitive position in industrial applications. At present, one quarter of annual silver consumption is in photography, and this is of course being threatened by the growth in digital technology.

On the industrial front, several potential growth areas exist for silver. They are based on silver's strengths as a catalyst, as a biocide and for conducting and storing electricity.

Fuel cells offer a medium to long-term option for power generation, particularly in motor vehicles. At present, the fuel cell development path for use in vehicles is centered on proton exchange membrane (PEM) cells and alkaline-based cells. The latter are of interest because they have various technical and cost advantages over PEM cells, including being able to use non-platinum catalysts such as silver. It should be noted thought that the most promising research is currently focused on platinum based fuel cells. However, the US government has recently proposed legislation that provides for a federally funded three-year study into the use of silver and gold as catalysts for automotive and industrial uses.

The anti-bacterial properties of silver are well documented. However, it is only recently that improvement in nano-particle research and production techniques have enabled more widespread use of silver as a biocide and anti-bacterial agent. For instance, Samsung announced in March this year that it has introduced a "silver sterilization clothes washing machine", targeted for domestic use. The machines incorporate nano-silver particles that kill 99.9% of bacteria without having to boil the water, thus providing both health and power efficiency benefits. Also, silver biocides may be able to replace arsenic and other chemical based preservatives in wood as well as being incorporated into marine anti-fouling coatings.

Gold use in electronics (bonding wires, plating) has been and is continuing to be replaced on grounds of cost and silver is often the main candidate to act as a substitute. This will become more prevalent as lower cost, mass-produced consumer products incorporate some sort of logic control and data storage. Of course, other materials such as copper, aluminum and ceramics are also in competition with silver.

High temperature superconductor wires, combining a ceramic core with a silver sheath, have been developed for use in new power generation plants and distribution grids. The wires are very efficient in carrying electricity and widespread usage could see many millions of ounces used in this application alone.

ray film manufacturing facility as part of a group-wide consolidation program.

Photographic demand in the first quarter of 2003 has been negatively affected by the same economic, technological and corporate factors mentioned above. Most of the impact has continued to fall on consumers' demand for paper and film, which has dropped sharply on a year-on-year basis. Although part of the specific weakness in the consumer sector stems from Easter falling in the second quarter (unlike 2002 when it fell in the first), there is little doubt that 2003 will be another very challenging year for the industry, with obvious implications for silver demand.

In **Europe**, much of the manufacturing relocation which has been taking place over recent years appeared to draw to a close during the course of 2002. As a result, it became clearer to gauge market trends from a cursory glance at the data series. Last year, the 6% fall in European fabrication was due to two key factors, weakness in consumer sales and increasing demand for digital products. This second point was highlighted by results published by Agfa, which noted that "new digital solutions" accounted for over a third of Group sales last year, compared to just 15% in 1999.

Japanese photographic demand is estimated to have fallen by around 7%, down from 62.2 Moz (1,935 t) in 2001 to 57.8 Moz (1,799 t). In contrast to 2001, we believe that all of the main manufacturers experienced declines in their production last year. The fall last year was due to a combination of shorter term or one-off factors and longer term issues.

In terms of shorter term or one-off issues, the weakness of the Japanese economy stands out, and this has directly impacted on consumers' willingness to spend as much as they had previously on photography (whether the state of the Japanese economy should be termed a "shorter term" factor is open to debate!).

Table 6
Silver Fabrication: Photographic Use
(including the use of scrap)
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Belgium	20.1	20.6	22.8	24.8	26.6	33.2	36.9	34.7	31.6	30.4
UK & Ireland	13.6	15.9	16.7	18.2	19.0	19.1	21.0	21.8	27.7	26.0
France	14.7	13.7	15.9	13.2	12.7	14.5	12.2	13.7	10.1	9.9
Germany	15.4	16.1	14.8	13.8	14.5	9.9	6.7	1.7	1.6	0.4
Czech and Slovak Republics	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.3	0.5	0.2
Hungary	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Romania	0.3	0.2	0.1	0.2	0.2	0.3	0.2	0.2	0.2	0.2
Bulgaria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Spain	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poland	0.5	0.5	0.5	0.3	0.2	0.0	0.0	0.0	0.0	0.0
Total Europe	65.2	67.4	71.1	70.7	73.5	77.4	77.2	72.6	71.8	67.2
North America										
United States	53.2	56.3	60.8	61.8	64.5	68.6	71.8	72.1	65.5	65.8
Mexico	3.2	3.2	3.3	3.4	4.1	3.4	2.9	0.0	0.0	0.0
Total North America	56.3	59.5	64.1	65.2	68.6	72.0	74.7	72.1	65.5	65.8
Central & South America										
Brazil	2.6	3.2	4.0	3.4	3.4	3.2	3.2	2.4	2.3	2.1
Argentina	1.8	1.8	1.8	1.8	1.8	1.8	1.6	1.3	1.0	1.1
Total Central & South America	4.4	5.0	5.8	5.2	5.2	5.0	4.8	3.7	3.3	3.2
Indian Sub-Continent										
India	2.3	1.6	0.6	0.6	0.6	0.3	0.3	0.3	0.3	0.3
Other	0.3	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.1	0.1
Total Indian Sub-Continent	2.5	1.8	0.9	0.9	1.0	0.7	0.7	0.7	0.5	0.5
East Asia										
Japan	57.2	55.1	56.9	57.9	58.6	58.2	59.9	61.2	62.2	57.8
Taiwan	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total East Asia	57.3	55.2	56.9	57.9	58.6	58.2	60.0	61.2	62.2	57.8
Oceania										
Australia	2.1	1.9	1.6	1.6	1.6	1.6	1.7	2.7	2.4	2.3
Total Oceania	2.1	1.9	1.6	1.6	1.6	1.6	1.7	2.7	2.4	2.3
Western World Total	187.9	190.8	200.4	201.6	208.5	215.0	219.1	213.1	205.7	196.7
Other Countries										
China	5.1	5.6	5.6	5.8	6.0	6.1	3.7	3.9	4.5	5.7
CIS	6.3	5.2	5.0	4.7	4.5	3.8	3.4	3.2	3.1	3.0
Total Other Countries	11.4	10.8	10.5	10.4	10.5	9.9	7.1	7.1	8.2	8.6
World Total	**199.3**	**201.6**	**210.9**	**212.0**	**219.0**	**225.0**	**226.2**	**220.2**	**213.9**	**205.3**

There is a plethora of data to support this contention, but one statistic suffices to show just how bad matters have been recently. Data just released shows that Japan's nationwide retail sales fell 0.2 % in February 2003 (versus a year ago), their 23rd straight month of decline. In addition to the impact of the weak economy, offtake in 2002 was adversely affected by the weather. Two of the three photo companies interviewed by GFMS cited the very hot weather last summer as a reason for lower photographic demand. Evidently it was so unpleasantly hot that families stayed at home in air-conditioned comfort rather than be outdoors taking photographs.

Of perhaps greater importance to the Japanese photo industry, however, are the longer term trends, two of which are already impacting on fabrication (albeit in opposite directions).

The first of these is the trend to digital. There can be little doubt that digital imaging is already having a marked negative impact on silver offtake in Japan.

There are two distinct forces at work in this sector. One is the demand from "gadget crazy" Japanese for the new technology. The other is the push from the photo companies themselves who perceive greater profits down the digital road and who are forcefully marketing this technology. As Fuji film themselves point out in one of their latest financial reports, they are "aggressively working to offer customers total solutions using digital and networking technologies in the imaging, information, and document businesses". A clear indication of this revolution has been the sales of digital cameras. According to Lyra Research, Inc., last year saw Japanese sales of close to 7 million digital cameras, up almost 24% year-on-year. This stands in stark contrast to sales of traditional cameras which have been falling, by around 20% last year. Perhaps more significantly, sales of digital cameras, measured by the number of units, now outstrip conventional by a factor of nearly two.

Secondly, there is the offsetting trend of rising demand in "non-traditional" markets like East Asia and Africa, and to a lesser extent the former Soviet bloc. Here, traditional silver halide is still holding its own and growth in these markets over the past few years has offset the decline in demand seen in the established Japanese, North American and European markets. At the margin though it remains to be seen if growth in these markets will outweigh the declines in offtake due to digital.

Worldwide Film and Paper Consumption and Photographic Fabrication Demand

	1998	1999	2000	2001	2002
Film**	3,332	3,441	3,511	3,541	3,332
Paper^	1,556	1,699	1,750	1,805	1,830
Fabrication*	225	226	220	214	205

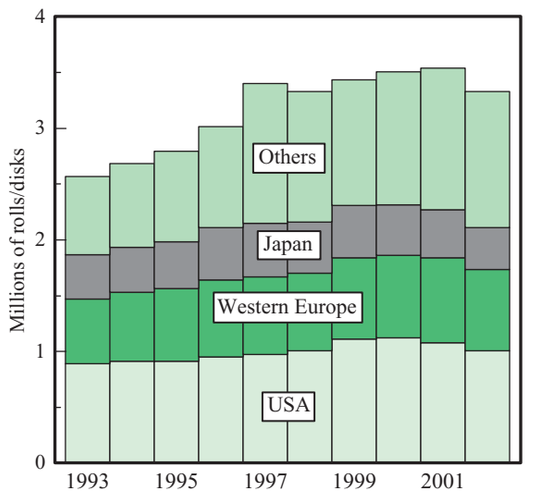
**Millions of rolls, ^millions square meters, *Moz

Source: Photofinishing News, GFMS

Chinese photographic demand rose for the second straight year, up from (a revised) 4.5 Moz (140 t) to 5.7 Moz (176 t). To the uninitiated reader this may appear, at first sight, to be a particularly low figure considering, for example, the fact that Kodak recently announced sales of one million cameras in China last year, more than anywhere else in the world (in fact, China is Kodak's second largest market behind the United States). The reason for this apparent anomaly is actually quite simple to explain. GFMS data counts fabrication demand, not consumption. The former only counts the transformation of raw silver into intermediate photographic products while the latter counts the actual use of such products, and consequently includes imported items like film.

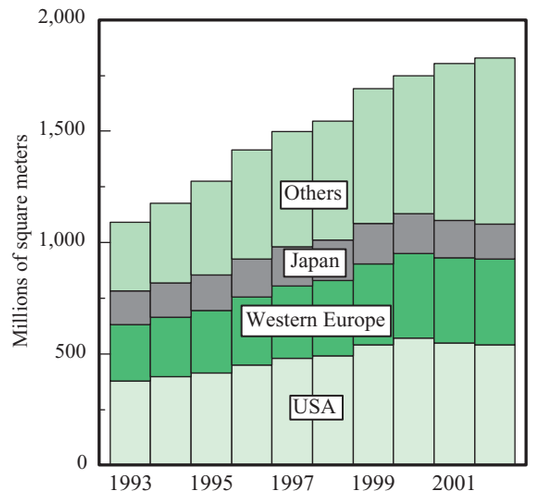
Whatever measure is used, Chinese demand increased last year. The rise in fabrication demand was the result of local manufacturing substituting for

Figure 51
World Consumer Film Sales



Source: Photofinishing News Inc.

Figure 52
World Color Photographic Paper Consumption



Source: Photofinishing News Inc.

Digital Technology and the Photographic Market

Silver use in photography in 2002 fell for the third successive year. At 4%, the decline last year exceeded that of both 2001 and 2000. Although the decline was partially due to economic weakness and the reduction in travel and tourism in North America, digital technology continued to eat into silver's share of the photographic market. In 2002, sales of digital cameras increased by 20% to reach almost 24 million units, compared with a modest fall in sales of conventional cameras (which, nonetheless remain dominant at 60 million units).

As with the previous two years, silver demand in the graphic arts segment in 2002 was severely affected by the move to digital, with absolute consumption down again year-on-year. The key markets of the United States, Japan and the United Kingdom all reported a fall in demand in this sector, with graphics film sales particularly affected.

Although digital technology has begun to impact on the growth of medical X-ray film demand, the effect has been relatively modest to date. This is mainly because the increase in digital products has generally been limited to Europe, the United States and Japan. Moreover, the total medical X-ray market is growing and this has also tended to offset the effect of digital technology on absolute demand for conventional technology, on sales of radiographic film and the quantity of silver used.

Silver consumption in the professional film sector has been hit by the heavy uptake of digital technology. Global sales of professional film products, which include color negative, color reversal and black-and-white film, are estimated to have fallen substantially in 2002, although some of this fall must also be attributed to the economic slowdown experienced in key regions.

Demand for silver in the motion picture industry was perhaps the bright spot last year, although this is more a reflection of the weakness of 2001 when the economic slowdown and aftermath of September 11th resulted in a number of motion picture film releases and television show productions being delayed. Moreover, the impact of digital technology has been fairly modest in this sector, with few theaters having made the expensive transition to digital technology.

Turning to the medium term outlook for silver demand in the photographic sector, it appears as though the impact of digital technology is growing and will continue to do so, affecting demand specifically in photographic film but also to an extent in paper.

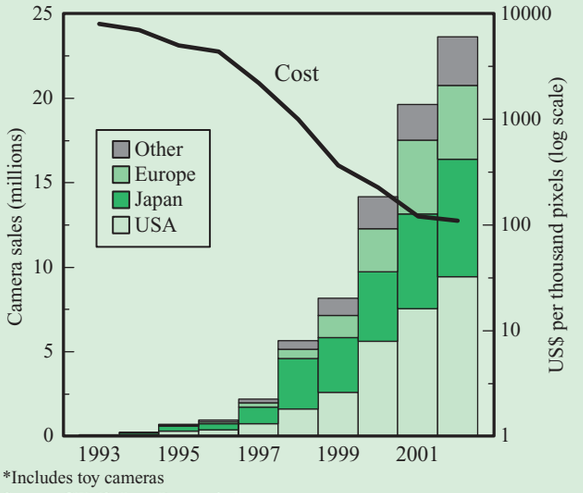
The cumulative impact of the swing to digital cameras in the consumer and professional sectors will gradually act to reduce the share of total cameras using film.

Moreover, as new technology is introduced and the cost of digital cameras is subsequently reduced, this process can be expected to accelerate. As Figure 53 shows, the cost per pixel has fallen dramatically over the last decade. This translates directly into cheaper cameras with improved quality. One new development that could speed up the reduction in the cost of digital cameras is the X3 chip, which it is claimed will improve the quality of digital images for a given number of pixels.

In addition to the impact of digital technology on film sales, the effect on photographic paper must also be considered. Many users of digital cameras only choose to print selective pictures and often pictures are not printed at all, but saved electronically. Despite this, evidence suggests that in 2002 sales of photographic paper rose, specifically as a result of the increase in digital camera usage.

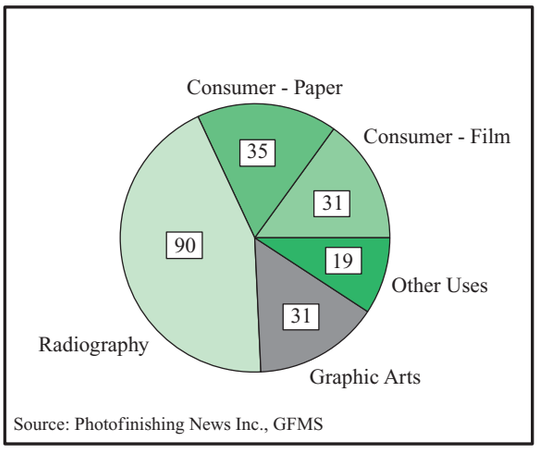
A final factor that has the potential to assist the move to digital, and which could further impact silver photographic demand, is the wireless camera phone, sales of which recorded strong growth in 2002.

Figure 53
Digital Cameras: Sales and Cost per Pixel*



*Includes toy cameras
Source: GFMS, Lyra Research, Inc.

Figure 54
Photographic Uses of Silver, 2002
million ounces



Source: Photofinishing News Inc., GFMS

(official) imports of intermediate products over the past few years. According to research published by Photofinishing News, Inc., both film and conventional camera sales in China rose sharply in 2002. The former is estimated to have risen by close to 10% year-on-year while the latter is thought to have risen by around 4.7% (digital camera sales were up an even more impressive 21%). Perhaps more remarkably, KingStar Photo Research and Photofinishing News estimate that the photoprocessing market, measured in renminbi, grew by a phenomenal 22% last year.

Based on these observations, it is clear that a substantial proportion of Chinese consumption is not met from locally fabricated photographic materials. As we have alluded to many times in past *World Silver Surveys*, a very large percentage of China's photo requirements are brought into the country unofficially, creating substantial competitive problems for Lucky Film in particular. According to a report published by Photo Imaging News (February 24th), much of Lucky's 16% drop in sales last year was the result of smuggling.

The data published in this report shows the staggering scale of this activity. For example, they estimate that around 570,000 rolls of film from one brand were smuggled into China in 2002, up from 510,000 in 2001. In addition to this, huge quantities of color paper (including large format paper) and x-ray films are regularly shipped into the mainland unofficially.

In terms of market share, Kodak is still dominant, accounting for around 56% of the Chinese market according to Photofinishing News, followed by Fuji at 27% and Lucky at around 13%. From a fabrication perspective, however, Kodak and Lucky are the only substantial producers of photosensitized material in China. On the corporate front, at the time of writing a number of companies are still vying for Lucky's attentions (Kodak, Fuji, Konica, and Belgium's Agfa). There has been considerable jostling to secure a tie up with Lucky ahead of the China's entry into the World Trade Organization and, although the received wisdom last year was that Lucky would ink a deal with Fuji, nothing has yet been finalized.

Jewelry and Silverware

- Total jewelry and silverware fabrication fell by 9% last year to 259.2 Moz (8,061 t).
- India's 28% or 29.0 Moz (900 t) fall accounted for much of this, its drop being due largely to a poor year for its farmers.
- European offtake also fell whereas most other regions saw gains with Thailand up 3.1 Moz (97 t).
- Jewelry consumption was robust in many regions whereas silverware saw further major losses.

Europe

Many European countries saw consumption (and therefore to varying degrees fabrication) of silver jewelry in 2002 hold broadly stable or even register a modest rise. To some extent, this was the result of consumers shifting down on price points from gold to silver but it also illustrates the benefits which have been gained from having brands, fashion and an appeal to the youth-orientated market on its side.

Italian fabrication demand for jewelry and silverware combined fell for the second consecutive year, slipping just over 6% to 42.2 Moz (1,313 t), its lowest level since 1996. Given that this sector accounts for roughly 80% of Italian fabrication, the modest scale of the fall may not seem to fit well with the 18% drop in official bullion imports. This apparent discrepancy is explained by such factors as higher scrap supplies, principally from imported sources.

The substantial fall in silverware was primarily responsible for this overall category's decline, with a sizeable drop in domestic sales and a yet larger fall in exports being seen last year. The fall in the local

Table 7
Silver Fabrication: Jewelry and Silverware
(including the use of scrap)
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Italy	46.2	41.4	39.0	40.5	44.8	45.3	51.2	54.2	45.1	42.2
Germany	11.6	11.6	10.3	10.0	10.0	10.1	10.0	9.3	9.4	7.8
Greece	3.7	3.9	3.8	4.2	4.5	4.1	4.1	3.3	3.0	2.8
France	2.0	1.9	2.0	2.0	2.2	2.6	2.7	2.8	2.7	2.7
UK & Ireland	2.7	2.9	3.0	3.3	3.4	3.3	3.1	3.2	2.9	2.6
Spain	3.7	4.0	4.1	4.5	4.0	4.1	3.4	3.0	2.4	2.4
Poland	1.0	1.1	1.6	1.8	2.3	2.7	2.9	3.0	2.5	2.3
Portugal	2.1	1.5	1.7	1.9	1.9	1.9	2.1	2.1	1.8	1.6
Norway	1.2	1.2	1.2	1.1	1.1	1.1	1.5	1.6	1.5	1.3
Sweden	1.2	1.2	1.0	1.1	1.3	1.0	1.0	0.9	0.6	0.7
Denmark	0.9	0.9	0.9	0.9	1.0	0.9	0.9	0.9	0.8	0.7
Finland	0.8	0.9	0.7	0.8	0.8	0.6	0.6	0.5	0.4	0.4
Switzerland	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3
Cyprus	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3
Austria	0.5	0.4	0.4	0.4	0.4	0.5	0.4	0.3	0.2	0.2
Other	0.9	0.9	0.9	0.7	0.8	0.8	0.8	0.7	0.8	0.7
Total Europe	79.0	74.3	71.2	74.0	79.2	79.7	85.3	86.6	74.7	69.0
North America										
Mexico	9.2	8.7	11.0	14.2	16.3	15.3	15.1	13.2	12.9	14.1
United States	11.3	12.0	12.5	12.4	12.5	12.6	13.1	13.7	13.0	13.7
Canada	0.9	1.0	1.2	1.3	1.5	1.8	1.5	1.4	1.5	1.5
Total North America	21.3	21.6	24.8	28.0	30.4	29.7	29.7	28.4	27.4	29.3
Central & South America										
Brazil	1.8	1.8	1.9	1.8	1.6	1.4	1.3	1.2	1.2	1.2
Peru	0.8	0.8	0.9	1.0	1.1	1.0	1.0	0.9	0.9	0.9
Colombia	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.6	0.5	0.5
Ecuador	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.4	0.4
Argentina	1.0	1.0	0.9	0.8	0.8	0.2	0.2	0.2	0.1	0.1
Other	0.7	0.6	0.7	1.0	1.4	1.7	1.9	1.2	0.9	0.8
Total Central & South America	5.5	5.7	5.9	6.0	6.3	5.8	5.4	4.5	4.1	3.9
Middle East										
Turkey	5.0	4.3	5.1	5.5	5.5	5.2	4.7	5.9	4.3	5.5
Israel	2.0	2.1	2.3	2.6	3.0	2.8	2.9	2.6	2.4	2.5
Egypt	1.8	1.8	2.0	2.1	2.0	1.7	1.9	1.9	1.6	1.5
Saudi Arabia	0.4	0.3	0.4	0.4	0.6	0.5	0.6	0.6	0.6	0.6
Other	2.0	2.4	2.5	2.6	2.6	2.4	2.5	2.6	2.7	2.5
Total Middle East	11.2	11.0	12.4	13.3	13.6	12.8	12.6	13.7	11.6	12.5
Indian Sub-Continent										
India	77.5	60.2	66.6	86.0	86.3	82.5	83.2	84.6	102.9	73.9
Bangladesh & Nepal	3.9	4.5	5.1	5.8	6.4	5.1	5.7	6.0	5.9	4.8
Other	2.5	2.1	2.9	2.0	3.1	1.9	2.4	2.3	1.7	1.7
Total Indian Sub-Continent	83.9	66.8	74.6	93.8	95.8	89.5	91.4	92.8	110.5	80.5
East Asia										
Thailand	38.5	28.9	27.4	27.1	26.8	23.9	26.5	30.0	32.4	35.5
South Korea	7.2	6.4	6.8	6.6	6.3	2.6	4.5	4.9	4.6	4.5
Indonesia	1.4	2.3	2.7	2.9	3.6	2.2	2.7	3.4	3.8	4.3
Japan	2.5	2.2	2.2	2.1	1.9	1.8	1.8	1.7	1.7	1.7
Cambodia	1.0	1.0	1.1	1.1	1.0	0.8	0.9	0.8	0.9	1.0
Vietnam	0.4	0.5	0.6	0.7	0.7	0.6	0.7	0.7	0.7	0.8
Malaysia	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6	0.6
Hong Kong	1.0	1.0	0.9	0.9	1.0	0.6	0.6	0.5	0.5	0.4
Taiwan	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.3	0.3
Other	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Total East Asia	53.2	43.4	42.8	42.6	42.5	33.6	38.9	43.4	45.9	49.3

Table 7
Silver Fabrication: Jewelry and Silverware
(including the use of scrap)
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Africa										
Morocco	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3
Tunisia	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Algeria	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
Other	0.4	0.5	0.5	0.4	0.4	0.3	0.4	0.4	0.4	0.4
Total Africa	1.2	1.3	1.3	1.2	1.2	1.2	1.1	1.2	1.1	1.1
Oceania										
Australia	0.6	0.6	0.6	0.5	0.6	0.7	0.7	0.8	0.7	0.7
New Zealand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Oceania	0.6	0.6	0.6	0.6	0.6	0.7	0.8	0.8	0.7	0.8
Western World Total	256.0	224.7	233.5	259.4	269.5	253.0	265.2	271.3	276.2	246.4
Other Countries										
China	0.7	1.0	1.4	2.4	3.1	4.7	6.3	6.7	7.4	8.9
CIS	2.4	2.2	2.0	1.9	1.7	1.7	1.8	2.0	2.5	3.8
Total Other Countries	3.1	3.2	3.4	4.3	4.8	6.4	8.1	8.7	9.9	12.7
World Total	**259.1**	**227.9**	**236.9**	**263.7**	**274.3**	**259.4**	**273.3**	**279.9**	**286.0**	**259.2**

market remains attributable to the ongoing shift in consumer behavior, essentially the dying tradition of silver being given as wedding presents or to mark other occasions. Indeed it is becoming rare to see silver on wedding lists in the north of the country, this having been displaced by competing items such as technology goods and foreign travel. This tradition remains more common in the south (Rome and below), for the moment, which explains why this region now accounts for well over half of domestic consumption.

Other European countries account for the bulk of Italy's silverware exports and it was these that showed some of the heaviest falls in imports. These declines were generally the result of poor economic conditions, a factor which affected exports in particular to Germany, or secular changes in consumer behavior similar to Italy, an issue which hit exports to Spain quite hard. In contrast, exports to the United States were broadly flat while some countries in the Middle East took greater volumes than in 2001.

By product, it was traditional heavy items such as table center pieces or *bomboniere* (decorative boxes, usually filled with sweets) that suffered most, mainly as it is this sort of product that is given at weddings or first communions. Other large pieces such as trays or serving dishes were also under pressure though cutlery in a few markets showed some signs of stabilization. Lighter weight pieces and items better termed 'giftware' in some regions even saw gains though the corporate market for these pieces was patchy.

Silver jewelry fabrication in contrast only suffered a modest decline in 2002 due to a slight fall in local sales while exports held roughly flat. It might come as some surprise that local sales had not risen year-on-year given all the talk of silver's fashionability and retailers' talk of buoyant sales. Here, it is important to distinguish between the value of sales and the weight of silver sold. Many of the new wave of designs on the market are branded, often large pieces with high markups. In addition, the newer styles of mixed material jewelry are often silver with other elements such as crystals, rubber and leather. The former has inflated the value and the latter diluted the silver content, allowing for both the fall in fabrication demand for the metal and the buoyancy of sales value to occur in the same year.

Exports of silver jewelry last year are thought to have been broadly stable by weight though, in a similar vein to the home market, the official value figures tell a different story as these rose by over 7% year-on-year. There was a strong regional variation in the pattern of exports; those to western Europe held steady or rose a little (for example exports to the United Kingdom or Spain), central and eastern Europe often saw useful gains, the Far East was flat to up but it was shipments to the United States (and many other markets in the Americas) that fell substantially year-on-year.

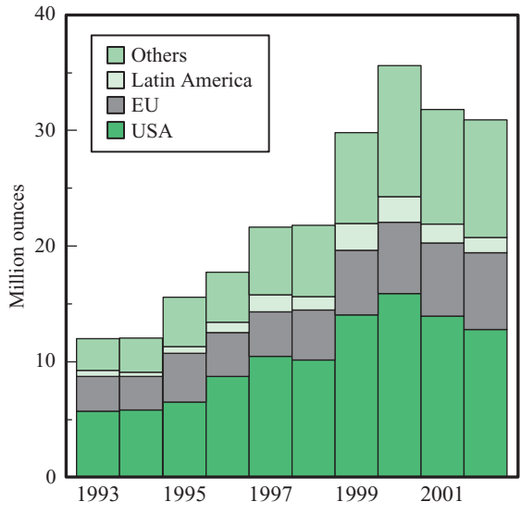
Fabrication demand for silver jewelry and silverware

in **Germany** is estimated to have declined by a sharp 16% to 7.8 Moz (244 t). This was very much the product of weakness in the silverware sector, in particular in the domestic market. Silver jewelry fabrication in contrast only saw a slight decline. Local consumption was broadly flat but this was undermined by rising import penetration, mainly from Asian producers, and sluggish exports. Jewelry fabrication in **France** was a similar story with the industry under pressure, despite consumption holding at least steady, due to rising imports.

In spite of the sharp rise in silverware and jewelry hallmarking in the **United Kingdom** last year, domestic manufacturing is estimated to have fallen back in 2002. However, the hallmarking data does confirm that retail sales, especially of silver jewelry, remained strong last year. In part, this was due to the continued success of diamond-set sterling articles, which includes "Hot Diamonds" products, although this jewelry has been exclusively sourced from imported products. This highlights the fact that, in recent years, imports have taken a greater share of the UK market, and last year this was typified by a sharp rise in imports from Thailand.

Conversely, domestic manufacturers benefited from a strong retail market in the United States (see below) which partially compensated for their weak sales into the local market. However, this could not prevent local fabrication from falling by 10% last year.

Figure 55
Official Italian Jewelry Exports



North America

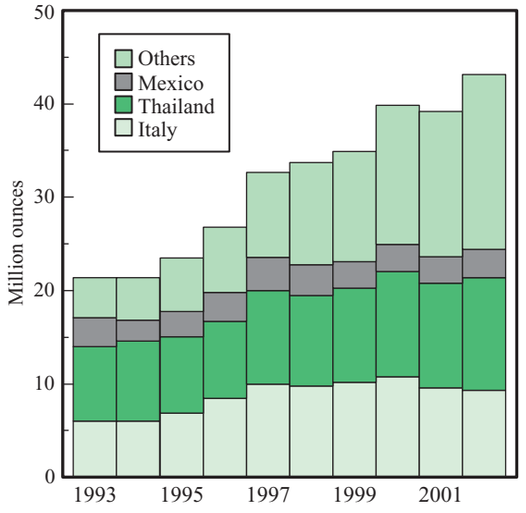
In the United States, the jewelry and silverware industry regained the ground that was lost in 2001. However, the 5% increase recorded last year, was almost entirely due to stronger fabrication in the jewelry sector (as the silverware market continued to stagnate). This in itself was driven by a robust performance at the retail level. In part, silver benefited from the popularity of the "white look" but, perhaps as important, was the fact that silver products attracted a significantly lower price point than other precious metals; in a difficult economic and more specifically retail environment, this encouraged consumers to opt for silver articles.

The strength of the retail market was partially reflected in higher jewelry imports, which are estimated to have increased by as much as 10% last year, after the modest decline seen in 2001. In fact, excluding the fall in 2001 shipments, US jewelry imports have posted uninterrupted growth over the past decade, to the point where the volume of 2002 imports was nearly double that of 1993. Until the mid to late 1990s, this sector was dominated by Thailand, Italy and, to a lesser extent, Mexico. More recently, however, the success of the import sector has been led by China, which has climbed to third place, behind Italy and Thailand.

After two years of declines, **Mexican** fabrication recovered strongly in 2002. At 9%, the year-on-year rise took the volume of silver manufactured to 14.1 Moz (437 t). Nevertheless, this total still falls short of the levels attained during the 1997-99 period. Furthermore, it should be borne in mind that this estimate is largely derived from information on bullion flows. Because a large share of jewelry and silverware output is unregistered, there is no reliable official production data to confirm our findings.

However, as implied above, there is strong evidence from suppliers of raw material that in 2002 the local industry saw a good recovery in output. The main reason for the stronger performance was a growth in exports. This was entirely due to the dominant United States market, as exports to most other destinations failed to increase. GFMS' analysis of US jewelry import data, for instance, shows that shipments from Mexico rose at least 5% in volume terms last year. Anecdotal evidence points to Mexican jewelry taking some US market share away from, generally, more expensive Italian products.

Figure 56
US Silver Jewelry Imports



Middle East

Jewelry and silverware fabrication demand in **Turkey** recorded a solid 26% year-on-year increase, due to both increased exports and, more importantly, a rebound in domestic consumption. Although the year-on-year picture is impressive, this is more a result of the poor performance of the market in 2001 than any secular trend (offtake was still some 8% below the level of 2000). The poor performance of 2001 was due to the impact of the February 2001 devaluation and sharp contraction in the economy (official figures show real GNP fell by 9.4% in 2001). Business Monitor International estimate that real GNP grew by 5.5% in 2002, and it is therefore unsurprising that domestic silver demand recorded an increase. What is perhaps more unexpected was the increase in silver jewelry exports - shipments to the key markets of the United States, Germany and Italy all registered a rise.

In contrast, fabrication demand in **Egypt** fell by 14%, largely in response to the economic and financial weakness experienced in that country during 2002. The Egyptian pound experienced a succession of devaluations in late 2001 (as well as in early 2003), and these resulted in a sharp hike in domestic silver prices. Although the rise in the international silver price in 2002 was limited to 5% the domestic price, converted at the official exchange rate, was some 20% higher year-on-year. This, coupled with the economic and geopolitical uncertainty prevalent throughout 2002, caused the fairly substantial drop in offtake. That demand did not fall further was due to a proportion of jewelry purchases switching from gold to silver. This demand-switch resulted from the rise in the gold price in 2002, which exceeded that of silver, and the economic hardship faced by consumers. Adding to the impact of domestic consumers' substitution to silver, the share of tourist jewelry purchases accounted for by silver also rose, reflecting both reduced global spending power and the type of tourist visiting the country last year.

Indian Sub-Continent

GFMS data shows that **Indian** jewelry and silverware fabrication fell by close to 30% in 2002, the most dramatic fall in offtake since we began collating data on this market. It is important to note that this decline seems all the more dramatic because of the record levels of demand seen in 2001 (when offtake peaked at 102.9 Moz (3,200 t)). Notwithstanding this observation, it is worthwhile pointing out that demand last year is estimated to have fallen to levels last seen in 1995. What have been the reasons for this precipitous fall? We believe that there are two main reasons for this, namely the price and the agricultural/rural economy.

Looking firstly at the former, there is little doubt that the price did play a role in holding back demand last year. At first sight this may appear a little surprising. Average rupee prices in 2002 rose by "only" 7% year-on-year, hardly sufficient, one would expect *a priori*, to precipitate such a marked decline in offtake. However, one needs to look further than the average to understand how the price affected demand. Two elements stand out here, the absolute price level and volatility.

In the Indian market, and as we pointed out in last year's *World Silver Survey*, the 8,000 rupee/kg price level is a tangible psychological barrier for most buyers. It is no coincidence, for example, that when the price breached this level in the middle of the year imports and demand fell sharply (the former dropped to below 6.4 Moz (200 t) in both June and July when the price averaged 8,344 and 8,360 rupees/kg). As the price dropped back into the 7,000s, imports picked up, and indeed peaked for the year in October at over 20 Moz (620 t).

Price volatility is also an important determinant of silver demand (as it is for gold as well). Consumers

are particularly sensitive to changes in the price and the oscillations throughout the year discouraged demand for extended periods of time. The received wisdom is that Indian consumers will tend not to buy on an upward trend in prices, expecting them to fall. However, falling prices are not necessarily a signal to buy either. Instead, potential purchasers hold back waiting for the price to reach what is perceived to be the low for the period, which can result in lengthy periods of slack demand. As most Indians in the industry will attest, as a rule of thumb, price stability is crucial for demand to return.

Although the price level and volatility were important determinants of demand last year, the very mixed macro and micro-economic backdrop also contributed to weaker offtake. Even though the economic data is rather patchy, it is still possible to draw some broad conclusions about the impact of the economy on silver demand. The statistics available point to the agricultural sector having performed particularly poorly in 2002.

The broad consensus is that agricultural output in 2002 fell by around 3% (official estimates for the fiscal year 2002/03 are that it fell by 3.1%) due to the poor summer rains which adversely affected the kharif crop. The government's "Economic Survey" has estimated

All India Monsoon Rainfall
(rainfall % of normal)

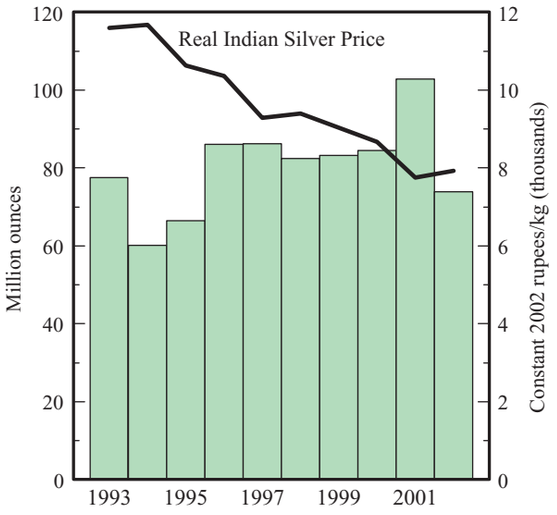
1998	1999	2000	2001	2002
106	96	92	94	81

(source: National Informatics Centre)

that there was a 13.6% fall in food-grain output to 183.2 million tonnes last year, the lowest absolute level since 1996-97, with most of this fall attributed to the decline in kharif production (from 111.5 million tonnes in 2001 to 90.3 million tonnes last year). The jury is still out on the impact the droughts had on the rabi (winter) crop, although some rain towards the end of the year appears to have lifted output.

The situation in the middle of last year was particularly dire on the agricultural front. Figures from the India Meteorological Department show that the country as a whole had received a cumulative area-weighted rainfall during the period from June 1st to September 11th which was almost 18% below the

Figure 57
Indian Jewelry and Silverware Fabrication

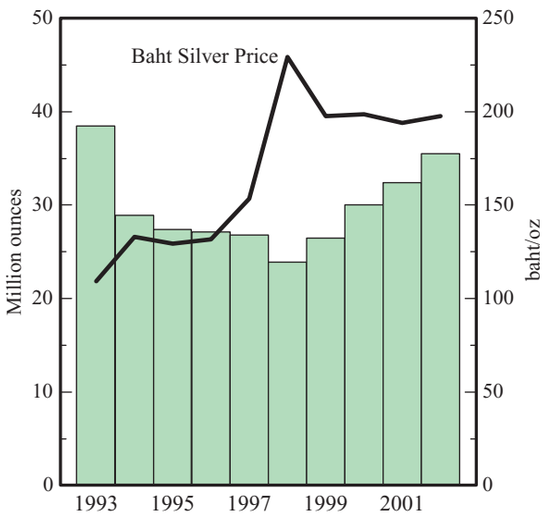


historical long period average. Nearly 24 of the 36 meteorological divisions were rain deficient. To compound matters, important silver consuming areas in the east and north east had excess rains, with floods in parts of Assam and Bihar.

It has been suggested in certain quarters that India actually suffered one of the worst droughts in 100 years in 2002 and it seems reasonable to assume that this adversely affected rural incomes, which in turn had an impact on silver offtake (one needs to bear in mind that these difficult economic circumstances were taking place against the backdrop of high local silver prices) as farmers cut back sharply on their purchases of "new" silver (there was also an offsetting rise in scrap, although this was very small compared with the situation in the gold market).

Although the agricultural sector has been weak, other sectors of the economy were actually quite robust last year, as we have already discussed above (telecoms and software exports have been particularly strong and have contributed to robust industrial output). Data released at the time of the 2003/04 budget pointed to industrial production having risen 6.1% (fiscal year-on-year) compared to just 3.3% the previous year. All other things remaining equal, this should have seen incomes and expenditure in this sector of the economy rising, offsetting, to some extent at least, the fall in spending seen in the rural areas.

Figure 58
Thai Jewelry and Silverware Fabrication



East Asia

Jewelry and silverware fabrication in **Thailand** rose by 9.7% in 2002, marking the fourth consecutive year-on-year increase. The export-orientated manufacturing sector last year was still around 90% of the size (in fine silver volume terms) it achieved in 1993 and around 95% in value terms. More telling, however, is the fact that the past four years have seen the sector expand by nearly 50%. This growth has been driven by the popularity of silver jewelry amongst younger consumers in developed economies.

Official Thai silver jewelry export statistics show that the value of shipments to the United States increased by nearly 40% between 1998 and 2002. The impact of such an increase is evident when considering that in 2002, exports to the United States were around 43% of total exports. Shipments to other important markets such as the United Kingdom, Germany and Japan, have also recorded impressive growth and last year alone rose by 28%, 10% and 21% respectively.

While such growth has no doubt helped many Thai jewelry manufacturers become successful, profits have not increased at the same fast pace. Firstly, on the positive side, the ability of silver jewelry production to adjust to seasonal and cyclical changes in demand is enhanced by the ability of manufacturers to vary production between gold and silver pieces. Many companies, particularly the many hundreds of small sub-contractors who provide the extra capacity and skills to the large companies, can produce jewelry in both metals and can switch production resources from one to the other over a relatively short period of time. This has enabled them to utilize existing production capacity without having to spend heavily on additional capital infrastructure.

However, last year this benefit was outweighed by other factors. The mild strengthening of the Thai baht (3.3% year-on-year, average annual basis) was a cause for concern among exporters last year, whose prices are normally denominated in dollars. For reasons related to competition, prices for silver jewelry have remained relatively static over the past few years and it has been difficult for Thai companies to increase their prices commensurate with their rising production costs. Thus a 3% fall in revenue last year had a material impact on profitability. Also, jewelry is typically sold on a fixed price per piece basis, meaning that the cost does not change with movements in the silver price. While the cost of the fine silver content represents, on average, around a third of the total cost of the piece, the 5% rise in the average silver price in 2002 also had a negative effect on profit margins.

Some manufacturers have tackled slow or non-existent profit growth by opting to operate partially outside the tax net. GFMS sources both inside and outside Thailand estimate that more than a quarter of total silver bullion imports arrive through unofficial channels. The main reason for such behavior is to avoid the 7% VAT charge on silver bullion purchases. It should be pointed out that the incentive to purchase unofficial silver is mitigated by fact that it normally sells for a “fee” that is a few percent above the silver spot price. Unlike VAT, this “fee” is not claimable from the taxation authorities and is thus a real cost. It does, however, allow a company intent on avoiding taxes, to sell the finished jewelry pieces into the local market (mostly for export by being hand-carried out of the country) and to keep the “VAT” that is added to the discounted sales price.

Lastly, as discussed in Chapter 6, one of the largest sources of silver for Thailand is China. However, Chinese silver is sometimes of dubious purity and usually varies between 99% and the London Bullion Market “Good Delivery” standard of 99.9%. This has led jewelry manufacturers to adapt their processes to accommodate the material and accuracy in terms of purity is not such a big issue for silver jewelry and silverware. This trend does not bode well for those

who are in the business of upgrading silver and earning slim margins at present.

Indonesian silver jewelry and silverware fabrication demand grew by 12.7% last year. While the economic slowdown in the United States and western Europe played a major part in curbing gold jewelry imports, the same could not be said for silver jewelry.

Thus, Indonesian manufacturers were able to again increase the quantity of silver items produced. Exports from Indonesia to the United States and the United Kingdom alone grew by over 10% year-on-year, based on the trade-flow statistics of those countries.

Of course, the tragic events in Bali in October last year did damage the Indonesian silver fabrication industry, which is primarily based on the island. Sales to tourists, as well as those to visitors who operate as part of the "back-packer carry trade", have fallen steeply since the terrorist attack.

China is emerging as one of the world's largest fabricators of silver jewelry. Having started from a very low base in the mid 1990s, output has grown strongly, taking advantage of the mainland's low cost base and the jewelry making expertise available in areas like Shenzhen. Most of China's production is for export, the main market (by a substantial margin) being the United States.

Coins and Medals

- Higher North American fabrication was the main factor behind the 3% rise in world minting.
- European Union fabrication fell to its lowest level since 1993 due to lower German production.

World silver coin fabrication rose by a modest 2.6% in 2002, as higher North American demand more than compensated for lower minting in Europe.

Total coins and medals fabrication in the **United States** rose to a record level of 14.2 Moz (441 t). The close to 15% year-on-year increase was due to higher production of the silver bullion one ounce Eagle coin. This coin accounted for 10.5 Moz (326 t), which in itself was a record level of sales, since the Eagle was first introduced in 1986 (in December 2002 alone a total of 2.5 Moz (77 t) were sold). The success of this coin was due to a number of factors. Firstly, marketing of the Eagle was enhanced by additional distribution channels, which were employed during the second half of the year. Secondly, these coins continued to be popular as gifts, both at the individual and corporate level (the latter can often include promotions, whereby companies incentivize employees by offering a number of coins to each employee within a department if there are no problems

Figure 59
World Coin Fabrication

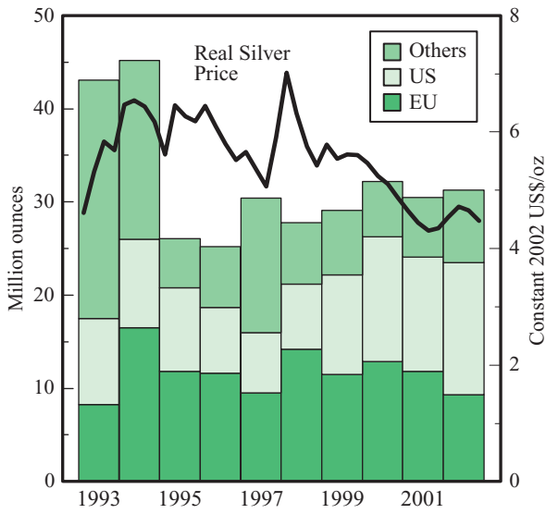


Figure 60
US Silver Eagle Coin Sales

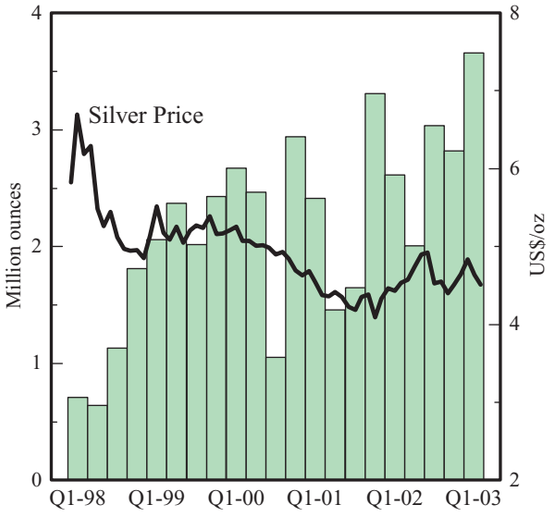


Table 8
Silver Fabrication: Coins and Medals
(including the use of scrap)
Million ounces

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
United States	9.2	9.5	9.0	7.1	6.5	7.0	10.7	13.4	12.3	14.2
Germany	4.4	8.7	4.0	6.2	5.3	10.0	7.0	8.8	8.1	6.1
China	0.4	0.7	0.8	1.4	2.8	2.4	2.3	1.2	1.5	2.1
Spain	0.3	4.8	4.0	2.8	1.8	1.7	1.5	1.8	1.8	1.5
Mexico	17.1	13.0	0.6	0.5	0.4	0.2	0.4	0.7	1.1	1.1
Canada	1.2	1.5	0.7	0.7	0.7	1.1	1.4	1.0	0.9	1.0
Australia	2.3	1.6	0.7	0.8	0.8	1.0	0.9	1.0	0.8	0.6
France	2.1	1.0	1.1	0.3	0.3	0.3	0.3	0.3	0.4	0.5
UK & Ireland	0.7	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.5	0.5
Austria	0.5	0.5	0.6	0.4	0.3	0.3	0.3	0.2	0.3	0.4
Switzerland	0.3	0.3	0.4	0.6	0.6	0.3	0.4	0.4	0.4	0.4
Thailand	0.2	0.2	0.3	0.5	0.3	0.2	0.1	0.2	0.2	0.3
CIS	0.1	0.2	0.1	0.6	0.4	0.2	0.2	0.1	0.2	0.3
Netherlands	0.0	0.3	0.9	0.5	0.4	0.3	0.9	0.0	0.0	0.3
Poland	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2	0.3
Portugal	0.3	0.4	0.5	0.8	0.8	1.0	0.9	1.2	0.7	0.0
Other	3.9	1.5	1.5	1.3	8.3	1.1	1.2	1.2	1.1	1.7
World Total	**43.1**	**45.2**	**26.1**	**25.2**	**30.4**	**27.8**	**29.2**	**32.2**	**30.5**	**31.3**

within a given period). Finally, despite the modest silver price performance, there was a modest level of retail investor interest in the United States.

Demand for US commemorative coins slipped back last year. In 2002, two silver coins were issued, to celebrate the Winter Olympic Games and the West Point Bicentennial. And finally, sales of silver proof sets, which had proved such a success when they were launched two years ago, remained steady last year (the strength of demand in its first year of sales, accounted for the fact that total 2002 demand was only 5.5% higher than in 2000).

It was also worthy of note that not all of the US Mint's silver requirements were satisfied by Defense Logistics Agency (DLA) stocks last year. Under previous legislation, the US Mint was required to use government owned stocks. However, as these holdings have been depleted, new legislation has been drawn up, allowing the Mint to purchase silver on the open market.

Elsewhere in North America, demand for the **Canadian** Maple Leaf bullion coin recovered last year, driven by buoyant demand in the United States, again, partly because of private investor interest.

Turning to Europe, coin production fell sharply in **Germany**, due to significantly lower production in 2002 of silver commemorative coins. However, a total of five issues were still put on sale last year, but 2002 mintage was markedly lower as two of the coins were minted late the previous year. It was also interesting to note that the introduction of euro coins marked an increase in coin weight from 15.5 grams to 18 grams.

Elsewhere, demand for the **Spanish** 12 euro silver circulating coin (the previous equivalent being the Pta 2000 coin) declined by over 14%, back to the 1999 level. Although fabrication of this coin fell sharply, after it was first issued in 1994, production has broadly settled down at close to the 1.6 Moz (50 t) level for the past six years, which would suggest that this coin has become established in the coin market. **Portuguese** silver coin production temporarily ceased last year, due to the introduction of the euro. However, minting is expected to resume in 2003, during which time commemorative coins are planned to be issued. In **Austria**, silver coin fabrication was up strongly (albeit from a relatively low base) due to a sharp rise in retail demand for commemorative issues. It appears that the introduction of the euro has led to a revival in the coin collecting market, both domestically and in those neighboring countries with a history of commemorative silver coins.

Finally, silver coin production in **China** increased sharply by 38% to 2.1 Moz (65 t). This was due to fabrication for two new silver coin programs, as well as advance minting for the Spring Festival Program, which will be issued this year.

Appendix I

Table 1
World Silver Supply and Demand
(Tonnes)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Supply										
Mine Production	14,614	14,038	14,915	15,175	16,269	16,907	16,886	18,128	18,327	18,224
Net Official Sector Sales	187	548	788	589	-	1,272	2,961	2,431	2,711	2,219
Old Silver Scrap	4,620	4,724	5,061	4,920	5,260	6,026	5,635	5,623	5,683	5,751
Producer Hedging	832	-	233	-	2,118	203	-	-	587	-
Implied Net Disinvestment	3,746	4,522	2,941	4,599	2,639	1,361	2,035	2,931	-	649
Total Supply	**23,998**	**23,833**	**23,938**	**25,283**	**26,286**	**25,769**	**27,517**	**29,112**	**27,308**	**26,843**
Demand										
Fabrication										
Industrial Applications	8,401	8,761	9,195	9,257	9,974	9,839	10,576	11,705	10,516	10,651
Photography	6,197	6,271	6,561	6,594	6,812	6,997	7,035	6,848	6,652	6,386
Jewelry & Silverware	8,059	7,087	7,369	8,203	8,533	8,067	8,500	8,707	8,896	8,061
Coins & Medals	1,341	1,405	813	784	945	866	907	1,000	949	973
Total Fabrication	23,998	23,524	23,938	24,838	26,264	25,769	27,018	28,260	27,013	26,071
Net Official Sector Purchases	-	-	-	-	22	-	-	-		
Producer Hedging	-	309	-	445	-	-	499	852	-	772
Implied Net Investment	-	-	-	-	-	-	-	-	295	-
Total Demand	**23,998**	**23,833**	**23,938**	**25,283**	**26,286**	**25,769**	**27,517**	**29,112**	**27,308**	**26,843**
Silver Price (London US$/oz)	4.313	5.285	5.197	5.199	4.897	5.544	5.220	4.951	4.370	4.599

Figure 61
World Silver Supply

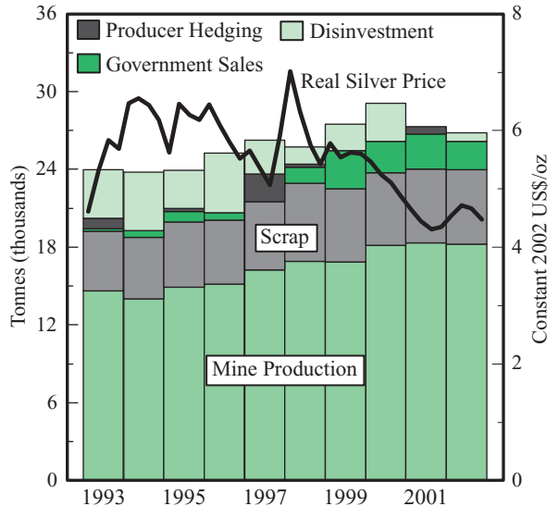


Figure 62
World Silver Demand

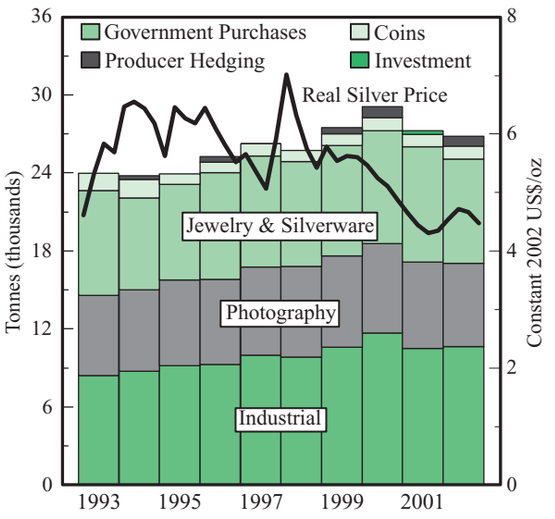


Table 2
World Silver Mine Production
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Poland	915	859	984	953	1,050	1,119	1,115	1,140	1,183	1,211
Sweden	278	252	250	241	265	268	275	294	275	293
Greece	59	45	45	16	36	45	40	31	62	75
Spain	183	176	124	103	66	47	95	117	68	36
Romania	45	42	44	44	43	39	39	34	38	32
Bulgaria	96	56	44	35	31	25	21	18	24	25
Yugoslavia	52	37	58	92	65	56	31	31	21	21
Portugal	36	32	39	34	34	31	27	21	23	19
Ireland	13	17	14	15	13	11	15	25	23	18
Czech & Slovak Republics	16	12	10	7	8	8	8	7	8	7
France	12	3	4	3	2	1	1	1	1	1
Italy	5	14	14	9	4	4	2	1	0	0
Finland	0	0	0	0	0	0	0	0	0	0
Norway	7	7	5	4	4	4	0	0	0	0
Other	2	2	2	0	0	0	0	0	0	0
Total Europe	1,719	1,554	1,636	1,554	1,620	1,658	1,669	1,721	1,726	1,738
North America										
Mexico	2,215	2,215	2,258	2,529	2,701	2,848	2,338	2,790	2,824	2,852
United States	1,645	1,480	1,560	1,570	2,180	2,060	1,950	1,970	1,635	1,445
Canada	879	740	1,245	1,243	1,213	1,131	1,166	1,174	1,265	1,368
Total North America	4,739	4,435	5,063	5,341	6,094	6,039	5,454	5,934	5,724	5,665
Central & South America										
Peru	1,671	1,742	1,908	1,968	2,077	2,025	2,231	2,438	2,674	2,761
Chile	970	983	1,042	1,145	1,092	1,341	1,381	1,242	1,349	1,085
Bolivia	333	351	429	383	386	407	424	437	425	451
Argentina	43	38	37	31	34	69	103	94	176	135
Honduras	24	27	30	38	45	46	49	53	50	56
Brazil	21	18	15	14	9	8	8	8	8	8
Dominican Republic	17	9	21	17	12	7	3	0	0	0
Other	15	39	10	10	11	10	10	6	9	8
Total Central & South America	3,094	3,207	3,491	3,604	3,664	3,913	4,208	4,278	4,689	4,503
Asia										
Indonesia	90	97	238	237	250	311	269	262	289	254
Turkey	72	67	65	90	90	87	108	109	114	114
Japan	137	134	100	89	87	94	94	104	80	81
Papua New Guinea	96	77	66	60	49	58	59	73	69	64
India	51	50	38	36	50	52	60	56	54	59
Thailand	3	4	7	8	3	4	5	5	6	22
Saudi Arabia	16	16	17	16	16	14	11	9	10	10
Philippines	33	31	33	25	20	19	18	23	34	9
Malaysia	14	13	11	10	10	7	3	0	0	0
Other	61	79	78	72	76	84	81	85	85	88
Total Asia	573	568	653	643	653	730	708	726	741	701
Africa										
Morocco	237	258	204	200	260	306	278	289	283	263
South Africa	195	192	178	171	163	157	152	144	126	116
Namibia	72	62	66	42	39	14	0	17	19	20
Zambia	18	11	8	9	7	8	5	5	5	5
Zimbabwe	24	22	22	10	10	6	5	5	5	4
Other	21	12	12	12	12	12	12	11	11	11
Total Africa	567	556	490	443	489	502	452	470	448	420

Table 2
World Silver Mine Production
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Oceania										
Australia	1,152	1,045	920	1,010	1,106	1,469	1,720	2,060	1,970	2,077
New Zealand	26	24	30	31	33	26	24	23	27	29
Fiji	1	1	2	2	2	2	2	2	2	2
Total Oceania	1,179	1,070	952	1,043	1,141	1,496	1,746	2,085	1,999	2,108
Total Western World	11,871	11,391	12,285	12,628	13,661	14,338	14,237	15,213	15,327	15,134
Other Countries										
China	986	1,050	1,080	1,134	1,339	1,350	1,375	1,495	1,452	1,396
Russia	778	746	730	758	649	605	617	628	646	776
Kazakhstan	809	684	650	482	440	430	499	637	755	775
Uzbekistan	68	66	66	70	77	82	64	62	53	49
Armenia	16	16	16	28	31	31	31	33	38	39
Mongolia	26	27	28	29	31	33	32	33	33	33
North Korea	56	53	53	40	36	32	26	22	19	16
Tajikistan	5	6	6	6	6	6	6	5	4	6
Total Other Countries	2,743	2,648	2,630	2,547	2,609	2,569	2,650	2,915	3,000	3,090
World Total	**14,614**	**14,038**	**14,915**	**15,175**	**16,270**	**16,907**	**16,886**	**18,128**	**18,327**	**18,224**

Figure 63
World Silver Mine Production

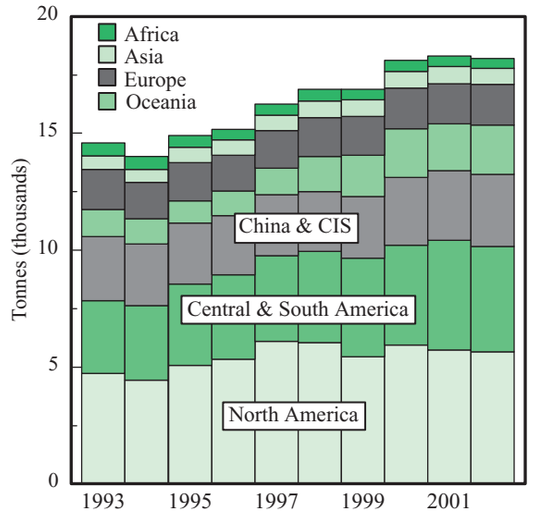


Figure 64
Silver Producer Hedging: Outstanding Positions

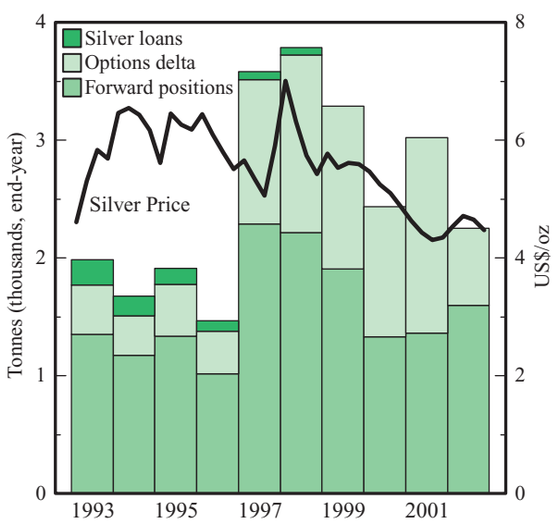


Table 3

Supply of Silver from the Recycling of Old Scrap

Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Germany	490	480	460	480	500	510	500	520	523	520
United Kingdom	228	245	231	236	261	337	358	338	346	367
France	124	130	145	140	133	127	124	110	122	120
Italy	85	87	100	110	105	145	105	105	110	113
Austria	60	60	63	55	56	57	52	50	62	58
Netherlands	35	39	35	39	40	40	40	45	42	44
Sweden	34	34	34	34	35	34	34	33	33	32
Norway	24	24	24	30	30	25	29	33	21	21
Belgium	20	20	20	20	20	20	20	20	21	20
Denmark	20	20	19	19	19	19	19	18	18	17
Portugal	12	12	12	13	14	14	14	14	13	14
Spain	10	10	12	14	14	13	12	13	13	13
Czech & Slovak Republics	24	22	23	28	25	22	19	19	14	13
Finland	15	15	15	15	15	15	15	13	13	12
Switzerland	48	19	51	52	24	14	10	10	10	10
Other	35	36	34	36	37	36	36	35	34	36
Total Europe	1,264	1,253	1,278	1,321	1,328	1,428	1,387	1,376	1,395	1,410
North America										
United States	1,343	1,405	1,432	1,505	1,612	1,733	1,785	1,941	2,005	1,842
Mexico	70	70	150	75	134	330	75	65	60	56
Canada	41	41	52	55	50	60	50	45	45	44
Total North America	1,454	1,516	1,634	1,635	1,796	2,123	1,910	2,051	2,110	1,942
Central & South America										
Brazil	60	60	60	60	50	50	55	48	50	32
Argentina	20	20	20	20	20	20	20	20	23	20
Chile	14	14	14	14	14	17	13	12	12	12
Other	25	23	23	23	23	29	27	25	24	24
Total Central & South America	119	117	117	117	107	116	115	105	109	88
Middle East										
Saudi Arabia & Yemen	25	58	94	40	101	64	232	70	24	224
Egypt	32	28	25	22	10	13	10	28	35	40
Turkey	63	70	72	60	50	53	43	40	40	40
Other	11	11	11	11	11	12	11	10	11	10
Total Middle East	131	167	202	133	172	142	296	148	110	314
Indian Sub-Continent										
India	140	140	300	200	300	370	207	200	200	210
Other	7	6	9	5	10	15	11	13	15	15
Total Indian Sub-Continent	147	146	309	205	310	385	218	213	215	225
East Asia										
Japan	816	836	850	842	865	908	917	927	931	940
South Korea	90	92	102	107	111	244	164	164	168	172
Taiwan	24	22	22	22	24	26	28	28	28	27
Thailand	10	10	10	11	25	30	12	10	11	14
Singapore	9	12	12	11	11	12	12	12	12	13
Hong Kong	8	8	9	9	11	15	11	11	11	12
Indonesia	7	9	10	11	11	12	13	15	13	10
Vietnam	7	10	11	11	12	12	12	11	10	9
Philippines	5	5	5	6	6	7	7	7	6	6
Malaysia	3	3	3	3	3	4	3	3	3	4
Total East Asia	979	1,007	1,034	1,033	1,080	1,270	1,179	1,187	1,193	1,207
Africa										
Morocco	11	11	14	14	16	17	16	16	16	16
Other	22	20	23	20	17	17	17	18	17	17
Total Africa	33	31	37	35	33	34	33	34	33	33

Table 3
Supply of Silver from the Recycling of Old Scrap
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Oceania										
Australia	75	78	78	73	71	74	75	76	74	73
Total Oceania	75	78	78	73	71	74	75	76	74	73
Western World Total	4,202	4,315	4,688	4,551	4,897	5,571	5,213	5,191	5,239	5,291
Other Countries										
CIS	303	281	238	230	220	275	240	245	252	263
China	115	128	135	139	143	180	182	187	192	196
Total Other Countries	418	409	373	369	363	455	422	432	444	459
World Total	**4,620**	**4,724**	**5,061**	**4,920**	**5,260**	**6,026**	**5,635**	**5,623**	**5,683**	**5,751**

Figure 65
World Silver Scrap Supply

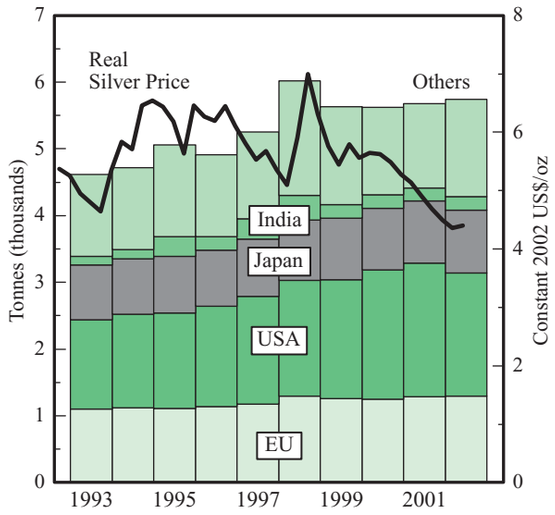


Figure 66
World Scrap Supply, 2002

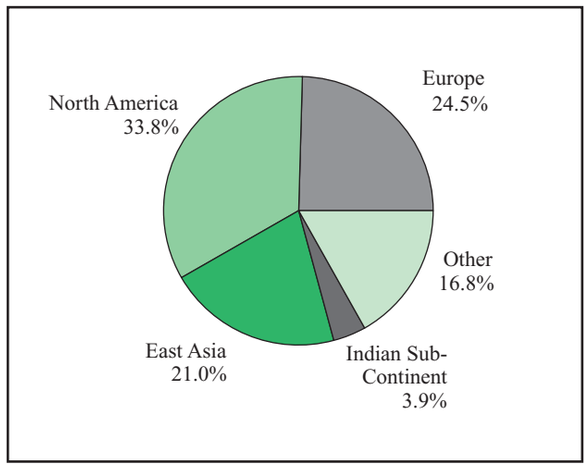


Table 4
World Silver Fabrication
(including the use of scrap)
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Italy	1,765	1,619	1,557	1,624	1,757	1,750	1,932	2,033	1,734	1,642
UK & Ireland	882	971	1,005	1,071	1,104	1,219	1,241	1,344	1,446	1,372
Germany	1,557	1,692	1,481	1,469	1,481	1,505	1,309	1,263	1,259	1,103
Belgium	642	655	728	788	847	1,052	1,167	1,098	999	958
France	938	876	968	845	892	892	837	906	907	860
Spain	191	333	309	288	271	275	234	210	171	161
Switzerland	194	221	229	243	298	332	344	281	108	106
Poland	70	79	96	94	104	111	117	120	107	100
Greece	115	120	118	133	140	126	126	104	94	87
Netherlands	64	74	92	77	74	70	88	60	57	65
Norway	60	51	50	45	46	47	94	89	71	60
Portugal	77	64	76	88	89	96	100	107	80	52
Austria	48	46	51	46	42	42	38	33	34	37
Sweden	49	47	43	46	52	43	42	41	31	33
Denmark	30	30	33	31	35	32	31	32	28	24
Czech & Slovak Republics	21	18	24	23	23	28	24	25	31	21
Finland	28	31	27	30	29	21	21	17	14	14
Romania	14	13	9	13	11	16	13	13	12	12
Cyprus & Malta	8	11	12	13	12	11	12	12	10	10
Other	34	27	27	25	24	24	24	25	24	24
Total Europe	6,786	6,978	6,934	6,989	7,332	7,691	7,793	7,812	7,215	6,740
North America										
United States	4,041	4,306	4,610	4,651	4,941	5,263	5,730	6,017	5,277	5,509
Mexico	994	859	544	646	732	682	705	570	556	590
Canada	88	96	83	83	87	106	109	92	90	96
Total North America	5,123	5,261	5,236	5,380	5,760	6,051	6,544	6,679	5,923	6,195
Central & South America										
Brazil	215	257	291	262	260	253	238	210	204	198
Argentina	126	126	122	118	118	97	84	70	56	58
Peru	26	28	31	34	35	34	32	30	32	32
Colombia	33	33	33	33	33	33	27	24	22	22
Ecuador	17	21	21	21	21	21	17	17	14	14
Chile	15	15	15	15	15	15	14	13	13	13
Other	18	15	19	27	41	50	56	35	27	23
Total Central & South America	451	495	532	510	523	503	468	399	368	360
Middle East										
Turkey	194	169	199	208	215	204	187	229	171	242
Israel	88	95	105	116	125	120	120	112	102	103
Egypt	59	78	67	70	65	58	63	64	55	49
Saudi Arabia	14	10	12	12	20	16	18	20	18	18
Other	64	76	79	83	81	77	80	82	83	78
Total Middle East	419	429	462	489	505	475	466	506	429	490
Indian Sub-Continent										
India	3,383	2,920	3,152	3,801	3,824	3,567	3,779	4,075	4,789	3,685
Bangladesh & Nepal	120	140	160	180	200	160	178	187	185	150
Other	105	88	117	84	127	87	105	98	67	66
Total Indian Sub-Continent	3,608	3,148	3,429	4,065	4,151	3,814	4,062	4,360	5,041	3,901
East Asia										
Japan	3,356	3,373	3,504	3,487	3,955	3,508	3,809	4,200	3,711	3,690
Thailand	1,205	905	862	859	843	751	829	939	1,013	1,114
South Korea	484	510	579	575	579	429	519	641	562	593
Taiwan	149	164	179	198	214	210	210	293	263	279
Indonesia	57	83	97	104	126	84	99	121	132	148

Table 4
World Silver Fabrication
(including the use of scrap)
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Hong Kong	81	106	107	117	138	112	120	138	100	105
Myanmar, Laos & Cambodia	31	31	33	34	30	25	28	26	28	30
Vietnam	12	16	20	21	22	19	22	22	23	26
Malaysia	14	11	12	12	13	12	15	18	18	19
Other	12	11	11	12	10	11	12	13	14	14
Total East Asia	5,402	5,210	5,404	5,418	5,928	5,161	5,663	6,410	5,865	6,018
Africa										
Morocco	14	14	17	18	20	18	17	18	19	18
Tunisia	7	8	8	9	10	10	10	10	10	10
South Africa	18	12	14	9	8	8	8	8	7	7
Algeria	9	9	9	8	7	6	6	6	6	5
Other	16	16	15	13	12	12	12	12	12	12
Total Africa	64	59	63	57	56	53	53	54	53	52
Oceania										
Australia	217	196	166	162	161	176	180	218	184	180
New Zealand	0	0	0	1	1	1	1	1	1	1
Total Oceania	217	196	166	162	162	177	181	219	186	181
Western World Total	22,069	21,776	22,227	23,070	24,415	23,925	25,231	26,438	25,080	23,938
Other Countries										
China	657	765	809	890	1,003	1,055	1,030	1,047	1,129	1,312
CIS	1,265	983	902	878	846	789	757	775	804	821
North Korea	7	0	0	0	0	0	0	0	0	0
Total Other Countries	1,929	1,749	1,711	1,768	1,849	1,844	1,787	1,822	1,933	2,133
World Total	**23,998**	**23,524**	**23,938**	**24,838**	**26,264**	**25,769**	**27,018**	**28,260**	**27,013**	**26,071**

Figure 67
World Silver Fabrication

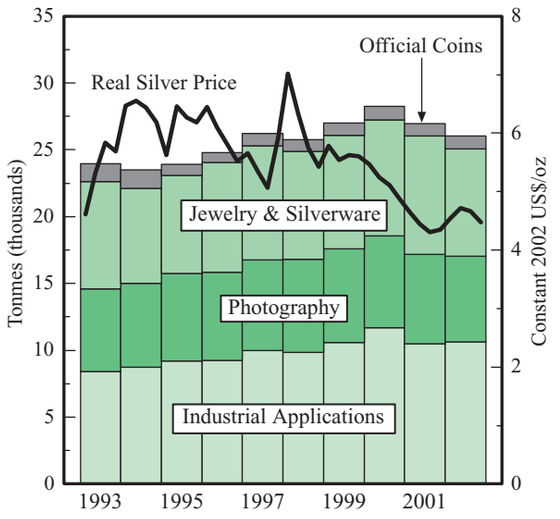


Figure 68
World Silver Fabrication, 2002

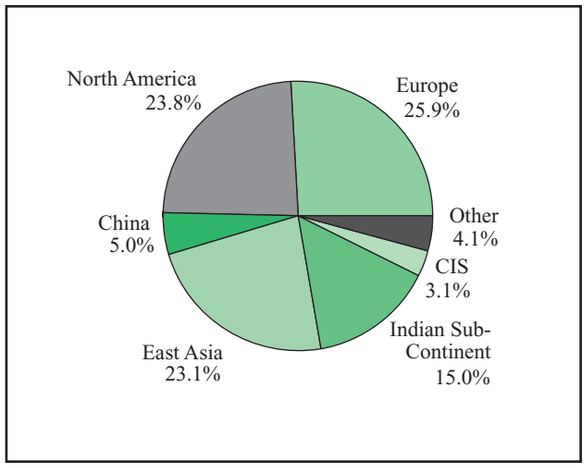


Table 5
Silver Fabrication: Industrial Applications
(including the use of scrap)
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Germany	580	560	575	535	555	571	571	647	665	660
UK & Ireland	354	363	371	381	388	506	472	549	480	466
France	352	360	374	363	418	349	362	381	495	453
Italy	315	316	329	348	354	329	331	340	324	324
Switzerland	174	203	206	215	269	311	322	259	85	84
Netherlands	54	54	54	54	52	52	52	52	48	49
Spain	57	54	55	61	91	95	83	62	40	40
Poland	19	24	26	24	23	23	23	23	22	21
Norway	13	13	13	12	12	11	45	37	23	20
Austria	19	19	22	19	18	17	17	17	17	17
Sweden	10	10	10	10	11	11	11	11	10	10
Czech & Slovak Republics	16	13	16	17	13	13	16	8	11	9
Belgium	10	10	10	10	10	10	10	10	8	8
Other	22	23	23	23	23	24	23	23	21	20
Total Europe	1,995	2,022	2,084	2,071	2,236	2,322	2,338	2,418	2,248	2,180
North America										
United States	1,751	1,886	2,050	2,120	2,343	2,520	2,757	2,928	2,449	2,596
Mexico	80	86	79	81	85	92	133	140	120	119
Canada	23	20	23	20	20	17	17	17	16	16
Total North America	1,854	1,992	2,152	2,221	2,448	2,629	2,907	3,085	2,585	2,731
Central & South America										
Brazil	78	100	108	102	105	108	98	98	98	98
Argentina	40	40	38	36	36	36	30	25	20	20
Colombia	9	9	9	9	9	9	7	6	6	6
Ecuador	2	2	2	2	2	2	2	2	2	2
Other	12	12	12	12	12	12	12	12	13	13
Total Central & South America	141	163	169	161	164	167	149	143	139	139
Middle East										
Turkey	39	35	39	38	43	41	38	44	35	41
Israel	26	28	30	33	31	31	30	30	26	24
Egypt	3	3	3	4	3	4	4	4	4	3
Other	0	0	0	0	1	1	1	1	1	1
Total Middle East	68	66	73	74	78	76	72	79	65	69
Indian Sub-Continent										
India	901	999	1,062	1,105	1,120	992	1,180	1,435	1,579	1,375
Other	18	15	20	14	22	15	18	16	10	8
Total Indian Sub-Continent	919	1,014	1,082	1,119	1,142	1,007	1,198	1,451	1,589	1,383
East Asia										
Japan	1,425	1,591	1,667	1,622	1,848	1,643	1,890	2,244	1,723	1,839
South Korea	260	311	369	370	382	349	379	489	418	454
Taiwan	131	146	163	181	197	193	196	274	250	270
Hong Kong	51	76	79	88	107	93	101	121	85	93
Indonesia	12	11	12	13	15	16	16	16	14	15
Total East Asia	1,879	2,135	2,289	2,273	2,549	2,294	2,582	3,144	2,490	2,671
Africa										
Morocco	2	2	5	7	7	7	7	8	8	8
South Africa	16	10	10	5	5	5	5	5	4	4
Other	7	7	7	7	5	5	5	5	5	5
Total Africa	25	19	22	19	17	17	17	18	17	17
Oceania										
Australia	63	67	76	70	66	72	76	77	65	66
Total Oceania	63	67	76	70	66	72	76	77	65	66
Western World Total	6,944	7,477	7,946	8,009	8,700	8,584	9,339	10,415	9,199	9,256

Table 5
Silver Fabrication: Industrial Applications
(including the use of scrap)
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Other Countries										
China	464	538	567	593	632	645	651	681	693	795
CIS	992	746	682	655	642	610	586	609	624	600
Total Other Countries	1,456	1,284	1,249	1,248	1,274	1,255	1,237	1,290	1,317	1,395
World Total	**8,401**	**8,761**	**9,195**	**9,257**	**9,974**	**9,839**	**10,576**	**11,705**	**10,516**	**10,651**

Figure 69
Main Components of Industrial Demand

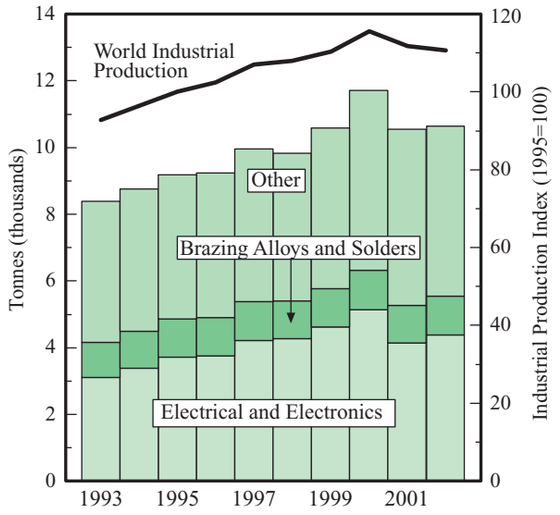


Figure 70
World Silver Industrial Fabrication, 2002

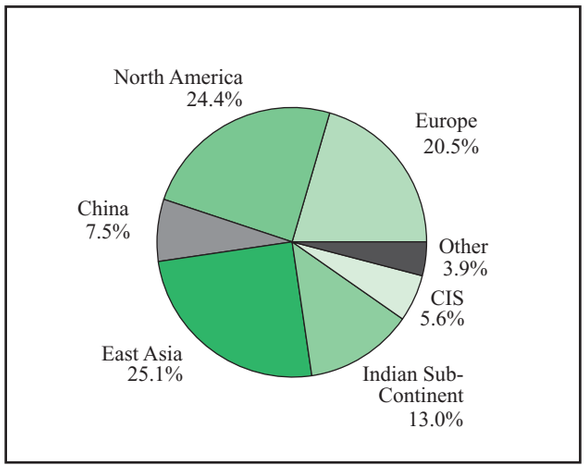


Table 5a
Silver Fabrication: Electrical and Electronics
(including the use of scrap)
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
United States	890	983	1,120	1,129	1,303	1,373	1,464	1,573	1,062	1,168
Japan	650	701	743	706	804	738	933	1,140	828	913
Germany	350	340	370	360	370	380	380	445	488	484
China	223	276	284	293	316	305	308	320	320	340
France	155	168	190	195	238	207	210	228	342	309
South Korea	140	164	200	199	201	188	206	268	237	255
Taiwan	89	102	113	130	146	148	150	216	203	223
UK & Ireland	141	143	145	155	160	210	179	211	153	164
India	76	80	92	100	130	130	140	150	145	145
Hong Kong	37	57	59	68	85	77	90	110	77	87
Italy	100	85	85	103	100	90	92	95	86	87
Mexico	36	38	34	34	36	40	90	97	80	80
Brazil	32	46	49	45	45	45	40	40	40	40
Turkey	29	26	29	28	31	28	24	28	22	26
Australia	14	14	17	16	15	17	18	19	18	20
Netherlands	20	20	20	20	18	18	18	18	16	16
Switzerland	86	108	117	127	172	228	232	165	12	12
Austria	7	7	7	7	7	7	7	7	7	7
Romania	3	3	3	3	3	4	4	4	4	4
Egypt	3	3	3	4	3	4	4	4	4	3
Spain	30	28	28	28	29	30	30	9	0	0
World Total	**3,112**	**3,391**	**3,709**	**3,749**	**4,212**	**4,266**	**4,618**	**5,147**	**4,143**	**4,383**

Table 5b
Silver Fabrication: Brazing Alloys and Solders
(including the use of scrap)
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
United States	224	239	249	255	260	269	280	272	258	272
China	138	146	159	170	179	196	198	208	215	247
Japan	119	147	150	160	155	130	131	137	109	104
Germany	140	125	110	90	95	97	94	101	88	96
UK & Ireland	71	72	72	72	72	75	68	72	82	72
Italy	54	58	66	65	59	54	62	65	63	64
India	45	50	60	65	50	47	50	55	57	60
South Korea	25	30	38	36	35	25	26	31	38	44
Switzerland	55	56	56	52	52	49	48	50	41	40
Taiwan	23	25	32	35	34	31	32	37	29	31
Spain	11	9	9	18	29	32	33	33	30	30
France	55	45	40	42	43	32	29	30	29	29
Brazil	18	26	27	27	25	25	23	23	23	23
Australia	19	20	23	21	20	22	23	24	20	19
Mexico	28	31	27	27	28	30	20	20	17	16
Canada	13	13	16	13	13	10	10	10	9	9
Netherlands	8	8	8	8	8	8	8	8	7	7
Austria	5	4	4	3	3	3	3	3	3	3
Israel	2	2	2	3	3	3	3	3	2	2
World Total	**1,053**	**1,106**	**1,149**	**1,161**	**1,163**	**1,138**	**1,140**	**1,181**	**1,120**	**1,168**

Table 6
Silver Fabrication: Photographic Use
(including the use of scrap)
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Belgium	626	640	708	770	828	1,034	1,149	1,080	983	944
UK & Ireland	422	495	519	566	592	593	652	678	862	810
France	458	425	495	411	395	452	380	427	315	307
Germany	480	500	460	430	450	307	208	52	49	11
Czech & Slovak Republics	0	0	0	0	3	8	1	9	14	7
Hungary	8	8	8	7	7	6	6	7	6	6
Romania	8	6	2	6	5	8	6	6	5	5
Bulgaria	1	1	1	1	1	0	0	0	0	0
Spain	11	6	3	0	0	0	0	0	0	0
Poland	15	15	15	9	7	0	0	0	0	0
Total Europe	2,029	2,096	2,210	2,200	2,287	2,408	2,402	2,260	2,235	2,090
North America										
United States	1,654	1,752	1,891	1,922	2,006	2,133	2,233	2,244	2,038	2,046
Mexico	98	98	104	107	127	107	91	0	0	0
Total North America	1,752	1,850	1,995	2,029	2,133	2,240	2,324	2,244	2,038	2,046
Central & South America										
Brazil	82	100	123	105	105	100	100	76	70	64
Argentina	56	56	56	56	56	56	49	40	32	34
Total Central & South America	138	156	179	161	161	156	149	116	102	98
Indian Sub-Continent										
India	70	50	20	20	20	10	10	10	10	10
Other	8	7	8	9	10	12	12	12	4	4
Total Indian Sub-Continent	78	57	28	29	30	22	22	22	14	14
East Asia										
Japan	1,779	1,713	1,770	1,800	1,822	1,810	1,864	1,902	1,935	1,799
Taiwan	3	3	1	1	1	1	1	0	0	0
Total East Asia	1,782	1,716	1,771	1,801	1,823	1,811	1,865	1,902	1,935	1,799
Oceania										
Australia	65	60	50	49	51	51	52	85	74	71
Total Oceania	65	60	50	49	51	51	52	85	74	71
Western World Total	5,843	5,934	6,233	6,269	6,485	6,688	6,814	6,628	6,397	6,118
Other Countries										
China	159	174	174	180	187	190	114	120	140	176
CIS	195	163	154	145	140	119	107	100	95	92
Total Other Countries	354	337	328	325	327	309	221	220	255	268
World Total	**6,197**	**6,271**	**6,561**	**6,594**	**6,812**	**6,997**	**7,035**	**6,848**	**6,652**	**6,386**

Table 7
Silver Fabrication: Jewelry and Silverware
(including the use of scrap)
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Europe										
Italy	1,436	1,288	1,212	1,260	1,392	1,410	1,592	1,685	1,402	1,313
Germany	360	360	320	310	310	315	312	290	292	244
Greece	115	120	118	130	140	126	126	104	94	87
France	63	60	63	62	69	81	85	88	85	83
UK & Ireland	85	89	92	104	105	102	98	100	90	81
Spain	115	125	127	140	124	126	105	93	76	74
Poland	32	35	49	57	71	83	89	92	78	71
Portugal	64	47	54	58	59	60	66	66	55	49
Norway	37	37	37	33	33	35	47	51	46	40
Sweden	36	37	32	35	40	31	30	29	20	22
Denmark	27	27	27	28	32	29	28	29	25	21
Finland	26	27	23	26	26	18	18	14	11	11
Switzerland	10	9	10	10	9	12	10	10	10	10
Cyprus	8	11	12	13	12	11	12	12	10	10
Austria	15	12	12	13	13	15	11	8	7	7
Other	28	27	27	23	26	25	24	23	23	23
Total Europe	2,457	2,311	2,215	2,302	2,462	2,480	2,653	2,693	2,325	2,146
North America										
Mexico	285	270	343	442	508	477	470	410	401	437
United States	351	373	389	387	389	391	407	427	406	426
Canada	27	30	38	41	47	55	48	45	47	48
Total North America	663	673	770	870	944	923	925	882	854	911
Central & South America										
Brazil	55	57	60	55	50	45	40	36	36	36
Peru	24	26	29	32	33	32	30	28	29	29
Colombia	24	24	24	24	24	24	20	18	16	16
Ecuador	15	19	19	19	19	19	15	15	12	12
Argentina	30	30	28	26	26	5	5	5	4	4
Other	22	20	23	31	45	54	59	37	29	25
Total Central & South America	170	176	183	187	197	179	169	139	126	122
Middle East										
Turkey	156	134	160	170	171	163	147	184	135	170
Israel	61	66	72	82	92	88	89	80	74	77
Egypt	56	55	64	67	62	54	58	60	51	46
Saudi Arabia	14	10	12	12	20	16	18	20	18	18
Other	63	75	79	82	80	76	79	81	83	77
Total Middle East	350	341	386	412	425	397	391	425	361	388
Indian Sub-Continent										
India	2,412	1,871	2,070	2,676	2,684	2,565	2,589	2,630	3,200	2,300
Bangladesh & Nepal	120	140	160	180	200	160	178	187	185	150
Other	79	66	89	61	95	60	75	70	53	53
Total Indian Sub-Continent	2,611	2,077	2,319	2,917	2,979	2,785	2,842	2,887	3,438	2,503
East Asia										
Thailand	1,199	899	852	844	834	744	825	934	1,007	1,104
South Korea	224	199	210	205	197	80	140	152	144	139
Indonesia	45	72	85	92	111	68	83	105	118	133
Japan	77	69	67	65	60	55	55	54	53	52
Cambodia, Kingdom of	31	31	33	34	30	25	28	26	28	30
Vietnam	12	16	20	21	22	19	22	22	23	26
Malaysia	14	11	12	12	13	12	15	17	18	19
Hong Kong	30	30	28	29	31	19	19	17	15	12
Taiwan	15	15	15	16	16	16	13	13	10	9
Other	8	7	8	9	9	9	9	10	11	11
Total East Asia	1,655	1,349	1,330	1,326	1,322	1,047	1,209	1,350	1,427	1,535

Table 7
Silver Fabrication: Jewelry and Silverware
(including the use of scrap)
Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Africa										
Morocco	12	12	12	11	13	11	10	10	11	11
Tunisia	6	7	7	8	9	9	9	9	9	9
Algeria	7	7	7	7	6	5	5	5	5	4
Other	13	14	15	12	11	11	11	12	11	11
Total Africa	38	40	41	38	39	36	35	36	36	35
Oceania										
Australia	18	19	19	17	18	22	23	24	22	23
New Zealand	0	0	0	1	1	1	1	1	1	1
Total Oceania	18	19	19	18	19	23	24	25	23	24
Western World Total	7,962	6,987	7,263	8,069	8,385	7,868	8,248	8,437	8,589	7,665
Other Countries										
China	21	32	45	75	96	145	195	208	229	276
CIS	76	68	61	59	52	54	57	62	78	120
Total Other Countries	97	100	106	134	148	199	252	270	307	396
World Total	**8,059**	**7,087**	**7,369**	**8,203**	**8,533**	**8,067**	**8,500**	**8,707**	**8,896**	**8,061**

Figure 71
World Silver Jewelry Fabrication

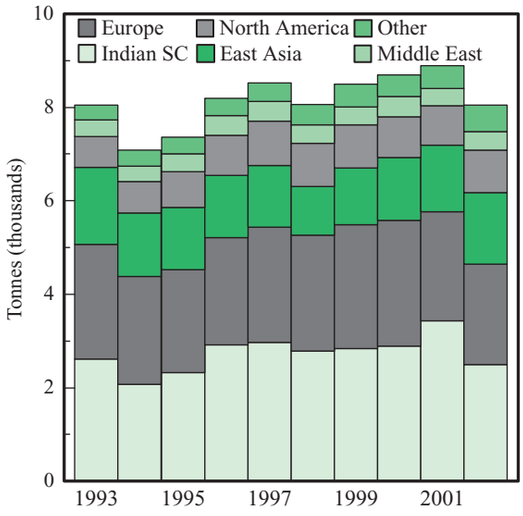


Figure 72
World Silver Jewelry Fabrication, 2002

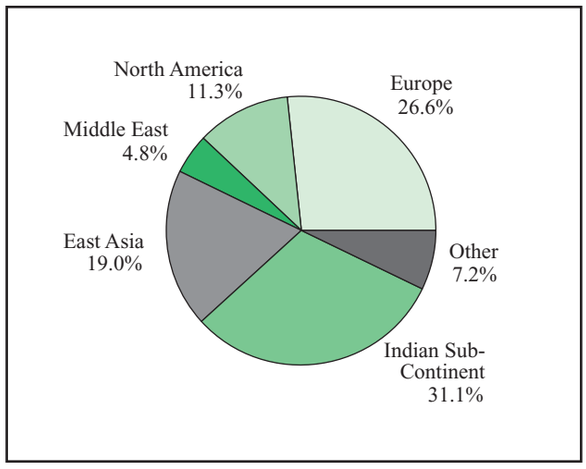


Table 8

Silver Fabrication: Coins and Medals

(including the use of scrap)

Tonnes

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
United States	285	295	280	222	203	219	333	418	384	441
Germany	137	272	126	194	166	312	218	274	252	188
China	13	21	24	43	88	75	71	38	47	65
Spain	8	148	124	87	56	54	46	55	55	47
Mexico	531	405	18	16	12	6	11	20	35	34
Canada	38	46	22	22	20	34	44	30	27	32
Australia	71	50	21	26	26	31	29	31	23	20
France	65	31	36	9	10	10	10	11	13	16
UK & Ireland	21	24	23	20	19	19	19	17	14	16
Austria	14	15	17	14	11	10	10	8	10	13
Switzerland	10	9	13	18	20	9	12	12	13	12
Thailand	6	6	10	15	9	7	4	5	6	10
CIS	2	6	4	19	12	6	7	4	7	9
Netherlands	0	11	29	15	12	8	27	0	0	8
Poland	4	5	6	4	3	5	5	5	7	8
Portugal	8	12	17	25	25	31	29	36	21	0
Other	128	49	45	38	254	31	32	37	34	54
World total	**1,341**	**1,405**	**813**	**784**	**945**	**866**	**907**	**1,000**	**949**	**973**

Appendix II

Silver Prices, 1982-2002
The Effects of Exchange Rates and Inflation

1. Actual Prices *(money of the day)

	London US$/oz	India * Rupee/kg	Thailand Baht/oz	Japan Yen/10g	Korea Won/10g	Eurozone** Euro/kg	Mexico Peso/oz
1982	7.922	2,675	182.20	634	1,862	316	0.45
1983	11.430	3,435	262.89	873	2,851	480	1.37
1984	8.145	3,514	192.53	622	2,111	381	1.37
1985	6.132	3,880	166.53	470	1,715	297	1.58
1986	5.465	4,105	143.71	296	1,549	195	3.34
1987	7.016	5,124	180.46	326	1,855	207	9.67
1988	6.532	6,231	165.23	269	1,536	189	14.85
1989	5.500	6,803	141.34	244	1,187	170	13.54
1990	4.832	6,779	123.62	225	1,099	128	13.59
1991	4.057	6,993	103.51	176	956	111	12.24
1992	3.946	7,580	100.24	161	991	101	12.21
1993	4.313	6,163	109.15	154	1,110	117	13.44
1994	5.285	6,846	132.92	201	1,365	141	17.84
1995	5.197	6,864	129.49	198	1,289	122	33.36
1996	5.199	7,291	131.79	197	1,345	129	39.51
1997	4.897	7,009	153.60	189	1,498	140	38.78
1998	5.544	8,016	229.30	233	2,498	160	50.65
1999	5.220	8,022	197.54	191	1,995	158	49.90
2000	4.951	8,002	198.61	172	1,800	173	46.82
2001	4.370	7,420	194.15	171	1,814	157	40.82
2002	4.599	7,934	197.57	185	1,909	157	44.41

*Prices are calculated from the London price and the average exchange rate for the year.
In the case of India, the price shown is the one actually quoted in the Bombay/Mumbai market.

** From 1982-1998 DM/kg price is expressed in Euro/kg at the official conversion rate of 1.95583

2. Real Prices ***(Constant 2002 money)

	London US$/oz	India Rupee/kg	Thailand Baht/oz	Japan Yen/10g	Korea Won/oz	Eurozone** Euro/kg	Mexico Peso/oz
1982	14.765	13,036	376.12	770	4,610	476	192.01
1983	20.642	14,971	523.05	1,040	6,824	700	305.90
1984	14.103	14,140	379.83	725	4,940	543	182.73
1985	10.254	14,791	320.66	537	3,918	414	133.49
1986	8.966	14,389	271.75	336	3,453	273	151.24
1987	11.107	16,512	333.07	370	4,001	289	189.49
1988	9.938	18,353	293.63	303	3,093	260	135.77
1989	7.980	18,874	238.37	269	2,261	227	103.10
1990	6.651	17,263	196.80	240	1,928	167	81.76
1991	5.358	15,635	155.93	182	1,533	139	60.04
1992	5.060	15,162	144.96	163	1,496	123	51.86
1993	5.371	11,592	152.42	155	1,599	136	51.99
1994	6.413	11,682	176.23	200	1,851	159	64.54
1995	6.133	10,627	163.06	198	1,674	136	89.41
1996	5.963	10,359	156.86	197	1,664	141	78.80
1997	5.488	9,292	173.05	185	1,775	150	64.10
1998	6.117	9,402	238.94	227	2,755	171	72.22
1999	5.637	9,032	205.21	187	2,182	167	61.04
2000	5.172	8,676	203.13	169	1,925	180	52.30
2001	4.438	7,747	195.24	169	1,864	159	42.89
2002	4.599	7,934	197.57	185	1,909	157	44.41

*** Derived from the actual prices shown above using consumer price indices.

Appendix III

Silver Prices, in US dollars per ounce

1. London and US Prices

	London Silver Market - Spot			Comex Spot Settlement		
	High	Low	Average	High	Low	Average
1977	4.9750	4.3130	4.6333	4.9760	4.2850	4.6235
1978	6.2640	4.8180	5.4218	6.3170	4.8110	5.4068
1979	32.2000	5.9350	11.0679	34.4500	5.9230	11.1135
1980	49.4500	10.8900	20.9837	48.7000	10.8000	20.6568
1981	16.3030	8.0300	10.4869	16.2900	7.9850	10.5014
1982	11.1100	4.9010	7.9219	11.2100	4.9800	7.9311
1983	14.6680	8.3700	11.4301	14.7150	8.4000	11.4340
1984	10.1100	6.2200	8.1446	10.0640	6.2950	8.1585
1985	6.7500	5.4500	6.1319	6.8350	5.5250	6.1459
1986	6.3100	4.8530	5.4645	6.2850	4.8540	5.4653
1987	10.9250	5.3600	7.0156	9.6600	5.3790	7.0198
1988	7.8215	6.0500	6.5324	7.8270	5.9980	6.5335
1989	6.2100	5.0450	5.4999	6.1940	5.0300	5.4931
1990	5.3560	3.9500	4.8316	5.3320	3.9370	4.8174
1991	4.5710	3.5475	4.0566	4.5450	3.5080	4.0355
1992	4.3350	3.6475	3.9464	4.3180	3.6400	3.9334
1993	5.4200	3.5600	4.3130	5.4430	3.5230	4.3026
1994	5.7475	4.6400	5.2851	5.7810	4.5730	5.2808
1995	6.0375	4.4160	5.1971	6.1020	4.3750	5.1850
1996	5.8275	4.7100	5.1995	5.8190	4.6760	5.1783
1997	6.2675	4.2235	4.8972	6.3070	4.1550	4.8716
1998	7.8100	4.6900	5.5442	7.2600	4.6180	5.4894
1999	5.7900	4.8800	5.2198	5.7600	4.8720	5.2184
2000	5.5470	5.0700	4.9514	5.5470	4.5630	4.9691
2001	4.8200	4.0500	4.3696	4.8570	4.0280	4.3594
2002	5.0975	4.2350	4.5992	5.1250	4.2230	4.6007

2. US Prices in 2002

	Comex Spot Settlement		
	High	Low	Average
January	4.7100	4.2230	4.4619
February	4.5380	4.2950	4.4291
March	4.6800	4.4660	4.5379
April	4.7470	4.4050	4.5760
May	5.0420	4.5290	4.7397
June	5.1250	4.8230	4.9002
July	5.1180	4.5980	4.9214
August	4.6750	4.4050	4.5271
September	4.6490	4.4370	4.5537
October	4.5100	4.2850	4.4037
November	4.6000	4.4140	4.5086
December	4.8120	4.4220	4.6494

3. Leasing Rates in 2002

	Monthly Averages		
	3-month	6-month	12-month
January	4.77%	3.44%	3.05%
February	1.48%	1.57%	1.94%
March	0.87%	1.23%	1.84%
April	0.53%	0.87%	1.50%
May	0.83%	1.03%	1.55%
June	0.51%	0.75%	1.22%
July	0.21%	0.41%	0.77%
August	0.22%	0.44%	0.73%
September	0.15%	0.29%	0.58%
October	0.26%	0.41%	0.64%
November	0.20%	0.32%	0.56%
December	0.16%	0.27%	0.43%

Appendix IV

Leading Primary Silver Mines

Rank	Mine	Country	Operator	2001 Moz	2002 Moz
1	Cannington	Australia	BHP Billiton	29.99	38.18
2	Proaño	Mexico	Industrias Peñoles SA de CV	28.74	31.25
3	Greens Creek	United States	Kennecott Minerals/Hecla Mining Company	11.00	10.91
4	Uchucchacua	Peru	Compañia de Minas Buenaventura SA	9.78	9.39
5	Tizapa	Mexico	Industrias Peñoles SA de CV	8.13	7.99
6	Imiter	Morocco	Société Métallurgique d'Imiter	7.65	7.06
7	Rochester	United States	Coeur d'Alene Mines Corporation	6.35	6.42
8	Galena	United States	Coeur d'Alene Mines Corporation	4.51	5.30
9	Huaron	Peru	Pan American Silver Corp	2.90	4.53
10	San Sebastian	Mexico	Hecla Mining Company	0.95	3.43
11	Arcata	Peru	Minas de Arcata SA	4.44	2.86
12	Caylloma	Peru	Hochschild Group	2.25	2.86
13	Quiruvilca	Peru	Pan American Silver Corp	3.26	2.51
14	San Martin	Mexico	First Silver Reserves Inc.	2.39	2.40
15	Lucky Friday	United States	Hecla Mining Company	3.22	2.00

Silver Mine Production by Source Metal
Million ounces

	1999	2000	2001	2002
Primary				
Mexico	35.5	43.2	47.7	50.3
Australia	26.5	33.6	30.0	38.2
United States	30.0	28.9	25.6	24.6
Other	56.3	39.0	45.3	47.9
Total	148.3	144.7	148.6	161.0
Gold				
Chile	8.7	22.6	22.2	15.8
Canada	15.2	17.5	20.1	23.1
United States	12.1	15.8	9.5	4.5
Other	34.7	36.7	36.6	36.1
Total	70.7	92.6	88.4	79.5
Copper				
Poland	35.1	36.0	37.4	38.3
CIS	20.8	25.4	28.7	29.3
Chile	16.5	17.2	20.7	16.5
Other	57.5	60.9	62.9	64.0
Total	129.9	139.5	149.7	148.1
Lead/Zinc				
Peru	40.0	43.7	43.7	45.5
Mexico	27.6	32.1	30.9	29.7
Australia	28.3	31.6	31.8	27.6
Other	91.2	92.1	88.7	86.7
Total	187.1	199.5	195.1	189.5
Other	7.0	6.5	7.5	7.9
Total	**542.9**	**582.8**	**589.2**	**585.9**

Silver Mine Production by Main Region and Source Metal
Million ounces

	1999	2000	2001	2002
North America				
Primary	65.5	72.0	73.3	74.9
Lead/Zinc	45.9	47.2	45.2	43.6
Copper	25.8	25.9	24.9	25.2
Gold	36.3	43.9	38.8	36.5
Other	1.9	1.7	1.8	1.8
Total	175.4	190.8	184.0	182.1
Central & South America				
Primary	39.7	21.4	27.9	28.8
Lead/Zinc	55.7	59.9	59.8	62.0
Copper	22.8	24.7	31.0	28.3
Gold	16.9	31.5	31.9	25.6
Other	0.1	0.1	0.1	0.1
Total	135.3	137.5	150.8	144.8
China & CIS				
Primary	6.4	6.8	6.6	9.1
Lead/Zinc	37.0	39.0	38.4	37.2
Copper	32.8	38.5	41.8	41.7
Gold	5.7	6.0	6.4	8.4
Other	2.4	2.7	2.6	2.6
Total	85.2	93.7	96.5	99.3
Rest of the World				
Primary	36.6	44.5	40.8	48.2
Lead/Zinc	48.6	53.4	51.7	46.7
Copper	48.3	50.4	52.1	52.9
Gold	11.8	11.1	11.1	9.0
Other	1.6	1.3	2.3	2.7
Total	147.0	160.8	157.9	159.7
Total	**542.9**	**582.8**	**589.2**	**585.9**

Appendix V

Comex Futures and Options Turnover and Open Interest, and LBMA Turnover

	Comex				LBMA Clearing Turnover[3]		
	No. of Contracts						
	Futures		Options		Ounces transferred (millions)	Value (US$bn)	Number of transfers
	Turnover[1]	Open Interest[2]	Turnover[1]	Open Interest[2]			
Jan-00	258,053	82,294	73,327	73,417	149.2	0.8	329
Feb	425,910	74,070	66,153	51,380	172.7	0.9	344
Mar	231,336	82,388	56,731	63,045	134.0	0.7	288
Apr	318,752	74,593	44,260	52,488	106.9	0.5	277
May	216,938	82,650	44,846	62,840	121.0	0.6	264
Jun	407,455	73,297	49,899	52,412	97.0	0.5	250
Jul	175,235	78,813	34,800	54,252	93.3	0.5	217
Aug	370,739	77,857	50,962	55,582	100.5	0.5	226
Sep	146,007	71,994	32,341	59,574	117.0	0.6	224
Oct	149,252	84,841	38,243	64,576	82.2	0.4	205
Nov	303,673	74,830	46,208	53,946	97.6	0.5	200
Dec	113,667	72,121	41,315	62,417	116.4	0.5	251
Jan-01	258,053	66,618	73,327	60,831	105.1	0.5	229
Feb	302,035	74,920	35,260	46,203	102.0	0.5	233
Mar	155,658	75,354	35,147	55,464	131.3	0.6	260
Apr	252,486	65,061	20,634	47,479	121.6	0.5	246
May	204,552	67,954	39,740	61,344	110.2	0.5	252
Jun	281,846	67,122	32,332	54,814	99.8	0.4	224
Jul	112,956	77,616	43,585	69,912	99.5	0.4	212
Aug	267,711	72,236	47,326	68,697	89.4	0.4	227
Sep	160,329	64,563	36,537	76,814	96.7	0.4	235
Oct	210,266	67,744	53,024	84,060	101.9	0.5	242
Nov	266,077	71,967	48,712	61,414	91.4	0.4	225
Dec	180,256	63,101	42,678	69,149	147.3	0.6	312
Jan-02	265,773	65,480	40,685	59,528	175.7	0.8	355
Feb	271,293	63,905	44,371	61,029	108.7	0.5	257
Mar	163,898	77,425	39,943	67,311	77.9	0.4	239
Apr	325,889	73,618	43,928	57,896	68.8	0.3	230
May	243,475	99,220	61,876	77,477	99.9	0.5	307
Jun	389,798	92,790	56,055	66,347	107.2	0.5	262
Jul	281,214	82,413	46,648	68,950	72.9	0.4	224
Aug	296,579	77,944	45,724	68,312	66.2	0.3	214
Sep	164,537	81,170	24,499	71,109	61.7	0.3	184
Oct	209,249	87,202	34,241	78,913	67.5	0.3	243
Nov	292861	78,974	24,042	40,520	58.2	0.3	168
Dec	230,998	80,920	29,566	48,027	79.1	0.4	208

1 Monthly total; 2 Month-end; 3 Daily average
Source: LBMA, Comex

Precious Metals Seminar, New York, 4-5 November 2003

Following last year's successful event in Toronto, GFMS and The Silver Institute are hosting the 4th Autumn Precious Metals Seminar on 4th and 5th November.

The Autumn Precious Metals Seminar will bring together leading experts who will explore and discuss with participants the key trends impacting today's precious metals markets and the outlook for gold, silver and PGM prices. Topics will include investment demand for gold and silver, the state of the gold jewellery market, Chinese silver supply, central bank sales and lending, trends in gold producer hedging and an analysis of the current state of the PGM markets. The seminar also includes a special session incorporating presentations from several important gold and silver mining companies.

Last year's event attracted a wide range of delegates including senior mining company executives, central bankers, bullion dealers and funds. This year's Autumn Precious Metals Seminar will gather together a similar group of attendees who will have the opportunity to engage leading industry experts in discussion about the challenges affecting today's precious metals markets and the prospects for tomorrow.

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