
WORLD SILVER SURVEY 2002

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Pan American
S I L V E R C O R P .

was 6.9 million ounces of silver - a 92% increase over that of 2000. Steady production from these three operations should result in approximately 9.0 million ounces of silver production in 2002 - a further 25% increase over 2001's output. Planned expansion of production from their Mexican La Colorada mine could see the company producing at a rate of over 11 million ounces of silver per year in 2003. Pan American now controls total silver reserves and resources of more than 611 million ounces and property holdings that give it a solid pipeline of exploration and development projects. Pan American Silver is listed on the NASDAQ National Market Board (trading symbol PAAS) and the Toronto Stock Exchange (trading symbol PAA), where it forms part of the TSE 300 Index, the TSE 200 Index, and the S&P/TSE Small Cap Index.

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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This is the eighth 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

2001 was a year that most in the silver market will be keen to forget. Producers of the metal had to cope with dollar prices that were down 12% from the already poor levels reached the previous year. Consumers of silver, especially the industrial and, to a lesser extent, photographic sectors, were hit by a decline in sales volumes (weaker fabrication demand being the main reason for the lower price). And intermediaries, such as the bullion banks and metal traders, suffered from the reduced amount of business from both sides of the market in 2001 (evident from the further slide in turnover on both the London Bullion Market and on Comex). Nevertheless, there were at least a couple of positive developments last year. Firstly, the expected assault on the \$4 level never quite materialized and subsequently this threat looks to have gone away entirely. Secondly, and for the first time in over a decade, there were virtually no net sales out of private sector bullion stocks. (Indeed, Table 1 below even indicates some very modest investment last year.)

In our view, however, the most influential change in the overall supply/balance last year was not the lower level of supply from private bullion stocks but instead the 44 Moz (1,370 t) decline in fabrication demand. The 5% year-on-year fall in the total though understates the impact this factor had on the price.

This is because fabrication demand would have been lower still had it not been for the sterling performance of the Indian market, something that itself was largely the result of lower silver prices. Most other fabrication demand is far less price sensitive, driven more by economic factors, particularly growth in world GDP and levels of industrial production.

The prospects for silver to move higher in 2002 are therefore to a large extent contingent on the strength of the economy. A rebound in global GDP growth would lead to higher demand for a wide range of silver containing products. In particular, the health of the electronics industry will be an important factor, as it was in this area that demand boomed in 2000 and then bust in 2001. On balance, fabrication demand should recover fairly strongly in 2002, even though the recovery is unlikely to be across the board - India, for instance, due to the price sensitivity of its demand, may act as a slight drag on growth in the level of offtake and therefore the price.

The scope for a price recovery may also be restricted by supply-side factors. Although mine production may fall in 2002, any decline will be slight - probably less than 1% - leaving this source of supply at close to the record level achieved last year. Less predictable is the quantity of bullion the market will have to absorb from official government and private stocks.

Table 1
World Silver Supply and Demand
(Million ounces)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Supply										
Mine Production	487.5	469.9	451.3	479.5	487.9	523.1	543.6	543.2	581.2	590.0
Net Government Sales	-	6.0	17.6	25.3	18.9	-	39.6	95.2	78.1	85.7
Old Silver Scrap	148.3	148.5	151.9	162.7	158.2	169.1	193.7	174.8	179.2	184.2
Producer Hedging	1.3	26.7	-	9.2	-	69.1	5.5	-	-	20.4
Implied Net Disinvestment	90.4	118.5	142.7	90.9	146.4	81.9	44.4	66.9	97.7	-
Total Supply	727.5	769.6	763.6	767.7	811.5	843.3	826.8	880.1	936.3	880.3
Demand										
Fabrication										
Industrial Applications	259.3	269.8	281.4	295.3	297.3	320.4	316.2	340.6	377.1	338.5
Photography	199.6	199.2	201.6	210.9	212.0	219.0	225.0	225.9	219.5	210.2
Jewelry & Silverware	210.3	259.1	227.9	236.9	263.7	274.3	259.4	273.3	281.4	287.6
Coins & Medals	33.5	41.5	43.6	24.5	23.6	28.8	26.2	27.6	29.8	27.2
Total Fabrication	702.6	769.6	754.5	767.7	796.6	842.6	826.8	867.3	907.8	863.6
Net Government Purchases	24.9	-	-	-	-	0.7	-	-	-	-
Producer Hedging	-	-	9.1	-	14.8	-	-	12.8	28.5	-
Implied Net Investment	-	-	-	-	-	-	-	-	-	16.8
Total Demand	727.5	769.6	763.6	767.7	811.5	843.3	826.8	880.1	936.3	880.3
Silver Price (London US\$/oz)	3.946	4.313	5.285	5.197	5.199	4.897	5.544	5.220	4.951	4.370

Government sales are dominated by China, which is estimated by GFMS to have disposed of 64.3 Moz (2,000 t) from official or quasi-official holdings last year. In the short term, China would seem to have the potential to continue this level of stock sales, which may restrict the scope for price appreciation in 2002. However, in our view, it is unlikely that remaining Chinese stocks are sufficient to keep up the recent rate of sales over the medium to long term.

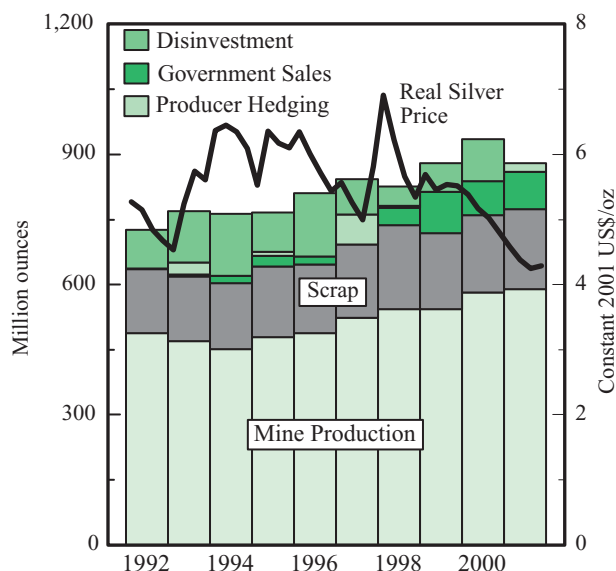
The silver market has been used to a regular and high level of private sector bullion sales. GFMS' data indicates that from 1992 to 2000 private bullion stocks dropped by an average of 102.9 Moz (3,200 t) per annum. By contrast, last year the reduction was a paltry 3.6 Moz (112 t) and entirely the result of a rise in producer hedging, as the data in Table 1 implies that investors may actually have shifted onto the buy-side of the market. To no small extent, this more positive outcome was related to the decline in the price - existing stock holders were not prepared to let silver go at the prices prevailing last year. Conversely, it is possible that, if prices were to rise sufficiently from the current \$4.50-\$4.60 range, holders of stocks (and here we would include producers with "reserves in the ground" that hedge) could become willing sellers. In that case, however, the price level and the implied strength of fabrication demand and market turnover would result in a far happier silver market - including producers, consumers and intermediaries - than was the case in 2001.

Supply

- Total supply contracted by 6% last year, to reach 880.3 Moz (27,381 t).
- Mine production was up by a modest 1.5%, despite a sharp fall in US silver output. Primary mines generated only 25% of mined silver.
- Government sales were almost 10% higher year-on-year but still below 1999 levels.
- Scrap supply increased by 5.0 Moz (155 t), largely as a result of industrial inventory rundown in the United States.

Overall silver supply fell noticeably last year. The fall in global supply was recorded despite a fairly robust performance on the **mine production** front: output was 8.8 Moz (274 t) higher than in 2000, and reached a new record level of 590 Moz (18,351 t). This increase was the result of significant growth at a

Figure 1
World Silver Supply



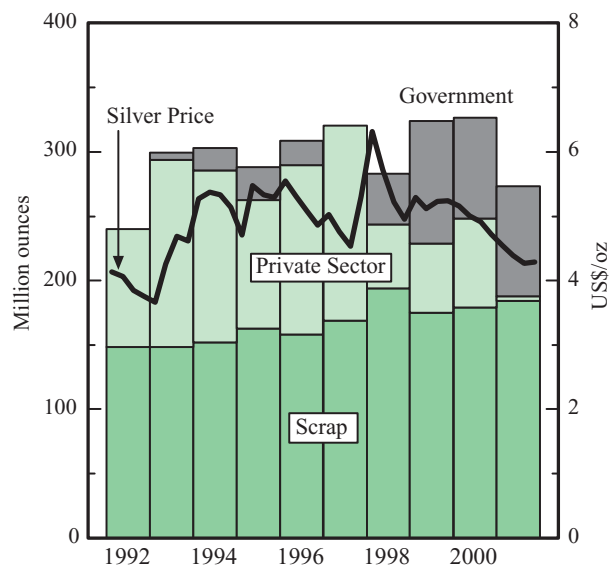
number of base metals operations, particularly in Peru and Chile - silver by-product from lead/zinc and copper mines increased by 3% and 4% respectively. On the other hand, gold mines reported a marked fall in their silver by-product (in the United States, the decline was as much as 39% year-on-year). Silver production from gold and base metals mines constituted three-quarters of all silver output last year, with lead/zinc mines, at 35% of the total, being the largest single source.

Many primary silver mines struggled under the pressure of poor prices, and a number announced early closure. In the United States, primary mine output fell by almost 10%. On the other hand, the large primary silver mines of Mexico achieved excellent results. For example, Industrias Peñoles, the world's largest silver producer, reported a 16% increase in output (from both primary silver and other mines) to 51.7 Moz (1,609 t). In addition, a ramping up of operations at a number of new primary mines (Pan American's Huaron and La Colorada, Hecla's San Sebastian and the Martha mine, recently acquired by Coeur) further contributed to the small increase in overall primary output. As these mines grow to full capacity, they could generate a further modest rise in primary output this year.

The weak outlook for base metals prices generally (with the possible exception of lead) and the implementation of numerous production cutbacks at zinc and copper operations announced towards the end of 2001 would suggest that there is little scope for higher silver mine output from these sources in 2002.

Figure 2

Mobilization of Above-ground Stocks



On the other hand, Antamina, Peru's new polymetallic mine, is expected to produce possibly as much as 6.2 Moz (200 t) this year, which would go a long way to counter falls elsewhere. Nevertheless, a small drop in mine production is anticipated this year, largely due to further falls in silver produced at gold, and to a lesser extent, copper mines.

Producers added further to physical supply via **hedging**, which increased last year after two consecutive annual declines. Producer hedging, primarily in the form of options structures, generated an estimated 20.4 Moz (634 t) of accelerated supply. Much of the activity was concentrated around the brief periods of higher prices in May, September and, particularly, in the last weeks of the year (and into 2002). Producers used these rare opportunities to add to nearly depleted hedge books. Though the increase in net hedging was not insignificant, it was interesting to note that the number of producers who are actively engaged in hedging shrank again last year.

Secondary supply in the form of **scrap** was also up modestly in 2001, increasing by almost 3% to reach 184.2 Moz (5,730 t). Scrap provided just under 21% of all physical supply last year. The increase was mostly from the United States, which saw unusually high levels of recycling of finished product inventories due to the slowdown in the electronics sector.

Government sales increased by a substantial 7.6 Moz (236 t) to reach 85.7 Moz (2,666 t) during 2001. As much as three-quarters of all sales originated from China, where government disposals continued for the

third consecutive year. (A detailed analysis of flows out of China is provided on pages 34 and 41.) As for government sales from the rest of the world, the most significant contribution came from a further rundown in US Defense Logistics Agency (DLA) stocks. This silver was used in coins produced by the US Mint.

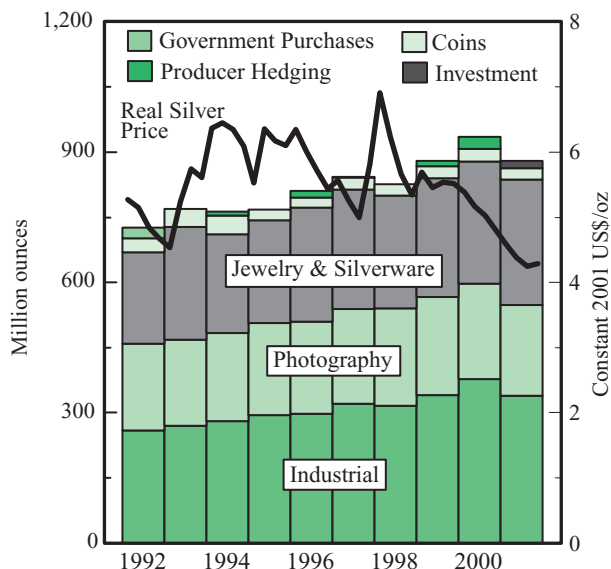
Demand

- Total fabrication was nearly 5% lower in 2001 at 863.6 Moz (26,859 t).
- The decline was mainly due to a sharp drop in industrial demand, which recorded the largest fall in both absolute and percentage terms.
- Photographic offtake fell for the second successive year, by over 4% to 210.2 Moz (6,539 t).
- Fabrication of jewelry and silverware was up over 2% last year, largely due to a rise in Indian demand.
- Output of coins and medals fell by 9% as a result of lower demand in the United States and Germany.
- For the first time in over a decade, it appears as if investor activity may have added to demand.

In last year's *World Silver Survey*, GFMS noted that one of the main factors behind the record level of offtake in 2000 was the strong rise in world GDP growth. In 2001 however, world economic growth slumped to its lowest level since the early 1990s. It is therefore not surprising that global fabrication fell back to below the 1999 level. Industrial and photographic demand was particularly affected, falling to three- and six-year lows respectively. But it was the decline in **industrial demand** that stood out last year, falling by over 10% to 338.5 Moz (10,529 t). Not only was offtake affected by the economic downturn but there was also a significant element of destocking. The electrical and electronics sectors were noticeably affected, with offtake falling by nearly one-fifth to 132.5 Moz (4,123 t). Nowhere was the collapse more evident than in the United States and Japan, which posted declines of 33% and 27% respectively (these two countries alone accounted for three quarters of the 32.9 Moz (1,024 t) loss of demand from this category). Elsewhere, the 8% fall in European industrial fabrication was due to poor domestic demand in a number of key markets. In addition, there was a degree of industry reorganization, which in some areas led to some significant year-on-year changes.

At 4%, the decline in **photographic** demand was relatively modest, but 2001 was the second successive

Figure 3
World Silver Demand

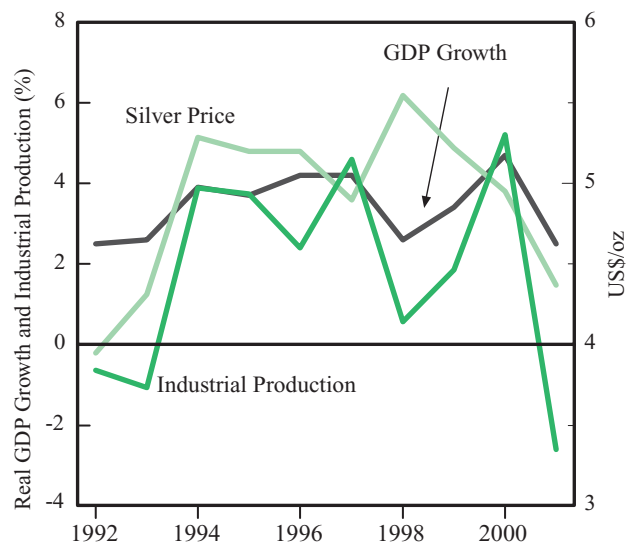


year in which silver offtake fell. There were four developments which were at work last year in the traditional silver halide market. Firstly, the slowdown in world economic growth impacted on both consumer imaging and the graphic arts industry. Secondly, the fallout from September 11th not only postponed an economic recovery but directly resulted in a fall in travel, which further impacted on the consumer film market. Thirdly, there was an element of stock carry-over (of both silver nitrate and film products) from late 2000, which reduced the need for fresh silver nitrate production in 2001. Finally, digital technologies appear to have made a minor contribution to the decline in silver offtake. Arguably, digital technology will make greater inroads into the silver halide market in future but, last year, the poor economic environment played a much greater role in determining the amount of silver used in photography.

A combination of the above-mentioned factors contributed to the weakness in the European and North American markets. In particular, demand in the United States fell by over 9% to a five-year low. The European market was also lower in 2001, by more than 5%, due to lower demand in all of the major end-uses of silver-based materials. In addition, corporate restructuring led to some major changes in the location of production. In contrast, Japanese demand was marginally higher last year, although this was solely due to some production being brought back onshore.

One of the few bright spots on the demand side was the modest rise in the **jewelry and silverware** sector.

Figure 4
Silver Price and World Economic Indicators



Source: GFMS, IMF

It may be surprising to note that offtake was actually lower in nearly all of the major fabricating regions; but a modest increase in East Asia and, more significantly, a strong rise in the Indian sub-continent, left total demand up 2.2% at 287.6 Moz (8,944 t). The rise in Indian demand was mainly driven by the weak rupee silver price and a reasonably good monsoon. This took Indian jewelry and silverware fabrication from around 9% of total global demand in 2000 to nearly 12% last year. The rise in East Asian demand was mainly attributable to a close to 8% rise in Thai demand. Elsewhere, a significant drop in the Italian market (for the first time in five years), due to weakness in both the domestic and export markets, was the main driver behind the more than 13% fall in European demand.

In contrast to the growth in jewelry and silverware, fabrication of **coins and medals** fell by nearly 9% in 2001 to 27.2 Moz (846 t). The silver coin market is dominated by just two countries, the United States and Germany, both of which experienced a fall in silver coin output last year. In particular, German coin minting was nearly one-third lower due to the production of fewer commemorative coins in 2001, as well as lower total mintage for those issues which were released.

Finally, last year saw a swing away from significant levels of net **disinvestment**, which had been such a feature of the market during the 1990s as well as in 2000. This was primarily due to the weakness in the (dollar) price of silver and the unwillingness of private holders of bullion stocks to sell at those levels.

2. Silver Prices

- Weak fabrication demand was primarily responsible for keeping prices under pressure during 2001 before a lease-rate squeeze brought about an end-year recovery.
- The average US dollar price fell by 12% to \$4.370 though the decline in other currencies tended to be smaller.

Silver prices spent most of 2001 under pressure, slipping from a high in January of \$4.82 to levels little above \$4 by late November. This left the average for the year, \$4.37, down a significant 12% year-on-year. 2001 at least ended on a brighter note, with silver fixing at \$4.52 on December 31st or only 7 cents down on the year's first trading day. Prices showed a fair degree of stability in 2001; volatilities rose slightly to 16.0% but stayed well below most recent years while the trading range shaded down a fraction to 17.6%.

Prices expressed in the currencies of consuming countries tended to show a fairly standard pattern, their fall being smaller than for the dollar price. The rupee

price, for example, dropped just 7%. There was a marked pick-up in Indian demand last year and this arguably saved the market from sub-\$4 levels. However, given the price elastic nature of Indian offtake, growth might have been even stronger had its domestic price fallen in line with the 12% drop in the dollar price. The pattern was less uniform for producing countries; in Mexican peso terms, for example, the price fell a fraction further (by 13%) while, in Australian dollar terms, it fell just 1%.

Having been generally subdued for much of the year, lease rates soared dramatically in December. The three month rate, for example, leapt from just over 1%

US\$ Silver Price

	1971	1981	1991	2001
Annual Average	1.537	10.487	4.057	4.370
Maximum	1.754	16.303	4.571	4.820
Minimum	1.272	8.030	3.548	4.050
Range:Average	31.4%	78.9%	25.2%	17.6%

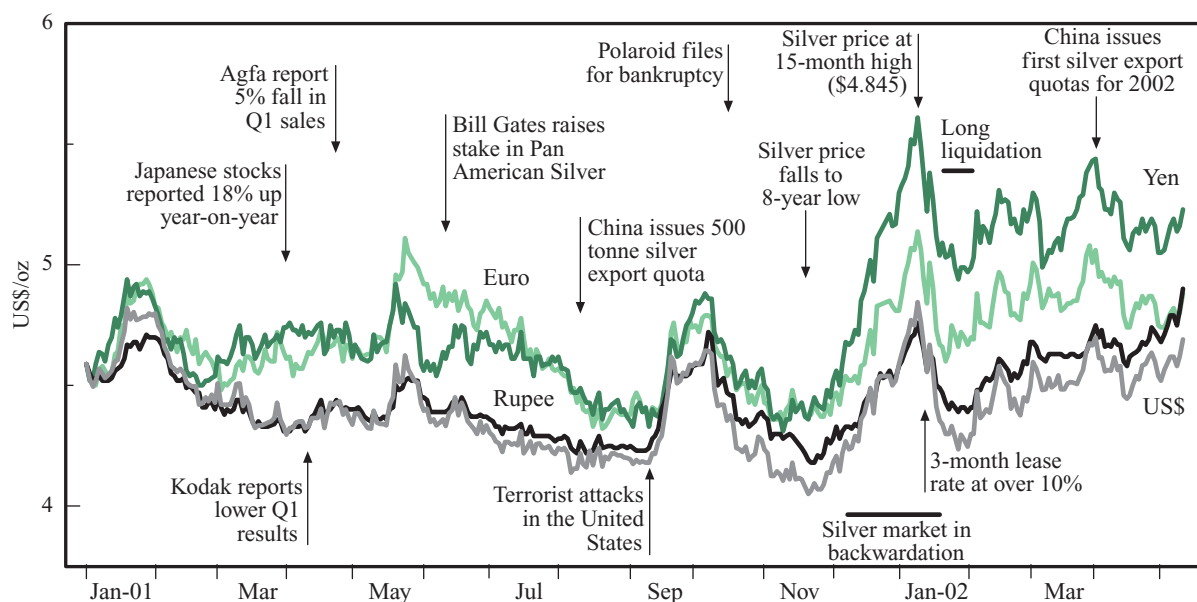
The Silver Price in Other Currencies (2001)

	US\$/oz	Euro/kg	Rupee/kg	Yen/10g
Annual Average	4.370	156.9	7,418	170.4
Change y-o-y	-11.7%	-9.1%	-7.2%	-0.7%
Maximum	4.820	173.4	7,960	191.7
Minimum	4.050	146.7	7,040	158.7

Figure 5

London Silver Market: Spot Price

US\$/oz; other currencies reindexed to 2nd January 2001



to almost 10% that month. It then collapsed to back under 1% before January was out. The cause and effects of this are analyzed in the section below. It is of note that, as the rally occurred so late in the year, 2001's average lease rates still ended up the lowest for the last five years (if above the "give-away" rates seen before 1997). Last year's low rates are seen primarily as a function of weak fabrication as this limited the call on the market. Poor offtake cannot have been the full explanation as the shorter tenures, where fabricator borrowing tends to be heaviest, fell less than the longer. The modest flattening of the yield curve is thought to have stemmed from a handful of stock holders choosing to lend more on a long term basis.

Market Analysis

There were three key features to price behavior last year: the post-September 11th rally and other price spikes, to varying degrees the result of developments in the gold market; the December 2001/January 2002 lease rate-driven rally and, lastly, a continuation of the decline broadly in place since early 1998.

The rally that followed the September 11th attacks was the most dramatic of the year with the price, after a brief period of hesitancy, jumping from the low \$4.20s to an initial high of \$4.62 in just a week. However, unlike gold, this period's maximum was not the high for the year. Nevertheless, the scale of the rally was proportionately larger than that for gold. This was chiefly due to the funds on Comex being

Figure 6
London Spot Price and 3-month Contango

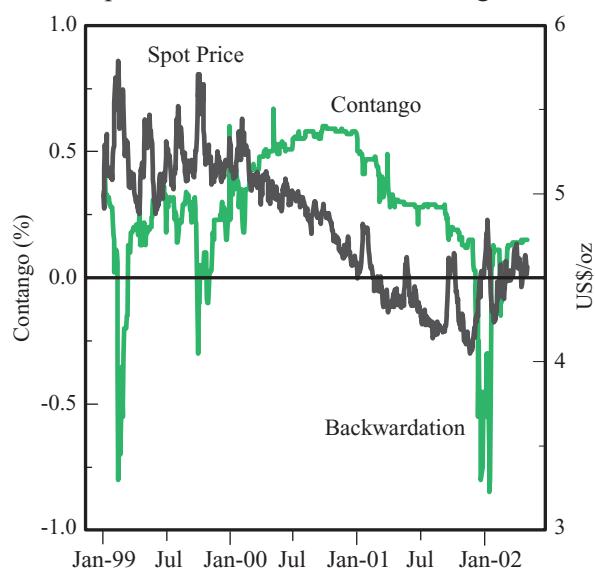
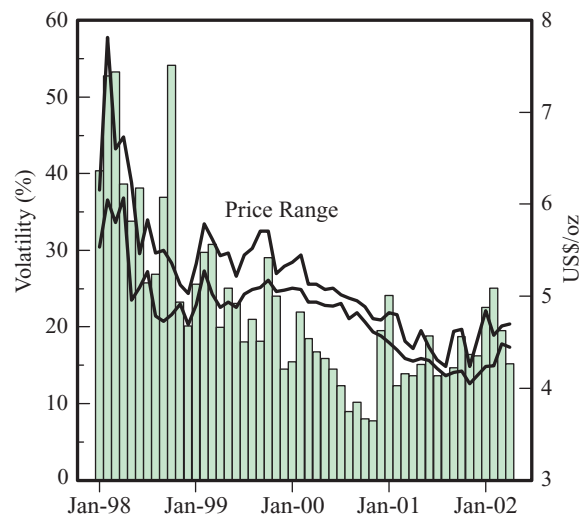


Figure 7

Daily Silver Price Volatility

Based on London fixings (30-day rolling average)



already respectably long of gold but roughly neutral in silver. The funds' silver position quickly changed as the gross short collapsed, few clearly wanting to be that side of the market in such tense times. This is seen very much as a case of silver riding the coat tails of gold. It is quite difficult to argue that silver has much safe haven status; in this instance for example, prices soon slipped to back below pre-incident levels whereas gold has subsequently maintained a "crisis premium".

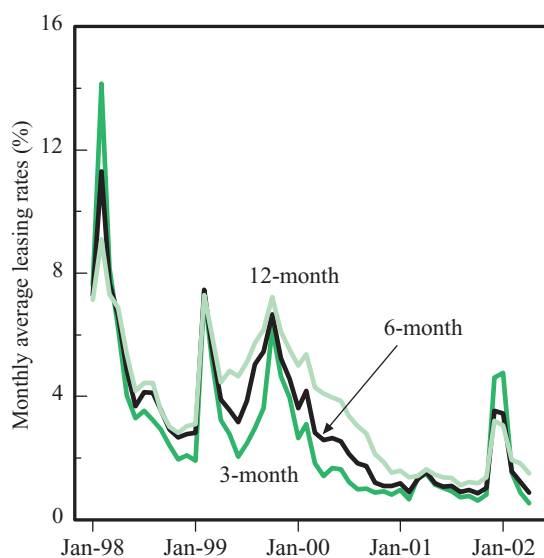
Prices had also seen a modest rally in late May 2001 but, on this occasion, there was even less silver-specific reason for the move which was more due to silver shadowing the far more marked spike in gold. Part of the reason for the rally was fund activity. Then, as in September and generally throughout the year, it was mainly changes in the funds' gross short position on Comex that influenced prices as the gross long was fairly steady. The unwinding of these short positions accentuated rallies caused by other factors last year and, arguably, it was only the January 2001 rally that

Volatility (US\$ price)

Based on London fixings (30-day rolling average)

1997	1998	1999	2000	2001
23.5%	37.4%	23.2%	14.1%	16.0%
Q1-01	Q2-01	Q3-01	Q4-01	Q1-02
16.9%	15.9%	14.0%	17.2%	22.4%

Figure 8
Silver Leasing Rates



was initiated and primarily driven by the funds.

The strongest rally of the year was that which followed the lease rate squeeze towards the end of 2001 (see Figure 8). This took silver from \$4.09 on November 28th to a high of \$4.85 on January 10th (2002). The surge came about through loco-London silver being shifted to allocated accounts by one or more large stock holders. That move drastically curtailed the supply of metal for lending, ramping up lease rates. These gains then rallied prices themselves, chiefly as high borrowing costs and resulting backwardation forced shorts to cover positions.

Prices up to December had been in decline for so long due to many factors but the continuation of this trend for much of last year was mainly a result of the 5% fall in fabrication demand, largely due to the slowdown in world GDP growth. Fabrication's true weakness is highlighted by the fact that, without India's offtake gains, which came about largely in response to low prices, the global fall would have been half as large again. Poor demand also indirectly affected the market's balance as some countries saw the meltdown of unsold inventory, boosting scrap. Weak fabrication had such an impact partly through the absence of alternative forms of demand. Gold fabrication fell more sharply (by 7%) but gold prices built steadily in 2001 as higher investment demand took up the slack. That this did not happen for silver underscores its lack of broad investor interest.

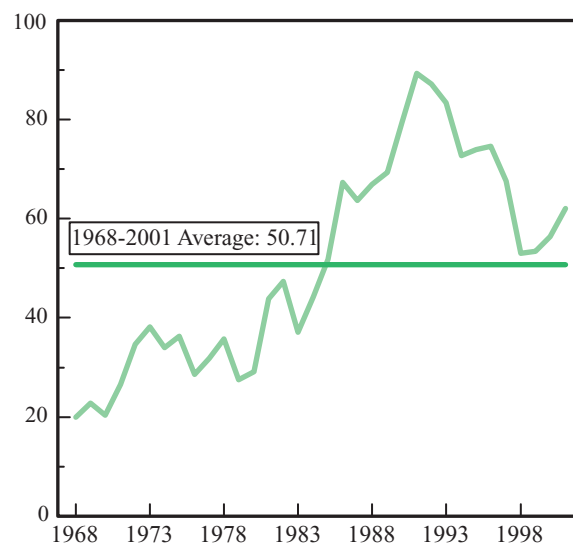
Supply-side factors tended to have less of an effect

on prices last year than did those on the demand side. However, the modest (though slightly higher than expected) rise in mine production and the fact that scrap rose whilst prices fell must have contributed at the margin. The chief exception as regards supply's limited impact was the sustained volumes emerging from China (see Chapter 5). It was thought these exports would fall at sub-\$5 levels but exporters' price expectations seem to have ratcheted down, helping keep prices under pressure.

Given 2001's poor fundamentals, it was perhaps not surprising that the end-year rally should prove short lived with prices back down below \$4.30 before January (2002) was over. However, it may be significant that prices at the time of writing are still above pre-squeeze levels and the speculators involved may feel this qualifies their operations as a success. As such, the market could well see a similar event being repeated.

This leads to the question of whether the silver market broke its long run decline in December, "turning the corner" at these arguably oversold levels just as was the case for gold back in April 2001. Theory states that futures markets "predict" changes in the fundamentals and there are fair grounds to suppose it has correctly done so on this occasion. The market's Achilles heel last year was poor fabrication demand. This could be eliminated in the second half of 2002 as an end to destocking and a pick-up in GDP growth feed through to a recovery in offtake.

Figure 9
The Gold/Silver Price Ratio



Silver and Gold Price Relationship

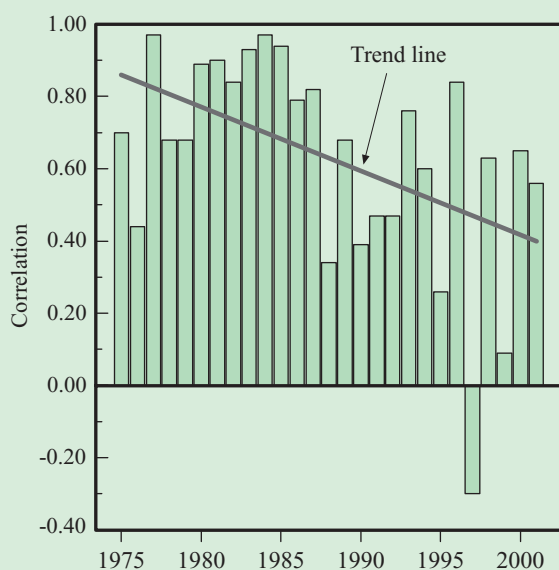
This focus box looks into the linkages between gold and silver prices.

Research indicates that there is a fair degree of price correlation between gold and silver, though this has lessened in recent years. Figure 10 shows the evolution of the correlation between changes (log returns) in monthly average gold and silver prices since 1975. The downward trend is clearly visible and, indeed, during 1997, the two markets exhibit a negative correlation (i.e. when gold fell, silver rose).

Although this analysis suggests that there is a (declining) degree of correlation between gold and silver prices, it does not necessarily imply a meaningful relationship linking the two markets; prices could be moving in a similar manner entirely coincidentally. Statistical co-integration analysis shows that prior to the late 1980s/early 1990s, a stable long-term relationship could indeed be detected linking gold and silver. However, the analysis also suggests that, since that time, the relationship has broken down.

Turning to the issue of causality, the general intuitive assumption is that gold affects silver rather than vice-versa. Further analysis does show that, for the period where a stable relationship existed between the two markets, causality tended to run from gold to silver. This certainly appears to have been the case for last year's major price events; the main gold moves (the May spike and the post-September 11th rally) impacted on the silver price but the end 2001/early 2002 silver price spike did not appear to affect gold in the same way.

Figure 10
Correlation of Silver and Gold Prices



The weakening relationship between silver and gold is to be expected, given the fundamentals driving each market have tended to diverge. Producer hedging in gold, for example, took off in the late 1980s/early 1990s and it may not be chance that this coincides with the start of price behavioral differences. Similarly, it was in the early 1990s that, for gold, official sector sales began to appear as a persistent sizeable part of supply. Official sector activity is also a feature of the silver market but this only became a major element of supply from 1998 onwards as sales from China boomed.

Recent interest in physical investment in gold came too late to explain the divergence in behavior but its more regular and important role in the gold market compared to its infrequent but dramatic involvement in silver will continue to differentiate the markets. Looking at the negative correlation in 1997, it should be remembered that this was the year when the silver market was subject to its own dynamics resulting from the Berkshire Hathaway purchases.

Turning specifically to the impact of September 11th, Figure 11 shows the evolution of gold and silver prices from September 10th to end-January. Immediately after the attacks, gold jumped and, although it took a few days for silver to respond, when it did, the reaction overshot that of gold. However, despite this initial drama, silver prices soon fell back, while gold retained a crisis premium. The drop in silver prices reflects the lack of significant safe haven buying and highlights the two markets' differing drivers. Figure 11 also illustrates the end of year silver rally and how this was specific to that market.

Figure 11
Silver and Gold Prices post-September 11th



3. Investment

- Fund and private investor trading of silver was limited last year, only picking up modestly after September 11th. Most activity was short term and technically driven by hedge funds and commodity trading advisors.
- 2001 saw a major swing away from the net disinvestment that was a feature of the market the previous year and in the 1990s. The fall in the price and reduced availability of private bullion stocks were the main two reasons.

Overview

Investors were generally less active in the silver market last year. For instance, there was little sign of new large positions being established (either short or long) that had a major impact on turnover or the price. Such a conclusion is strongly supported by further declines in both Comex and London Bullion Market turnover. The overall neutrality of the investor or speculator community for much of 2001 is also manifest in GFMS' statistical overview: a swing from implied net disinvestment of 97.7 Moz (3,039 t) in 2000 to net investment of 16.8 Moz (522 t) last year.

The net investment referred to above is, of course, a residual derived from the sum of all the other components of supply and demand. It is not independently calculated and therefore the absolute number generated needs to be approached with caution. Nevertheless, it is significant that, for the first time in over a decade, investors (and here we are basically referring to Europe and North America) appear to have increased their holdings of silver, albeit by a relatively trivial amount. But even if the modest scale of the implied purchases means a better description of the outcome in 2001 would really be one of "neutrality", the change from the heavy net dishoarding seen the previous year and in the 1990s warrants some explanation.

The first point to make is that the negative price trend in 2001 was not related to any major growth in fund short positions or large-scale liquidation of long positions, which, as discussed in this chapter, did not occur last year. This was in contrast to the outcome in 2000 when investor selling was one factor behind the slide in the price from above \$5 to the \$4.60s (e.g. that

year there was a dramatic fall in funds' net long position on Comex; this was not to be repeated in 2001). Anecdotal evidence from dealers plus the behavior of lease rates during 2001 also indicate that there was little substantial Over-The-Counter (OTC) market selling via forwards or options. Most of the trading activity last year by hedge funds and commodity trading advisors was of the trend following variety, as opposed to large bets being placed on expectations of fundamentally-driven price moves.

Second, and again unlike the previous year, sales out of existing physical holdings were, at most, minimal. For instance, GFMS data shows European dealers' vault stocks at the end of 2001 were not much changed from their end-2000 level. And Comex stocks actually were higher at the end of December than they had been a year earlier. (See Chapter 5 for more on changes in these and other bullion stocks.) The relative stability of private sector bullion stocks supports the conclusion that investors or speculators were not the primary factor behind the slide in the price last year.

An important reason why pressure on the market from investor stock sales was absent last year is that those disappointed longs, who had bought in 1997-98 in the anticipation of higher prices, had already exited their positions in 1999 and, especially, 2000. We have in past *World Silver Surveys* alluded to the fact that, besides Mr Buffett, other investors snapped up 50-80 Moz (1,560-2,490 t) before and during the early stages of the 1998 rally. It is probable that a good part of this silver had already been sold in 2000 - much of it feeding the boom in fabrication demand that year.

It may seem surprising that last year's negative price trend, weakening economy and therefore silver demand did not lead to a stronger speculative push against the metal. This may be because speculators realized leasing rates and the price could quickly move against them. (Associated with this, the low contango was also a disincentive.) Furthermore, in the first half at least, silver's low was tending to consolidate in the \$4.30s, creating the expectation that there was relatively little further downside. This perception may have been about to change in the third quarter when it looked as if a break towards the \$4 level was possible. However, at this point the terrorist attacks on the

Silver Price and Investment Indicators			
	2000	2001	Change
	Average	Average	y-o-y
Silver Price	4.951	4.370	-12%
Contango (3-mth annualized)	5.02%	2.56%	n/a
US\$ Libor (3-mth annualized)	6.54%	3.78%	n/a
S&P 500 Index	1,427	1,194	-16%
CRB Index	220	206	-6%
XAU Index	55	54	-2%
World Inflation	4.2%	3.5%	n/a
World GDP	4.7%	2.5%	n/a

London Bullion Market (LBM) and Comex Turnover

(daily averages)

	LBM No. of Transfers	Turnover Moz	Comex Turnover Moz	LBM/ Comex Ratio
Jan-01	229	105	42	2.5:1
Feb	233	102	79	1.3:1
Mar	260	131	35	3.8:1
Apr	246	122	63	1.9:1
May	252	110	46	2.4:1
Jun	224	100	67	1.5:1
Jul	212	100	27	3.7:1
Aug	227	89	58	1.5:1
Sep	235	97	42	2.3:1
Oct	242	102	46	2.2:1
Nov	225	91	67	1.4:1
Dec	312	147	47	3.1:1
Jan-02	355	176	63	2.8:1
Feb	257	109	71	1.5:1
Mar	239	78	41	1.9:1

World's 10 Largest Commodity Trading Advisors, 2001

	CTA Assets (US\$ billion)
Campbell & Co	2.7
Quantitative Financial Strategies	2.1
John W Henry & Co	1.2
Graham Capital Management	1.2
Dunn Capital Management	1.0
Crabel Capital Management	1.0
Sunrise Capital	0.8
Analytic Investment Management	0.7
Allied Irish Capital Management	0.5
Eckhardt Trading	0.5

Source: Zurich Capital Markets 2002

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

World's 10 Largest Hedge Funds, 2001

	Fund Equity (US\$ billion)
Orbis Investment Management	3.0
Carlson Capital	2.9
Millennium International Management	2.9
Clinton Group	2.8
Perry Corp	2.7
Marshall Wace Asset Management	2.6
Elliott Management Corp	2.3
Zweig-Dimenna Associates	2.1
Appaloosa Management	2.1
King Street Advisors	1.9

Source: Zurich Capital Markets 2002

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

United States prompted a recovery, mainly on the back of short covering. (The renewed slide in the price in late October showed that the post-September 11th rally had not been based on a more solid foundation.) In November and early December, an assault on the \$4 level seemed likely, particularly given the very gloomy economic prognosis after "911". It is probable that this did encourage some additional shorting of the metal, though once again we doubt this was on a massive scale. Otherwise the withdrawal of liquidity from the market and the rise in silver leasing rates in December would presumably have resulted in a far stronger recovery in the price. The end-year squeeze did though force shorts to cover and this phenomenon, more than the growth in outright long positions, goes some way towards explaining why there was net investment in 2001.

The outlook for silver has brightened a little in the first four months of 2002. The prospect of an economic recovery and stronger fabrication demand has improved the chances for higher prices, especially if gold's move does not falter. Such considerations may have encouraged some to consider taking positions in the metal. Nevertheless, it would be wrong to exaggerate the renewed interest in silver. Most of the fund activity is still short term and fickle. A reversal in the price would quickly see trend followers shift from long to short. However, with lease rates so unpredictable and the contango still very slight, a major fund-led assault on silver also looks very unlikely.

Figure 12

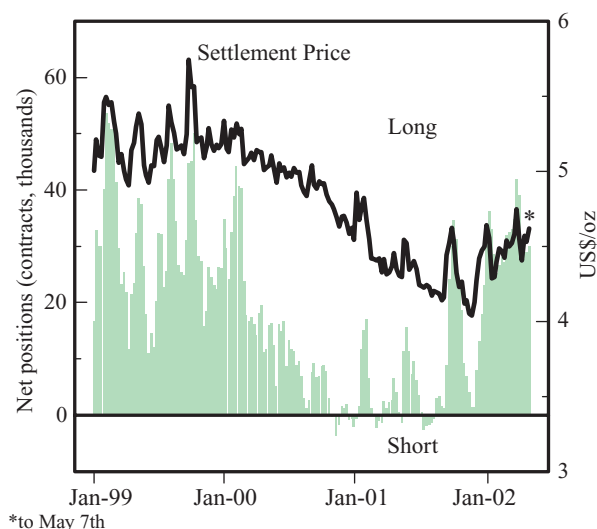
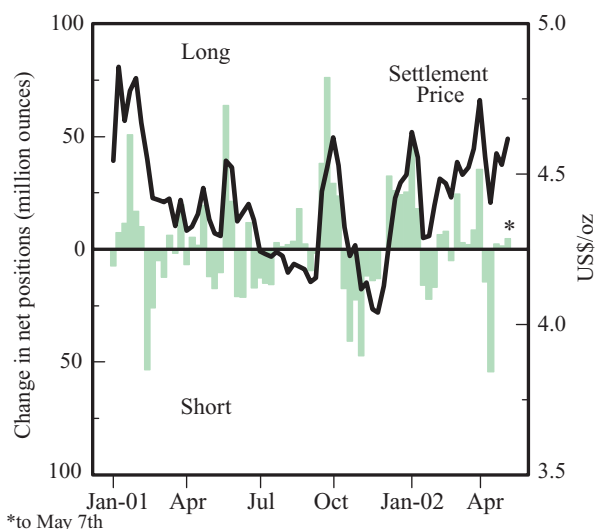
Comex: Non-commercial Net Open Interest
Weekly Net Positions and Settlement Price

Figure 13

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



Comex

2001 was generally a quiet year on Comex, at least if measured by average levels of turnover and open interest, both of which were lower year-on-year.

Turnover on the exchange averaged only 10,277 contracts per day, down 18% on the already low level recorded in 2000. And it was not as if the figure was forced lower by the operational difficulties affecting trading after the destruction of the World Trade Center. In fact, after the attacks through to the end of the year, average daily turnover was slightly higher than it had been prior to September 11th.

Open interest averaged 69,615 contracts, representing a fall of nearly 11% on 2000's level.

Net "Fund" Position on Comex

(period averages for non-commercial net open interest and settlement price)

	Contracts	Price
1997	12,075	4.88
1998	25,513	5.50
1999	30,153	5.22
2000	13,162	4.97
2001 Q1	3,718	4.54
Q2	5,922	4.38
Q3	2,930	4.25
Q4	15,904	4.27
2002 Q1	30,832	4.49

CFTC data on non-commercial open interest (taken here as a proxy for funds' Comex positions) suggests that a little less than half of this was accounted for by a (gross) open long position in futures that has risen from and fallen back to core positions of a little under 30,000 contracts. This gross long has existed since the latter part of 1997. Last year, the change in funds' net positions on the exchange owed less to increases from this level, which were rare, and more to the fairly regular rise and fall in funds' gross short position, which oscillated from over 34,000 to less than 7,000 contracts during the course of the year. Prior to September 11th, the gross long and short positions of funds were, on average, more or less evenly matched - before the attacks, the sum of the average year-to-date gross long and short was a net long of just over 3,000 contracts, taking futures and options combined. After September 11th, the average net position (to year-end) rose to over 16,000 contracts. This increase, however, was less the result of real buy-side interest and more the tendency to cover short positions - prompted by the attack itself and, at the end of the year, the squeeze on leasing rates and associated rise in the price.

Tocom

A fall in liquidity, accompanied by a marginal improvement in turnover, marked out Tocom during 2001. Average daily open interest levels fell by 32% year-on-year, whilst daily turnover increased by 19% (though turnover was still only a third of 1998's level).

Three main events produced significant activity on the Tocom in 2001. The first occurred in May, when silver moved in tandem with gold on rumors of a significant gold hedge book buyback by the administrators of a failed gold miner. The second major spike in activity occurred after "911". Interestingly, turnover was unremarkable in the following two weeks but then picked up, reaching a daily high of 9,608 contracts on the 20th (in comparison the average for the year was just under 2,700 contracts). By mid-October, the volume of trading had fallen back down to pre-"911" levels.

The third major event was specifically silver related and occurred at the end of the year when the loco-London squeeze drove lease rates above 10%. The reaction on Tocom was not as marked as in the case of the above-mentioned events, but was more sustained, with turnover rising steadily throughout December. Increased activity has continued into 2002, through to early May, at levels 90% higher than last year.

Figure 14

Comex: Non-commercial Net Open Interest
Weekly Net Positions

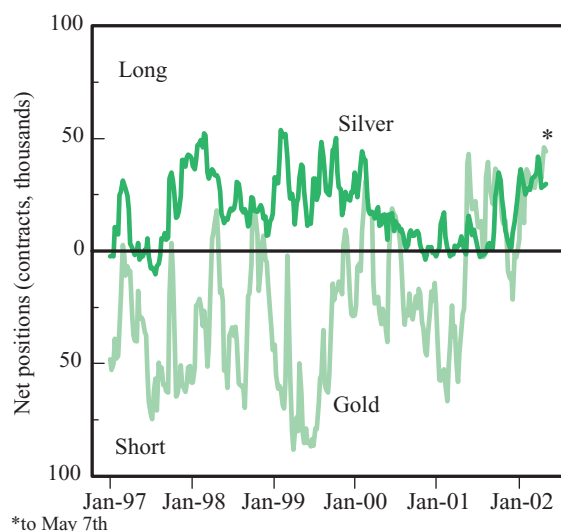
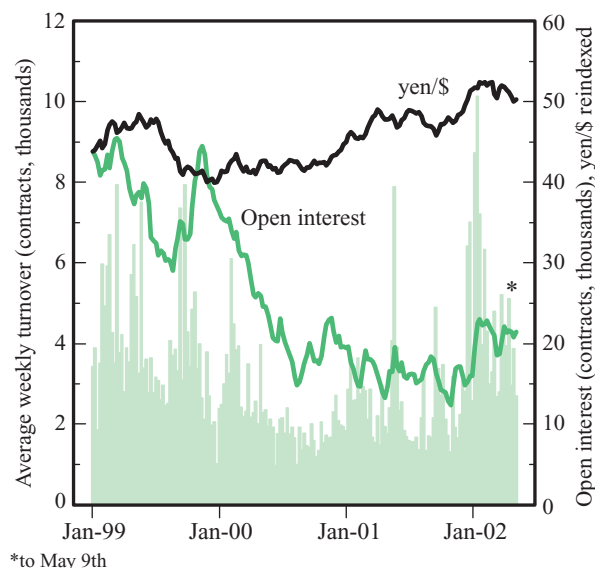


Figure 15

Tocom Futures Turnover and Open Interest



OTC Market

The Over-The-Counter market was not the scene of regular large scale transactions by investors in 2001. As alluded to earlier in this section, the downtrend in the silver price was not provoked by the shorting of silver any more than the occasional rallies in the price were the result of major new position taking by funds in the OTC market. Put simply, silver was not where speculators were inclined to look for action in 2001. Besides the lack of a compelling buy or sell “story”, this outcome reflected the tendency for the majority of funds to trade commodities from the long side. And last year with the price sliding, the economic outlook getting worse and continued Chinese sales, there was no convincing reason to go long silver. Shorting the metal on the other hand was a risky business. This meant that the majority of funds playing the market were trend followers using the Comex (where the data implies they tended to regularly end up on the wrong side of the market, building up short positions as the price moved lower and being forced to cover these on the four main rallies during 2001 in January, May, September and December).

Physical Investment

Physical investment in silver bars and coins at what might be termed a “retail” level, excludes fund and rich private investor buying that is discussed in the

above sections on the futures and OTC markets. Such retail purchases are largely an American phenomenon. Thus it was to be expected that, in the aftermath of September 11th, demand for coins and bars would rise from private investors. Nevertheless, the scale of the demand was solid rather than spectacular. For example, sales of Eagle coins that had been down year-on-year in the nine months through to September, averaging a little over 600,000 oz per month, rose by 80% in the fourth quarter to 1.1 Moz per month. The surge in patriotism at the time was said to have been a factor behind the rise in demand. The buying of silver as a genuine safe haven was evident though, as can be seen from the volume (and value) of sales, this clearly came from only a tiny minority of investors and did not add up to much. There was also a pick-up in demand for coin bags (typically containing 715 oz of formerly circulating coins) and 100 oz bars. This resulted in an increase in the premium on the latter, which has recently been attractive enough that some new 100 oz bars have been produced for local investors for the first time since the early 1980s. However, it should be borne in mind that the rise in the premium is as much a reflection of the relative scarcity of this product (after years of dishoarding) as the strength of demand. Indeed, the main reason why investors’ bullion stocks may have risen slightly last year is that the selling back of physical product (including 100 oz bars) was very much diminished in 2001 due to the low and falling price.

4. Mine Supply

- World silver mine production increased modestly last year to a new record level of 590.0 Moz (18,351 t).
- Primary silver mines contributed 25% of the total, at 147.2 Moz (4,578 t). Silver by-product from gold mines dropped noticeably but output from lead/zinc and copper mines was higher year-on-year.
- Weighted average cash production costs at primary silver mines fell by a marginal 1 cent/oz to \$3.10/oz.
- Large volumes of new options transactions bought and sold by a small number of producers, primarily in the second half, generated accelerated supply through net hedging of 20.4 Moz (634 t).

Ranking			Output (Moz)	
2001	2000		2000	2001
1	1	Mexico	89.7	90.8
2	2	Peru	78.4	86.0
3	3	Australia	66.2	63.3
4	4	United States	63.3	52.6
5	5	China	48.2	48.9
6	6	Chile	38.0	43.4
7	7	Canada	37.7	39.7
8	8	Poland	36.7	38.0
9	9	Kazakhstan	20.5	24.3
10	10	Russia	20.2	20.1
11	11	Bolivia	14.1	13.7
12	13	Morocco	9.3	9.4
13	14	Indonesia	8.4	9.3
14	12	Sweden	9.5	8.8
15	19	Argentina	3.0	5.3
16	15	South Africa	4.6	4.2
17	17	Turkey	3.5	3.6
18	18	Japan	3.3	2.6
19	16	Spain	3.8	2.2
20	20	Papua New Guinea	2.4	2.2

Ranking		Company Name	Country	Output (Moz)	
2001	2000			2000	2001
1	1	Industrias Peñoles	Mexico	44.7	51.7
2	2	KGHM Polska Miedz	Poland	36.0	37.4
3	3	BHP Minerals	Australia	32.5	33.0
4	4	Grupo Mexico	Mexico	23.4	22.1
5	6	Rio Tinto plc	UK	14.4	17.7
6	5	Homestake Mining	USA	14.7	15.5
7	11	MIM Holdings Ltd.	Australia	10.2	13.8
8	10	Cia. de Minas Buenaventura	Peru	10.7	12.5
9	9	Pasminco Ltd.	Australia	10.8	11.8
10	8	Coeur d'Alene Mines Corporation	USA	11.7	10.9
11	14	Volcan Cia. Minera SA	Peru	8.5	10.7
12	13	Codelco	Chile	9.3	10.4
13	15	Noranda Inc.	Canada	8.4	9.3
14	12	Boliden AB	Sweden	9.9	8.9
15	17	Société Métallurgique d'Imiter	Morocco	7.9	7.9
16	18	Comsur	Bolivia	7.5	7.8
17	16	Hecla Mining Company	USA	8.0	7.4
18	29	Pan American Silver	USA	3.6	6.9
19	19	Placer Dome Inc.	Canada	6.3	6.8
20	7	Echo Bay Mines Ltd.	USA	12.3	6.5

Silver Mine Production

- Strong output at Mexico's primary mines offset lower production in the United States and Australia, leaving primary output up less than 1%.
- US production fell almost 10.7 Moz (335 t) year-on-year, but growth in several other countries, including Peru, Chile and Kazakhstan, was sufficient to cancel this out.
- Mexico's Industrias Peñoles strengthened its position as the world's largest producer with a 16% increase in output.

Global silver mine production rose almost 2% last year, increasing by 8.8 Moz (274 t) to a new record level. The increase was relatively small compared to 2000, although interestingly, last year's growth rate was the same as the average of the last decade. Mine production has grown by 21% over this period.

Mexico remained in the leading position among silver producing countries with a modest 1.1 Moz (34

t) increase in domestic production, although an impressive performance in Peru (partly due to the start-up of the giant new polymetallic mine, Antamina) saw that country's production leap 10%, substantially narrowing the gap between first and second position on the top producing countries list. As the table shows, there was very little change in the ranking among the other major producing countries despite a sharp fall in US silver output. A doubling of production due to the start-up of a new silver mine in Argentina saw that country edge up to 15th position; while Sweden and Spain recorded lower output due to closures and cutbacks at lead/zinc mines.

The small increase in Mexico's production was entirely due to the very robust results achieved at Industrias Peñoles, which remained comfortably at the top of the producing companies league. A 16% rise meant that Peñoles produced almost as much silver as the entire United States last year. MIM and Buenaventura both moved up the producer table due to

Table 2
World Silver Mine Production
 Million ounces

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Poland	25.7	29.4	27.6	31.6	30.6	33.8	36.0	35.9	36.7	38.0
Sweden	9.1	8.9	8.1	8.0	7.7	8.5	8.6	8.9	9.5	8.8
Spain	7.5	5.9	5.7	4.0	3.3	2.1	1.5	3.1	3.8	2.2
Greece	2.0	1.9	1.4	1.4	0.5	1.2	1.4	1.3	1.0	2.0
Romania	1.5	1.5	1.4	1.4	1.4	1.4	1.2	1.4	1.2	1.1
Yugoslavia (former)	3.3	1.7	1.2	1.9	2.9	2.1	1.8	1.0	0.9	0.8
Bulgaria	2.7	3.1	1.8	1.4	1.1	1.0	0.8	0.7	0.6	0.8
Portugal	1.2	1.2	1.0	1.2	1.1	1.1	1.0	0.9	0.7	0.7
Ireland	0.4	0.4	0.5	0.5	0.5	0.4	0.3	0.5	0.8	0.7
Czech & Slovak Republics	0.6	0.5	0.4	0.3	0.2	0.3	0.3	0.3	0.2	0.2
France	0.4	0.4	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Italy	0.4	0.2	0.5	0.5	0.3	0.1	0.1	0.1	0.0	0.0
Norway	0.4	0.2	0.2	0.2	0.1	0.1	0.1	0.0	0.0	0.0
Other	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
<i>Total Europe</i>	55.2	55.3	50.0	52.6	50.0	52.1	53.3	53.8	55.4	55.5
North America										
Mexico	67.4	71.2	71.2	72.6	81.3	86.9	91.6	75.2	89.7	90.8
United States	58.0	52.9	47.6	50.2	50.5	70.1	66.2	62.7	63.3	52.6
Canada	37.6	28.3	23.8	40.0	39.9	39.0	36.4	37.5	37.7	39.7
<i>Total North America</i>	163.0	152.4	142.6	162.8	171.7	195.9	194.2	175.4	190.8	183.1
Central & South America										
Peru	53.6	53.7	56.0	61.4	63.3	66.8	65.1	71.7	78.4	86.0
Chile	33.0	31.2	31.6	33.5	36.8	35.1	43.1	44.4	38.0	43.4
Bolivia	10.2	10.7	11.3	13.8	12.3	12.4	13.1	13.6	14.1	13.7
Argentina	1.5	1.4	1.2	1.2	1.0	1.1	2.2	3.3	3.0	5.3
Honduras	1.1	0.8	0.9	1.0	1.2	1.5	1.5	1.6	1.7	1.6
Brazil	0.7	0.7	0.6	0.5	0.4	0.3	0.3	0.3	0.3	0.3
Dominican Republic	0.4	0.5	0.3	0.7	0.5	0.4	0.2	0.1	0.0	0.0
Other	0.5	0.5	1.3	0.3	0.3	0.3	0.3	0.3	0.2	0.3
<i>Total Central & South America</i>	101.0	99.5	103.1	112.3	115.9	117.8	125.8	135.3	135.6	150.4
Asia										
Indonesia	3.2	2.9	3.1	7.7	7.6	8.1	10.0	8.6	8.4	9.3
Turkey	2.5	2.3	2.1	2.1	2.9	2.9	2.8	3.5	3.5	3.6
Japan	5.5	4.4	4.3	3.2	2.9	2.8	3.0	3.0	3.3	2.6
Papua New Guinea	3.1	3.1	2.5	2.1	1.9	1.6	1.9	1.9	2.4	2.2
India	0.8	1.6	1.6	1.2	1.1	1.6	1.7	1.9	1.8	1.7
Philippines	0.9	1.1	1.0	1.1	0.8	0.6	0.6	0.6	0.7	1.1
Saudi Arabia	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.3	0.3	0.3
Thailand	0.2	0.1	0.1	0.2	0.2	0.1	0.1	0.2	0.2	0.2
Malaysia	0.5	0.5	0.4	0.4	0.3	0.3	0.2	0.1	0.0	0.0
Other	2.4	2.0	2.5	2.5	2.3	2.5	2.7	2.6	2.7	2.7
<i>Total Asia</i>	19.6	18.4	18.3	21.0	20.7	21.0	23.5	22.8	23.3	23.8
Africa										
Morocco	4.9	7.6	8.3	6.6	6.4	8.4	9.8	8.9	9.3	9.4
South Africa	5.9	6.3	6.2	5.7	5.5	5.2	5.1	4.9	4.6	4.2
Namibia	2.9	2.3	2.0	2.1	1.4	1.2	0.4	0.0	0.5	0.6
Zambia	0.6	0.6	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2
Zimbabwe	1.1	0.8	0.7	0.7	0.3	0.3	0.2	0.2	0.1	0.1
Dem. Republic of the Congo	1.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	0.4	0.3	0.3	0.3	0.4	0.3	0.3	0.3	0.3	0.3
<i>Total Africa</i>	16.6	18.2	17.9	15.8	14.2	15.7	16.1	14.5	15.1	14.8
Oceania										
Australia	39.2	37.0	33.6	29.6	32.5	35.6	47.2	55.3	66.2	63.3
New Zealand	0.7	0.8	0.8	1.0	1.0	1.0	0.8	0.8	0.7	0.9
Fiji	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<i>Total Oceania</i>	39.9	37.9	34.4	30.6	33.5	36.7	48.1	56.1	67.0	64.3
Western World Total	395.3	381.7	366.2	395.0	406.0	439.2	461.0	457.9	487.2	491.9

Table 2
World Silver Mine Production
Million ounces

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Other Countries										
China	31.4	31.7	33.8	34.7	36.5	43.0	43.4	44.2	48.2	48.9
Kazakhstan	30.0	26.0	22.0	20.9	15.5	14.2	13.8	16.0	20.5	24.3
Russia	25.5	25.0	24.0	23.5	24.4	20.9	19.5	19.9	20.2	20.1
Uzbekistan	2.7	2.7	2.6	2.6	2.7	2.5	2.6	2.1	2.0	1.9
Other CIS	0.2	0.2	0.2	0.2	0.7	1.2	1.2	1.2	1.2	1.2
Mongolia	0.7	0.8	0.9	0.9	0.9	1.0	1.1	1.0	1.1	1.1
North Korea	1.7	1.8	1.7	1.7	1.3	1.2	1.0	0.9	0.8	0.8
<i>Total Other Countries</i>	92.2	88.2	85.1	84.5	81.9	83.9	82.6	85.3	94.0	98.2
World Total	487.5	469.9	451.4	479.5	487.9	523.1	543.6	543.2	581.2	590.0

increased output at Mount Isa and Uchuccacua, respectively. Pan American's near-doubling in output vaulted it onto the top producers list, while Echo Bay dropped back sharply as output at McCoy/Cove halved.

Analysis of the sources of silver mine production shows that three-quarters of output was generated as a by-product of other metals. Primary silver mines struggled under the pressure of a weak market environment, and many were hit by lower output and/or early closure. It was largely thanks to the strong growth in output at Peñoles' primary mines that global primary production managed a small (less than 1%) rise year-on-year.

Output from lead/zinc mines increased by almost 3% (lead/zinc mines generated 35% of all silver last year) and copper mines also increased their silver by-product (up 4% to 141.2 Moz (4,392 t), or 24% of the total). On the other hand, lower output from several US gold mines with substantial silver by-product led to a 4% fall in silver from this source. Gold mines generated 15% of the world's silver in 2001.

North America

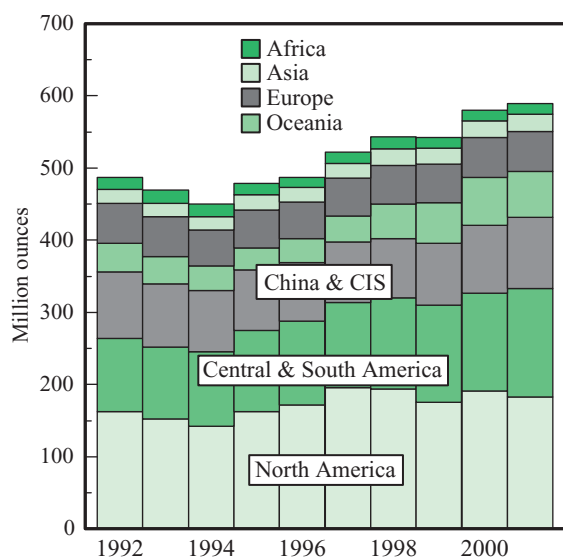
Despite a modest increase in silver output from the world's biggest silver producer, Mexico, and growth in Canada, ranked seventh amongst the top silver producing countries, a significant decline in silver production from the United States left combined output from these three important producers 4% lower year-on-year at just over 183.1 Moz (5,694 t). In **Mexico**, silver output increased modestly by just over 1% to reach 90.8 Moz (2,824 t). The narrow rise was perhaps a surprising result considering the surge in output from the country's and the world's biggest silver producer, Peñoles, which reported a 16% increase year-on-year to reach 51.7 Moz (1,609 t). The bulk of the increase can be attributed to higher production at Fresnillo (which last year contributed 56% of the company's

total silver production) where output was up 20% to 28.7 Moz (894 t). There was further support from Pan American Silver's new La Colorada mine that contributed 0.8 Moz (24 t), as limited-scale mining began early last year, while Peñoles' Rey de Plata mine (which came on stream in October 2000) added 1.9 Moz (58 t) to the country's total. Furthermore, Mexico's newest mine, Francisco I. Madero, started operations in the September quarter last year and yielded 0.3 Moz (9 t) of silver.

These production gains, however, were substantially offset by a decline in output from the informal mining sector. In the late 1990s, the medium and small-scale miners contributed over 35% of the country's total silver production (predominantly as a by-product from lead/zinc and copper operations). Last year, however, reports suggested that production from this sector dropped by around 25% year-on-year to an estimated 14.8 Moz (459 t), or only 19% of the total. Some of the decline can be attributed to mine closures, as producers struggled to maintain profitability, in part the result of the combined effects of low zinc and copper prices and the strength of the peso. However, it is worth mentioning that the effects of these market conditions were not restricted to the informal mining sector. Peñoles, for example, formally suspended operations at its recently opened Rey de Plata on December 20th last year.

In the **United States**, declines from both primary silver and by-product mines left output a significant 17% lower year-on-year at 52.6 Moz (1,635 t). At the country's primary silver operations, there were production decreases at Lucky Friday, which was down 36%, largely the result of a reduced production program implemented to cut costs and preserve the resource. Meanwhile, it was announced that the Sunshine mine (placed on care and maintenance in February last year) had been permanently closed. On

Figure 16
World Silver Mine Production



the other hand, at Galena and Greens Creek, output was up 12% and 19% respectively. At the former, the improvements were primarily the result of accelerated underground development, which provided access to higher-grade ore, while at Greens Creek an 8% increase in silver grades contributed to the output gains. Overall, however, production from primary silver mines was estimated to have fallen by 3.1 Moz (97 t) year-on-year. Compounding declines from this source was lower output from the gold operations which decreased 6.8 Moz (210 t) when compared to the previous year. Remarkably, roughly 86% of this fall can be attributed to the decline in output from a single operation, McCoy/Cove, where mining was completed last year and lower output reflected the processing of low grade stockpiles.

Canada, in contrast, recorded reasonably strong growth last year, with silver production more than 5% higher year-on-year at 39.7 Moz (1,235 t). There are no primary silver mines operating Canada, with over half of the country's silver sourced from gold operations and the balance, in roughly equal proportions, from copper and lead/zinc operations. The increase last year can largely be accounted for by higher output from gold mines - in particular, Eskay Creek, which reported silver production at 15.5 Moz (482 t), an increase year-on-year of over 5%. A moderate rise from lead/zinc operations further supported the gains. Noranda's Brunswick mine, for example, reported an 8% increase in 2001 to reach 7.1

Moz (219 t), partly due to higher mill throughput.

Central and South America

Silver output in Central and South America increased last year by a substantial 11% to reach 150.4 Moz (4,679 t), accounting for just over a quarter of global silver production. There are three important silver producers in the region, namely Peru, Chile and Bolivia, which between them generated 95% of output in 2001. The biggest of the three, **Peru**, has experienced an average growth of roughly 10% a year for the last three consecutive years and in 2001 reported record high production of 86.0 Moz (2,674 t). The strongest growth was from the lead/zinc mines, which generated 59% of the country's silver, or 50.9 Moz (1,583 t). Perhaps the most significant contribution to the rise came from the new polymetallic Antamina mine (the world's third largest zinc mine and seventh largest copper mine), which added close to 3.9 Moz (120 t) of silver. Strong growth was also reported at Volcan's operations, where silver output was 26% higher at 10.7 Moz (334 t). As regards primary silver producers, Buenaventura's Uchucchacua mine reported a 12% increase year-on-year to 9.8 Moz (304 t) thanks to an increase in the silver ore grade and improved metallurgical recovery. In addition, at Hochschild's Caylloma mine, where silver extraction dates back some 500 years, output reached 2.3 Moz (70 t), a 21% increase. In the current year, higher grades should see production increase again to reach approximately 3 Moz (93 t). Primary output was buoyed further by the start-up in April of Pan American Silver's Huaron mine, which during its first partial year of operation yielded 2.9 Moz (90 t) of silver. Turning to the gold mines, modest gains were made at Barrick's Pierina and Hochschild's Ares, while the start-up of Buenaventura's new Antapite mine provided a further boost.

In **Chile**, the completion in 1999 of mining at Chimberos, the country's only primary silver mine, means that silver is now almost exclusively produced from gold (51%) and copper (48%) operations. Last year, silver by-product increased from both categories to leave the country's total at 43.4 Moz (1,349 t), an increase of 14% year-on-year. Strong growth was reported by the State mining and processing company, ENAMI, which saw production up 44% to reach 4.9 Moz (152 t), the bulk of the increase the result of high grade material sourced from Compañía Minera Can-Can's Arqueros gold/silver mine.

Bolivian silver production declined moderately last year to 13.7 Moz (425 t), reflecting lower output from Comsur's Bolivar mine (down 8%) and at the Kori Kollo gold mine (down 32%). On the other hand, output was close to double year-on-year in **Argentina**, as production at the new primary Martha mine boosted the country's total. The first shipment of ore from Martha left Puerto Deseado on Argentina's southern Atlantic coast in February last year and, during its first partial year of operation, it is estimated to have produced 1.7 Moz (53 t) of silver. In recent news, Coeur announced the completion of its previously announced purchase of a 100% interest in the Martha mine from Yamana Resources. According to Coeur, Martha currently contains 787.7 Moz (24,500 t) of very high-grade reserves and production in the current year is expected to be around 2.3 Moz (72 t).

Europe

Total silver production from Europe increased by less than 1% to reach 55.5 Moz (1,727 t), representing around 9% of global production (see Figure 16). The largest contribution by far came from **Poland** which accounted for over two-thirds of the region's total. Silver production from the country is principally generated by KGHM Polska Miedz as a by-product at its three underground copper mines and last year silver output here increased 4% to 37.4 Moz (1,163 t). Offsetting these gains somewhat was lower production from both **Sweden** and **Spain**, where silver output declined roughly 7% and 42% respectively. As regards the latter, lower output reflected the closure of Boliden's troubled Los Frailes zinc mine in the September quarter. Production in **Greece**, on the other hand, more than doubled last year to 2.0 Moz (62 t), reflecting higher output at TVX Hellas' Stratoni operations, resulting from the implementation of productivity improvements.

CIS

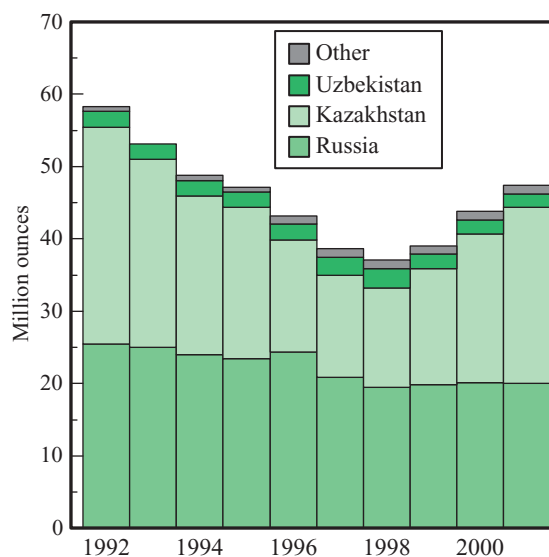
For the third consecutive year, silver production increased from the countries that constitute the Commonwealth of Independent States (CIS). Last year output climbed a significant 8% year-on-year to reach 47.4 Moz (1,475 t).

It is clear from Figure 17 that the driver of this growth has been the impressive rise in silver output from **Kazakhstan**, which last year accounted for 51% of the region's total silver production, having reported a remarkable 19% increase year-on-year to 24.3 Moz

(755 t). All of the country's silver is produced at base metal operations, which have benefited from substantial investments over the last few years. Kazakhmys, for example, Kazakhstan's biggest copper producer, has been virtually transformed by targeted expenditure, primarily aimed at improving existing infrastructure and upgrading mining and processing facilities. The results have been impressive: copper production rose 6% last year while silver by-product output increased by almost 20% to 21.0 Moz (654 t).

Kaztsink, the largest lead and zinc producer, also benefited from foreign investment. Switzerland's Glencore holds the controlling stake in Kaztsink via a local subsidiary and, while several investment projects were prepared to improve operations at the Maleyevsky pit and increase capacity at the beneficiation plant, a large part of the program was focused on upgrading the lead and zinc smelters. Glencore process both local and imported concentrates at their processing facilities and, as silver in both materials are included in the Kaztsink production statistics, the company total overstates the country's silver output generated from domestic ores. While in the past precise classification had not been possible, new information has refined the split between foreign and domestic ore with the result that a fairly substantial revision to the country's total silver production has been made. Kaztsink's domestic output is expected to decline moderately in the current year with plans recently announced to shut the Tekeliisky GOK, or

Figure 17
CIS Silver Mine Production



mining and milling complex, because it is uneconomical at present metal prices.

Silver production in **Russia** was less than 1% lower than the previous year at 20.1 Moz (624 t) (see Figure 17). As regards the country's primary output, reports suggest that the development of the Dukat silver-gold mine is progressing and, despite the fact that the license stipulated that the joint venture (known as Serebro Magadana) should start commercial mining by the December quarter of last year, the Ministry of Natural Resources has said that it does not intend to revoke the license. Recent announcements suggest that mining activities could be under way by the September quarter of the current year, although some regard this as a somewhat optimistic timetable.

Silver output from gold operations increased modestly last year with some of the gains coming from the new Julietta gold mine, which came on stream in September. Julietta is expected to yield around 2.4 Moz (75 t) of silver this year.

China

Despite reports of a dramatic rise in silver mine production from China, it is clear from the surge in imported concentrates to the country that the significant increase in silver output was not generated locally. However, initial estimates for local silver output do show a modest rise, albeit less than 2%, to 48.9 Moz (1,520 t). Most of the growth is thought to have been as a result of higher domestic lead/zinc

production, which generated around half of the country's silver in 2001 (see Figure 18), although some of the gains here were offset by lower copper output and unconfirmed reports of a decline in silver from primary operations.

Oceania

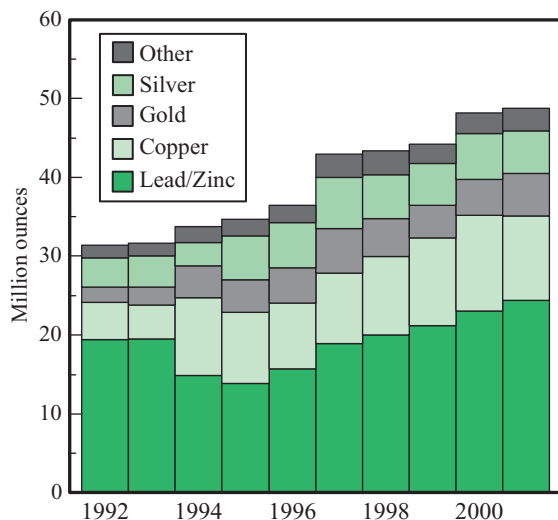
Australia accounted for over 98% of the total silver production from this region in 2001, so in spite of the year-on-year increases recorded in **New Zealand** (up 19%) and **Fiji** (up 5%), the 4% decline in Australia left output from the region as a whole 2.7 Moz (86t) lower at 64.3 Moz (1,999 t). At Cannington, the world's biggest producing primary silver mine (reclassified in last year's *World Silver Survey*; see page 26 for further details), production was 8% lower than the previous year at 30.0 Moz (933 t), primarily reflecting a decline in grades. Some of the losses at Cannington, however, were offset by higher production at Pasminco's Century zinc mine, which produced 2.4 Moz (74 t) in its first full year of operation, and by improvements at Mount Isa where by-product silver from zinc and lead concentrates was 20% higher year-on-year at 11.8 Moz (368 t).

Asia

Output from Asia grew for the second consecutive year to stand at 23.8 Moz (739 t), a moderate 2% increase year-on-year. Over half of the region's total is produced in **Indonesia** (40%) and **Turkey** (15%) and in 2001 both countries recorded a rise in output. In the former, significant silver is generated at the copper-gold mine Grasberg, which saw output increase last year by 11% to 4.3 Moz (133 t). This rise was matched by the increase in silver produced at the gold operations in the country, leaving the total up 10% to reach 9.3 Moz (289 t). As for **Turkey**, the moderate 3% increase to 3.6 Moz (112 t) can be ascribed to higher production at the primary 100th Anniversary mine (up 4% to 3.1 Moz (96 t)) and by a modest contribution from operations at the new Ovaçık mine. In a recent development, production at Ovaçık was suspended from April 1st 2002, following concerns raised regarding the possibility of environmental damage to the area if activities were allowed to continue.

In **Japan**, a 22% decline in production reflected a drop in silver by-product from both lead/zinc and copper mining. Meanwhile, in **Papua New Guinea**, the 5% decrease was largely the result of a 21% drop in

Figure 18
Chinese Silver Mine Production
By source metal



output from the OK Tedi copper mine and lower output from Misima, as lower grade stockpiles were processed following the cessation of mining activities in May last year.

Africa

Initial reports suggest that output levels at **Morocco's** Imiter primary silver mine, operated by Société Métallurgique d'Imiter (SMI), a subsidiary of the ONA Group, were maintained from the previous year with production at around 7.9 Moz (246 t). This is Africa's biggest silver mine, accounting for roughly two-thirds of the continent's total in 2001. **South Africa** is the only other significant producer of the metal in Africa, with an annual production of over 4.0 Moz (124 t). However, in contrast to developments in Morocco, where silver output has almost doubled over the last ten years, South Africa's production, over the same period, has declined by close to 30%. Some of the drop last year can be attributed to the decline in gold production, which accounted for just less than one-third of silver by-product, but there were also declines in copper, lead and zinc production which, not surprisingly, resulted in lower silver by-product.

Outlook

The marked decline in metal prices had a significant impact on primary silver and by-product operations during 2001. A common feature of most of the metals markets last year was the frequent announcements of mine closures and suspensions and, with zinc prices testing new lows, it was not surprising that the bulk of the closures and suspensions were made at primary zinc operations. The list last year included Los Frailes, Laisvall, Nanisivik, Tara and Sullivan. Closures, however, were not just limited to the more established operations: Aguas Tenidas and Rey de Plata, which had started commercial operations in 2000, both suspended mining activities in December last year. There were also closures reported at primary silver operations: the Sunshine mine stopped production in February 2001 and, in Mexico, the Avino mine suspended activities late last year. In addition, long-time major producers of silver as a by-product from gold saw output decline significantly. At McCoy/Cove in the United States, where mining reserves were depleted last year, production almost halved from 12.3 Moz (383 t) to 6.5 Moz (201 t). Meanwhile at El Indio, historically an important silver producer in Chile, silver production has also been in decline with

the cessation of mining activities timetabled for the second half of this year. In all, silver output lost from this batch of mines is anticipated to total over 12.9 Moz (400 t).

On the other hand, a number of new mines started up during last year, which should partially offset the anticipated decline or "lost" output from the operations outlined above. The largest of the new mines is Peru's zinc-copper Antamina, which started production late last year and is expected to add over 6.4 Moz (200 t) of silver to the country's total in 2002. Other new mines include Pan American's Huaron and La Colorada, Coeur's recently acquired Martha mine, Hecla's San Sebastian and Bema's joint venture gold mine, Julietta in Russia. In terms of new silver output (the extra ounces that this group is expected to yield year-on-year), forecasts are close to 9.6 Moz (300 t). All other things being equal, this implies that global output in the current year should decline, albeit modestly by less than 1%. However, further closures and suspensions during 2002 and additional production curtailments should not be ruled out, which could leave global output somewhat lower than suggested above.

On the development side, there is little new capacity expected to come on stream in the current year, although it is worth mentioning that the merger completed in December last year between Barrick and Homestake, combined with the firmer gold price, has revived some interest in the mothballed Pascua-Lama project on the Argentina/Chile border. According to reports, work is currently under way on looking at the possibility of combining the Pascua-Lama and adjacent Veladero deposits. Cost saving generated by shared infrastructure could see the development of either or both the projects, which have the potential to generate a combined output of around 41.8 Moz (1,300 t) of silver annually. However, with most of the exploration work currently still focused on Veladero, it would seem that full-scale operations at Pascua-Lama could still be some way off and it may need substantially better gold prices before its owners would proceed with its development.

By-product Analysis

Silver is unusual among the metals in that most of it is produced at operations which would not be classified as silver mines. Last year, only a quarter of the world's silver was mined at "primary silver mines" (defined as mines where silver is the primary revenue earner). Over 75% of global silver was produced as a

by-product of another metal. The implication is, of course, that silver production levels are influenced by a far wider range of factors than those relating specifically to the silver market. In fact, it is only that portion of output which is mined at primary mines that will show any kind of responsiveness to silver price movements and other supply and demand considerations.

Silver Output by Source Metal

Million ounces

	2000 output	% of total	2001 output	% of total	Change y-o-y
Primary	146.2	25%	147.2	25%	0.7%
Lead/zinc	199.6	34%	204.5	35%	2.5%
Copper	136.0	23%	141.2	24%	3.8%
Gold	92.7	16%	89.2	15%	-3.8%
Other	6.7	1%	8.0	1%	19.4%

Cannington was the largest **primary** silver mine in 2001, with output just shy of 30.0 Moz (933 t). For the purposes of this analysis, Cannington is treated as a primary silver mine because more revenue is generated from silver than from either lead or zinc, although geologically speaking it is a lead/zinc deposit. The inclusion of Cannington in the primary category is the main reason why output from this source soared in 1997, the year in which full-scale production commenced (see Figure 19).

Six other primary mines produced more than 5.0 Moz (156 t) last year: two of these in Mexico (Peñoles'

Fresnillo and Tizapa mines, the former producing just fractionally less than Cannington), two in the United States (Rio Tinto/Hecla's Greens Creek and Coeur's Rochester), one in Peru (Buenaventura's Uchucchacua) and one in Morocco (SMI's Imiter). As a group, these mines produced over 70% of all primary silver. Strong increases in output were reported at each of these mines apart from Rochester and Cannington, leaving their combined production up close to 7% over 2000 at 101.9 Moz (3,169 t).

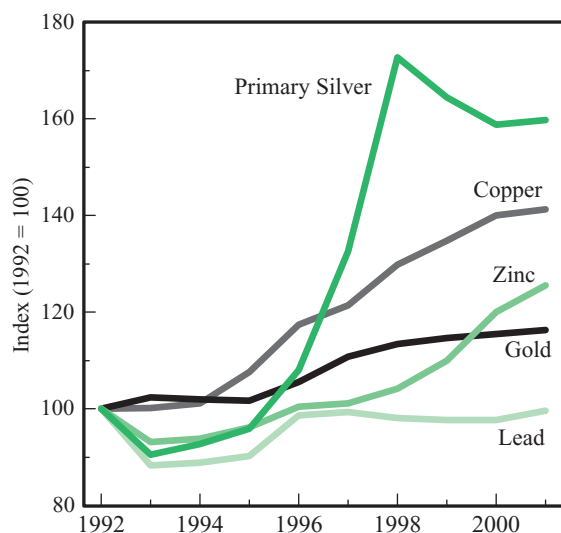
However, a number of primary silver mines are in the process of shutting down, the result of an extended period of weak prices. Most notable among these last year was the Sunshine mine in Idaho. Mining started at Sunshine in 1884 but finally ceased early last year and residual production fell to only 0.5 Moz (16t) from a high in 1998 of 5.8 Moz (181 t), contributing to the 10% fall in total US primary silver production. Worldwide, primary silver output was left only marginally higher in 2001 at 147.2 Moz (4,578 t), with its contribution to total silver output unchanged from 2000 at 25%.

Most of the world's silver output is generated at **lead/zinc** mines. Last year, output from this source increased by almost 3%, and its share of global production inched up to 35%. Around a quarter of silver generating lead/zinc mines are located in Peru, where last year impressive growth was recorded: output was up 17%, reaching 51.1 Moz (1,589 t). Much of this increase was the result of the ramping up of production at the new polymetallic mine, Antamina. Strong increases were also reported at Volcan's zinc mines (including Cerro de Pasco, Andaychagua and Carahuacra) where silver output was up 26% to 10.7 Moz (334 t).

Not surprisingly, higher silver by-product reflected increased production at the lead/zinc mines themselves. Initial estimates from the International Lead and Zinc Study Group (ILZSG) suggest that lead production was up 2% last year, while zinc output increased by 5%.

Figure 19

Mine Production of Source Metals



Sources: GFMS / ILZSG / WBMS

World Mine Production of Source Metals

Thousand tonnes

	1997	1998	1999	2000	2001	Change y-o-y
Lead	3,030	2,992	2,979	2,977	3,036	2%
Zinc	7,337	7,565	7,977	8,705	9,112	5%
Copper	11,482	12,285	12,756	13,251	13,366	1%
Gold (tonnes)	2,479	2,537	2,567	2,584	2,604	1%

Sources: ILZSG, WBMS, GFMS

2001 was a poor year for zinc, with prices falling 21% year-on-year amidst high and rising stock levels. Weak demand from the auto and brass industries was primarily to blame. Low prices prompted a number of producers to announce capacity cutbacks, but the effect on the price was muted as most of the cutbacks will only come into effect in the next year or two. In fact, prices fell even further in the first months of 2002. It is hoped that reduced supply from Pasminco (formerly the world's biggest producer of lead and zinc but placed in administration in September), Asarco, Boliden, Hudson Bay and Outokumpu would help to improve zinc's fundamentals.

Lead fared somewhat better, with the average price firming a respectable 5% in 2001. Although lead also suffered the impact of weak industrial demand, a sharp fall in primary mine output was more than enough to offset this. Cutbacks and closures of mines in North America and Sweden should result in a further fall in lead output.

Average Prices of Source Metals

	1997	1998	1999	2000	2001	Change y-o-y
Lead (\$/t)	624	528	503	454	477	5%
Zinc (\$/t)	1,313	1,023	1,077	1,128	888	-21%
Copper (\$/t)	2,276	1,653	1,575	1,814	1,581	-13%
Gold (\$/oz)	331	294	279	279	271	-3%

Sources: LME, GFMS

Copper mines were responsible for just under a quarter of total silver output. Silver from this source increased by 4% to reach 141.2 Moz (4,392 t), lifting copper's contribution to the global total somewhat. Each of the three largest producers of silver-from-copper, Poland, the CIS and Chile, recorded strong increases in output, which was more than sufficient to cancel out declines elsewhere. The single biggest source of silver from copper mines, KGHM Polska Miedz in Poland, reported a 4% increase in silver by-product. There were additional increases reported at Codelco's operations in Chile (which include Teniente, Chuquibambilla and Salvador) and at Kazakhmys in Kazakhstan. The large-scale copper mines, Grasberg in Indonesia and Bingham Canyon in Utah, made further contributions to higher silver by-product output.

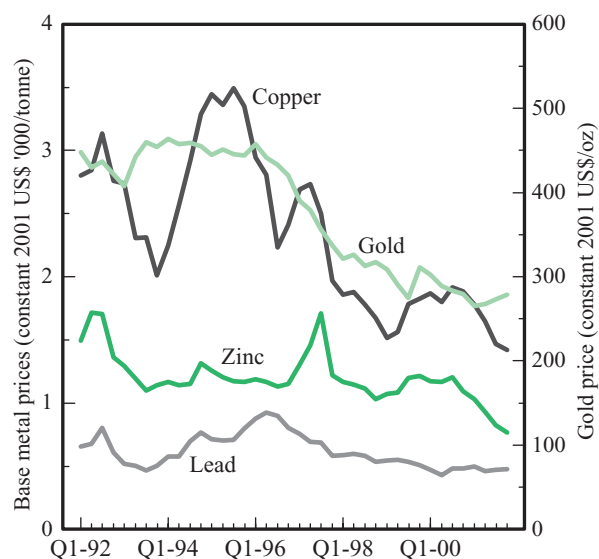
The copper price was 13% lower last year (see Figure 20), reflecting, as with zinc, a massive stock overhang. Copper suffered from a collapse in demand in the United States, Japan and, to a lesser extent, East

Asia and Europe. Copper mine output, on the other hand, was estimated by the World Bureau of Mineral Statistics (WBMS) to have increased by 1%. The outlook for 2002 remains negative, as mine production is expected to keep pace with a pick-up in demand, despite announced cutbacks at Phelps Dodge's North American mines and BHP Billiton's Escondida and Tintaya operations in South America.

Silver produced at **gold** mines fell by 4% to 89.2 Moz (2,774 t) due to a sharp decline in the contribution made by US gold mines, although production from this source was still up more than 54% over the course of the past decade. Gold mines generated 15% of global silver last year, slightly less than in 2000. The leading producers of silver at gold mines are Chile, Canada and the United States. Chile reported a modest 4% increase in silver output from this source, largely due to the high silver by-product recorded at Meridian Gold's new El Peñon mine and at La Coipa. In Canada, silver output at Barrick's Eskay Creek gold mine expanded somewhat but most of the 15% increase in silver output from this source was the result of higher silver at the recently-expanded LaRonde mine which more than doubled to reach 2.5 Moz (79 t). By contrast, US gold mines reported much lower silver by-product, with an almost 40% decline resulting largely from the collapse in silver production at McCoy/Cove, formerly the country's largest silver-generating gold mine.

Although the outlook for the gold market improved notably during the course of last year, average prices were 3% lower than in 2000 due to poor demand,

Figure 20
Source Metal Prices (real terms)



weakened by the global economic slowdown. Contrary to expectations, though, gold mine production was maintained (output edged up less than 1% to 2,604 tonnes) and is expected to remain stable this year as well. The recent strength in the gold price and the exceptionally strong performance of gold mining companies on the world's beleaguered stock exchanges have raised expectations that a number of mothballed gold projects may be resuscitated in the near future, which could see new silver coming onto the market. On the other hand, many of the silver-generating gold mines are fast approaching the end of their profitable lives (regardless of what the gold price does in coming months).

Production Costs

- **Weighted average production costs among primary silver mines were materially unchanged at \$3.10/oz.**

Cash costs in 2001 were calculated on the basis of data collected from thirteen operations, which in total produced 96.5 Moz (3,001 t) or 16% of the global total (see the table below). Although the sample size may seem trivial, it should be remembered that only 25% of total silver output last year was generated at primary silver mines. Hence only a minority of the world's silver producers actually report cash costs on a per silver ounce basis.

Silver Mine Production Costs

		1999	2000	2001
Cash costs:	highest	\$5.09	\$5.02	\$5.14
	lowest	\$1.99	\$2.20	\$2.17
	weighted average	\$3.18	\$3.11	\$3.10
Average spot price		\$5.22	\$4.95	\$4.37
% output with costs > spot price		0.0%	5.0%	11.0%
Sample size (million ounces)		87.7	96.8	96.5

The weighted average cash cost for the sample size declined a fraction year-on-year to \$3.10/oz. However, the decline did little to improve cash margins, which fell a significant 31% year-on-year due to the 12% decline in the average silver price. The lower price also impacted on the percentage of sampled production with cash costs greater than the average spot price, which increased from 5% in 2000 to 11% last year.

As regards total production costs (including depreciation, depletion and amortization), a smaller sample size of twelve mines with a combined output of

86.7 Moz (2,696 t) was used to calculate the weighted average, which last year stood at \$4.12 (up from \$4.11/oz in 2000). The sobering result was that 49% of costed silver production (ten of the mines in the sample group) had total production costs higher than the average spot price.

Producer Hedging

- **Net outstanding producer hedge positions increased by 20.4 Moz (634 t) during 2001. Much of the increase occurred in the third and fourth quarters.**
- **Forward sales positions were virtually unchanged year-on-year, but options positions expanded significantly.**

After two consecutive annual declines in silver producer hedge books, last year witnessed a marked increase in the net outstanding global position. Producer hedging activity brought an estimated 20.4 Moz (634 t) of silver to the market in the form of accelerated supply.

The absolute volumes mentioned here are not very significant given the overall size of the silver market: accelerated supply generated by hedging activity represented only 2% of total physical supply. However, within the silver hedging universe, the increase was significant – GFMS estimate that the global book grew by almost a quarter last year.

It is necessary to add an immediate caveat to the above statement. This area of the market is far from transparent and we do not claim to have access to entirely comprehensive information. The main reason for the dearth of reliable data is that it is only the primary silver producers and gold producers who produce silver by-product that report in any kind of detail the silver hedging transactions they engage in. For the remaining 60% of producers, silver is often a non-strategic metal and hedging its price is not a priority. In addition, those that do hedge tend not to disclose many details relating to the size and tenure of silver positions. Thus it is more than likely that our statistics do not capture all silver hedging transactions. But we do have access to enough information - both from the public and the private domain - to enable us to make reliable observations about the direction and probable extent of changes. The data discussed here should therefore be regarded as broadly indicative of trends.

As was referred to above, few mining companies

actively engage in silver hedging. And those that do hedge, tend to maintain much lower levels of hedge cover than is typical, for example, among gold producers that hedge. As for potential new hedging, with prices having been depressed for some time, there is very little in terms of new projects in the process of being prepared for development that might require financing and associated hedging.

These factors alone would have been enough to lead one to expect very little new hedging last year. But in addition, the silver price performed poorly for most of the first nine months of the year, and with US interest rates falling to successive lows, the contango virtually disappeared. Few silver producers who hedge at all; low levels of hedge cover among those producers; few new projects requiring financing; depressed prices and no contango to speak of – hardly the kind of environment in which one would expect to see much hedging activity. And indeed, among the small community of hedging silver miners, very little activity was noted during the first nine months (apart from the brief spike in May, when modest amounts of new hedging was reported). The handful of producers that had hedge positions in place, allowed those to run down as contracts were delivered into and not replaced.

Hedge cover was running down to “dangerously low” levels. When the September rally came along, producers made full use of the chance to lock in higher prices, and a fair amount of activity was recorded. Although the post-September 11th rally was short-lived, the global hedge book by the end of the

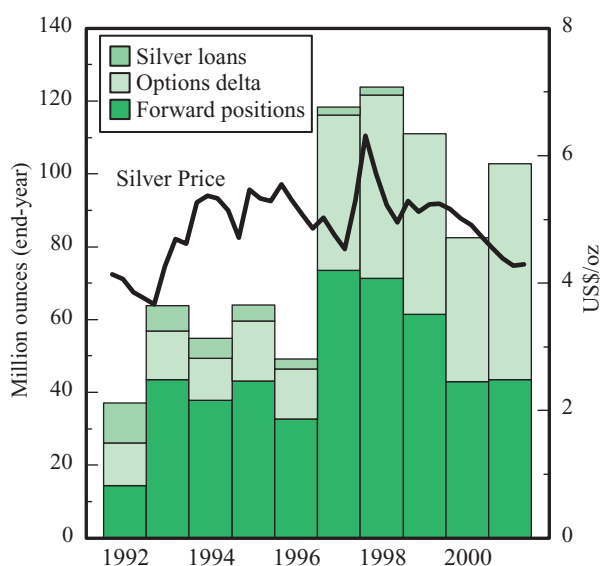
September quarter had expanded markedly from end-2000 levels.

Towards the end of the year, the silver market squeeze saw prices race up (the price gained 9% over the course of December 2001) and producers responded swiftly in an effort to lock in prices above \$4.60. At this time, however, lease rates had surged even more than the spot price, plunging the market into a deep backwardation. Brief periods of backwardation are not unusual in the silver market (lease rates tend to be more volatile in this market than in the much more liquid gold leasing market) and the presence of a negative forward premium in itself has not always been enough to discourage silver producers to conclude hedging transactions – during the last period of backwardation over the 1999 year-end, for example, the silver price was high enough for miners to accept the forward discount on locked-in prices, and significant amounts of forward selling were transacted.

Last year the situation was very different, however. Not only was the market in backwardation, but the price, though rallying convincingly, was still rather poor by historical standards, which meant that forward selling prices were not attractive enough to encourage this kind of hedging. Instead, producers bought and sold options, tying in secured minimum revenue levels through buying put options and generating premium through the selling of calls.

As a result, by the end of the year forward selling positions were virtually unchanged on a net basis, but options positions had expanded substantially (see Figure 21). It was the delta hedging associated with these put and call options structures that generated almost all of the 20.4 Moz (634 t) which found its way to the physical market last year. The pattern of hedging becomes even more evident when one considers the following statistics: during 2001, absolute volumes of protected ounces – that is, ounces hedged through forward sales and put options – increased by an estimated 35% (as measured against the end of 2000); committed ounces, on the other hand – defined as all forward sales plus all call options – surged to end the year 56% higher. Some of this was the result of gold producers selling silver calls to generate revenue which could be offset against gold hedge books under pressure from rising gold prices; but much of it was simply due to silver producers taking advantage of higher prices, lease rates and volatilities to generate income through selling calls and applying that to lock in some downside protection.

Figure 21
Silver Producer Hedging: Outstanding Positions



5. Supply from Above-ground Stocks

- Supply from above-ground stocks fell by over 50 Moz (1,500 t) in 2001. A reduction in bullion stock sales more than offset a rise in scrap supply from recycled fabricated products.
- Sales out of private bullion stocks declined to a negligible level due to an absence of disinvestment last year.

Summary

Recycled above-ground stocks of bullion and scrap provided 273.5 Moz (8,507 t) of silver to the market last year, the balance of supply coming from new mine production.

Supply from Above-ground Stocks		
	2000	2001
Implied Net Disinvestment	97.7	-16.8
Producer Hedging	-28.5	20.4
Net Government Sales	78.1	85.7
Sub-total Bullion	147.3	89.3
Scrap	179.2	184.2
Total	326.5	273.5

The quantity of silver mobilized and sold out of above-ground stocks fell by over 50 Moz last year. This decline was entirely brought about by the swing from net disinvestment out of private bullion stocks to a modest increase in the same (shown in the above table as negative disinvestment). This shift was also more than enough to offset the reappearance of producer hedging as an element of supply (the decline in positions during 2000 effectively added to demand that year). Sales of bullion stocks in 2001 were therefore almost entirely out of government holdings. Most of the estimated 86 Moz of net official sales were accounted for by China, supply from which rose slightly above the level that GFMS estimates for 2000.

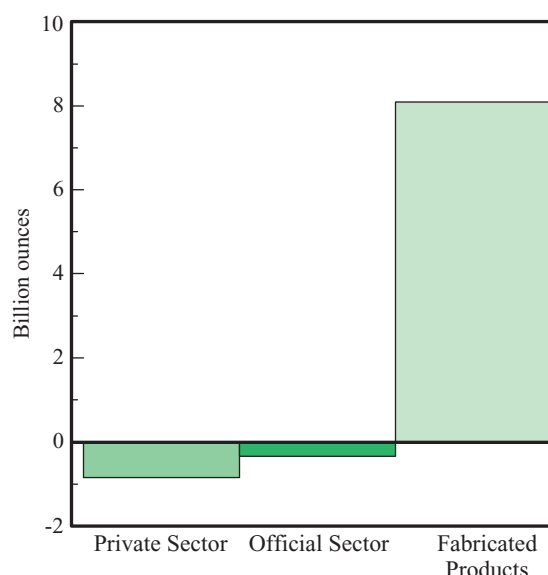
The decline in the silver price was certainly a factor behind the reduced level of supply from bullion stocks. (Net bullion stock sales accounted for only 10% of total silver supply compared to an average of 16% over the 1992-2001 period as a whole.) By and large, holders of stocks in the private sector refrained from selling into a weakening market. In addition, after several years of large falls, there is certainly less privately held bullion close to the market than used to be the case. On the other hand, the declining price did not lead to any downshift in government stock sales. This was largely because the Chinese were eventually prepared to accept lower prices for their surplus silver.

Overall though, the step down in bullion stock sales recorded last year (and the only modest growth in mine production) does emphasize that weak demand rather than growth in supply was the main driver behind the slide in the silver price for much of 2001.

Contrary to what might have been expected given the price trend last year, scrap supply increased in 2001. To some extent this merely reflects the “natural” increase in supply from this source as the above-ground stock of fabricated products grows and is recycled. However, in addition to this, there were special factors at work, notably the scrapping by manufacturers of unsold inventory. This was a reflection of the weakness of fabrication demand that is described at length in Chapter 7.

The stock of fabricated products may have grown more slowly last year but it still increased by up to 679 Moz (21,100 t) - i.e. by new fabrication less scrap supply. Figure 22 suggests that the net increase in fabricated product stocks could have reached as much as 8 billion ounces in the last ten years. Of course, in reality, the growth in the stock of fabricated products would have been rather less than this - some fabricated products would have come to the end of their lives yet not been scrapped as it would have been economical to recycle them at the prevailing silver price. These

Figure 22
Changes in Above-ground Stocks, 1992-2001



fabricated products would then have gone into landfill or a near equivalent. A similar observation can be made for a significant portion of total above-ground stocks fabricated products. For instance, much of the silver used in electronics products has already effectively been “lost” as silver prices would have to rise to a large multiple of today’s levels to make it worthwhile to recover the raw material. This and the lack of historical data on fabrication makes it very hard to come up with reliable estimates for the size of the current above-ground stock of fabricated products.

Establishing the true size of global bullion stocks is an equally difficult task. Estimates will vary tremendously depending on the assumptions used for the amount of silver irretrievably lost over time. (If mined silver - cumulatively no less than 40,200 Moz or 1.25 million tons - is neither lost nor in fabricated products, by default it should be in bullion form.) An alternative way of addressing the issue is to measure those silver bullion stocks that can be more easily identified. This at least provides an estimate of 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 as well as being graphically represented in the figure below.

Identifiable Bullion Stocks

Figure 23 shows that identifiable bullion stocks amounted to some 593 Moz (18,440 t) at the end of

Figure 23
Identifiable Bullion Stocks

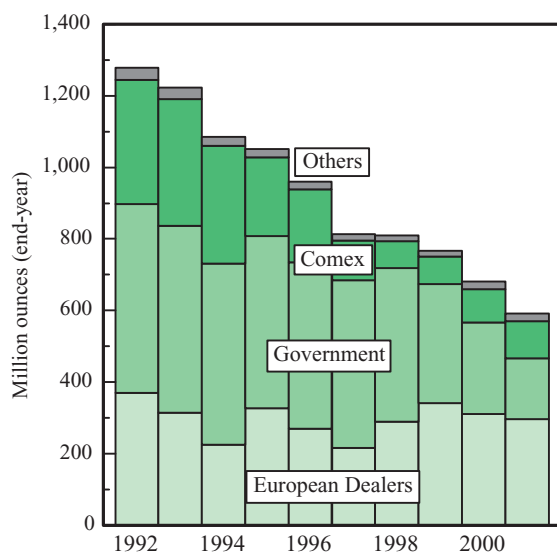
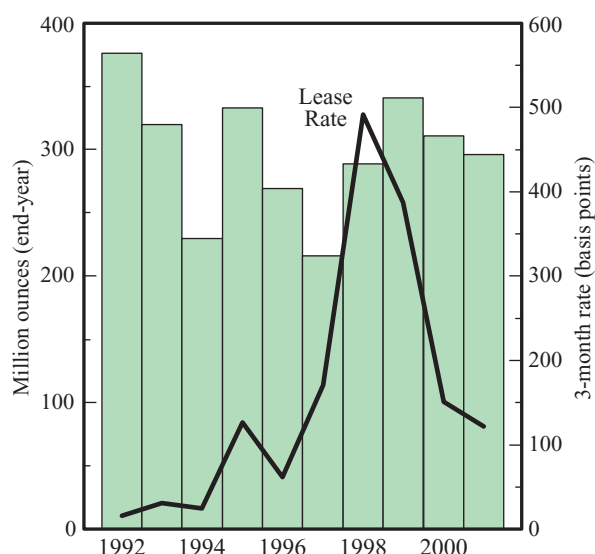


Figure 24
Bullion Stocks in Dealers' Vaults in Europe



2001. Last year, the total fell by 90 Moz (2,800 t). At the same annual rate of decline, the identifiable stock would disappear within a decade.

By the end of 2001, identifiable bullion stocks had fallen to less than half their level ten years earlier. The total decline in bullion stocks over the 1992-2001 period implied from GFMS' supply/demand data comes to 1,271 Moz (39,530 t) and around 63% of this reduction is covered by the 803 Moz (24,980 t) fall in identifiable stocks as shown in Figure 23. The balance would have come from unrecorded private or government holdings that are outside our identifiable bullion stocks universe and therefore not measurable in any reliable fashion.

There are three main components to the identifiable bullion stocks series: European dealers' vault stocks (data on which are 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.

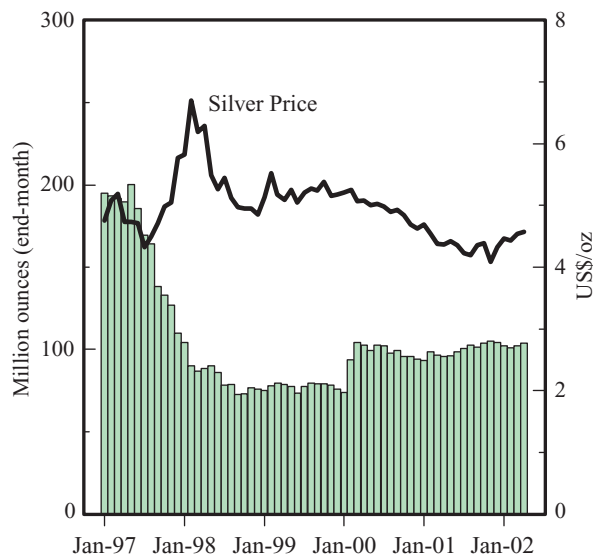
Identifiable Bullion Stocks

(Moz)

	end-2000	end-2001
European Dealers	311	296
Comex	94	105
Government	256	170
Others	22	22
Total	683	593

Figure 25

Comex Warehouse Stocks



European Dealers' Stocks

GFMS' proprietary data on European dealers' vault stocks shows that these ended 2001 little changed from the aggregate level indicated a year earlier. The decline last year of some 15 Moz (470 t) would have been greater, however, had it not been for a strong rise in stocks at the end of the fourth quarter. This was the result of some silver that had been on loan to the market being allocated and, in the wake of the rise this triggered in leasing rates, a large inflow of metal into the London market, principally from the United States. The latter effect was, if anything, more pronounced in the first quarter of this year and so it is no surprise that European dealers' stocks continued to increase, by all accounts, to above the figure registered at the end of 2000.

Notwithstanding the general stability of European dealers' stocks last year, it would seem likely that there was some turnover in holdings, including a change in ownership of metal. This is because the scale of the inflow of metal into London in late 2001 (and in January 2002) would have otherwise resulted in stocks increasing by a larger amount than implied by the quarterly information we have on European dealers' stocks. It is in fact probable that some holders took the opportunity of the end-year move in the price to get out of existing holdings. On the other hand, on balance, we are doubtful that Berkshire Hathaway would have liquidated any of its 129.7 Moz (4,034 t) position last year. There are a number of reasons for believing this to be the case, not least of which is that the silver price

Comex Silver Stocks (end period)

(Million ounces)

	Q1	Q2	Q3	Q4
2000	104	103	100	94
2001	97	99	102	105
2002	102			

in 2001 never reached a level at which Mr Buffett's fund could have profitably exited the position it built up in late 1997.

Comex Stocks

The total quantity of registered and eligible silver stocks held in Comex depositories came to 104.5 Moz (3,250 t) at the end of 2001. This represented a 10.6 Moz (330 t) increase on the end-2000 level.

Notwithstanding the over 10% rise in inventories during 2001, the spotlight was really on Comex stocks only after September 11th. This was largely because 29.9 Moz (930 t) of silver held in ScotiaMocatta's vault lay buried beneath the World Trade Center. The non-availability of this silver led to some concern regarding the amount of silver on hand in the admittedly unlikely event that delivery were taken against Comex futures and options contracts. The need to compensate for this state of affairs may explain why Comex stocks did not fall in late December in spite of the increase in leasing rates and the associated premium available in the London market. Access to the buried silver was restored in early January 2002 and this played a part in easing the squeeze on liquidity that was affecting the market at this time.

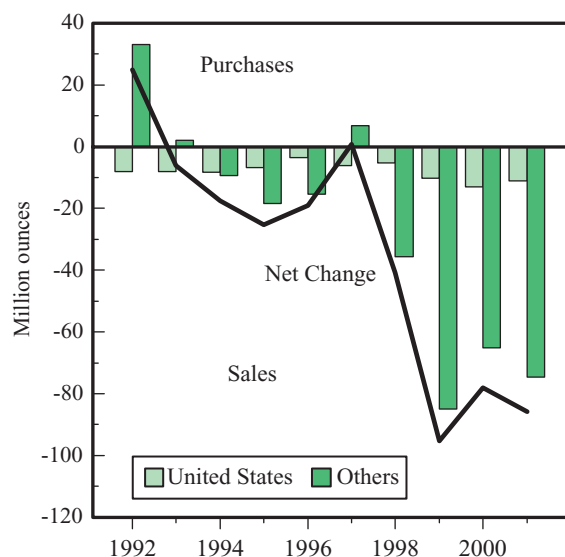
Government Stocks

In 2001, for the third year in a row, the silver market had to absorb a very high level of government stock sales. The net figure of 85.7 Moz (2,666 t) estimated by GFMS was up 9.7% year-on-year. Once again, China dominated the picture, its 64.3 Moz (2,000 t) of net sales accounting for no less than 75% of the world total in 2001. (Chinese government disposals are discussed in greater detail in the box on page 34.)

The bulk of the net sales by other countries was accounted for by the United States. This silver has come out of the Defense Logistic Agency (DLA) stockpile, the last of which was physically transferred to the US Mint during the course of 2001. The DLA will, however, continue to show this silver on its books until it is all consumed by the US Mint in its various

Figure 26

Changes in Government Stocks



coin programs. The data published by the DLA on the level of its stockpile is helpful in mapping changes in US government stocks but only tells part of the story. To some extent, this is because the statistics refer to fiscal not calendar years. For this reason, GFMS also relies on the US Mint's data for coin sales in its generation of numbers for US government stock sales.

Excluding the United States and China, other sales totaled just over 10 Moz (310 t). This number is, however, conservative. The main reason is that we have only been able to capture partially the melting of demonetized coins in Europe. This was especially important last year (and will continue to be so in 2002) because of the changeover from national currencies to the euro. This development has focused attention again on the large stocks of demonetized silver coins held in several European countries.

Similarly, our number for outstanding government silver stocks at the end of 2001 of 170 Moz (5,300 t) should be regarded as a "low field" estimate. Not only does this probably fail to capture all the officially held coin stocks in Europe referred to above but it also includes a relatively conservative estimate for Chinese government holdings.

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 23 and were unchanged year-on-year at 22 Moz (680 t) at the end of 2001.

Silver Borrowing

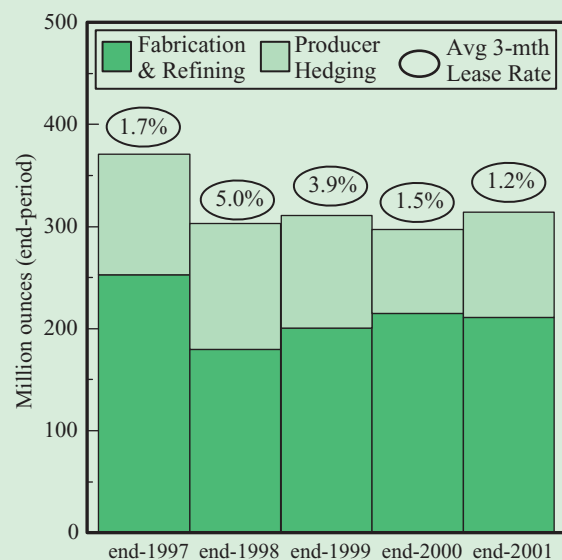
Silver borrowing demand is estimated to have risen in 2001. The growth was entirely due to the 20.4 Moz (634 t) increase in producer hedge positions, which is described in Chapter 4. By contrast, fabrication related borrowing is thought to have fallen. This chiefly occurred because of the slump in the output of industrial goods containing silver. The accompanying fall in the level of work in progress and rundown in inventory will have driven down the requirement for borrowed silver from this quarter.

The weakness in borrowing demand explains why for much of last year silver leasing rates remained at a very low level (e.g. 3-month rates averaged only 1.2% in 2001). Indeed, borrowing costs across all tenures were at the lowest levels seen since 1996.

Rates surged in December and in January 2002, with 3-month silver at one point briefly exceeding 10%. This was due to a squeeze on liquidity initiated by metal being withdrawn from the lending market. Eventually fresh supplies of silver and sagging borrowing demand alleviated the shortage that had been created and rates returned to more normal levels.

Figure 27

Silver Borrowing



Chinese Bullion Stocks

It is useful to begin this focus box with two observations. Firstly, collecting data on the silver market in China has never been easy and the secrecy surrounding mine production and central bank sales/allocation has been, and remains, a statistical challenge. Secondly, although GFMS' analysis of this market is now fairly widely accepted, there are still those who maintain that China has **not** been a substantial exporter of metal, from domestic sources, over the past 4 years. This contrary view has been founded on the (mistaken) belief that mine production is actually quite small (less than 8 Moz or 250 t), that the bulk of exports recently has been from imported base metal concentrates and that the mainland has in fact been a substantial net importer of silver for much of the past decade.

It is certainly true that, during the late 1970s and early 1980s, China was not a large producer of silver. This was cause for considerable concern in the State Council at the time, who then decided that in order to support China's industrialization and to move towards self-sufficiency, local production needed to be expanded.

This led to a series of supportive policies being put in place to boost domestic production (the People's Bank of China (PBOC) was given sole responsibility for setting prices and buying and selling silver). As a result of these measures, production increased rapidly through the 1980s. A number of large primary silver mines were brought on stream, silver rich base metals operations were developed and smelter and refining capacity was upgraded to facilitate efficient extraction. It is our view that China was almost certainly a surplus producer of silver by the end of the 1980s and has remained so ever since.

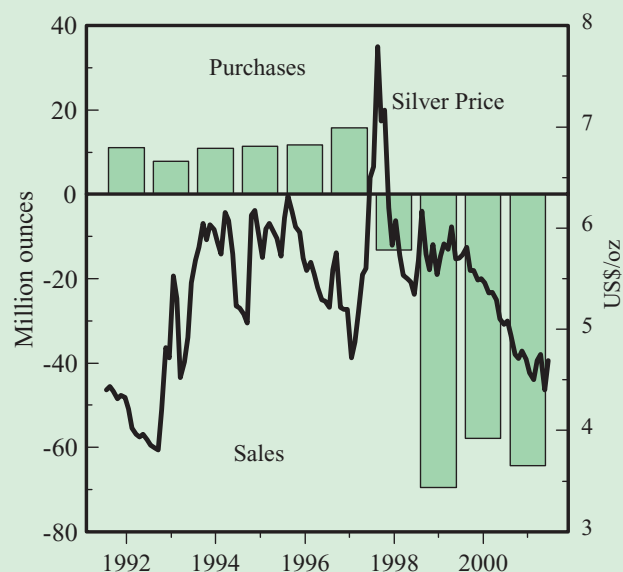
Although the magnitude of the cumulative surpluses cannot be known with certainty, it is GFMS' understanding that by the mid-1990s, they were substantial indeed. In fact, as early as 1996, a senior Chinese official made it very clear to us that the government had no need, nor any desire, to purchase more silver to add to stockpiles. It is no coincidence that at the beginning of 1997, the official PBOC purchasing price was reduced by over 6% and that it remained at this level until the market was deregulated in 2000, in spite of the gyrations in the global price in the intervening years (thus remaining at a nearly permanent discount to the international price). In a nutshell, it appears as if the central planners overestimated the speed at which demand would grow as China industrialized.

Based on GFMS estimates, loco-China stocks were built up during much of the 1980s and, especially, the 1990s. However, there was a sea-change in activity in 1998. (In Chapter 6 we discuss the various holders of these stocks. It is important to realize that not all of this metal was held

directly by the PBOC). In that year, based on hard data, GFMS estimates show various agencies in China shipped a significant volume of metal to the international market. Around 50% of these exports were to Europe and the balance into the Asian markets, mainly to India. (In contrast to the following years, it is our belief that all of this metal was in fact sold.) The next year saw a massive increase in exports (and implied stock depletion) and shipments have remained at elevated levels. On a point of clarification, it is crucial to note that GFMS' estimates of silver exports are in fact substantially larger than the net run down in stocks shown below. This is because a proportion of these shipments came not from hoards but from surplus domestic mine production as well as from silver recovered as by-product from imported lead, zinc and copper concentrates. However, in 2001, the latter would have contributed at most 14.5 Moz (450 t) to locally available silver in China, up by around 75% on 2000's volumes. (Prior to liberalization silver recovery from imported concentrates was very low. This was primarily because foreign producers were unwilling to ship silver rich concentrates to China due to PBOC controls over the market.)

As Figure 28 implies, over the past ten years, there has been a net run down of stocks in China. A key question then concerns the level of holdings prior to this. Here the uncertainty is greater. Our view is that, considering official fears in the 1980s about not having enough silver to feed industrial demand, these stocks were probably not massive. And although we estimate that China can still supply substantial volumes of silver to the international market, the capacity to continue at current levels must surely be limited.

Figure 28
Chinese Government Sales



Scrap

- Global scrap supply in 2001 is estimated at 184.2 Moz (5,730 t), up 3% year-on-year

Last year saw silver scrap increase by 2.7% to reach 184 Moz (5,730 t). This represented 21% of total silver supply in 2001, a contribution that is slightly higher than that typical for gold (in 2001, gold scrap is estimated to have provided 18% of that metal's supply).

As in past years, the United States remains the biggest source of scrap, generating around 36% of the world total, followed by Japan (16%) and Germany (9%). The importance of US scrap is highlighted by the fact that, if we exclude the 4.2 Moz (131 t) increase in its contribution last year, the rest of the world's scrap rose by only 0.5%.

Given the historically low correlation (less than +0.5) between the silver price and scrap supply, it is hardly surprising that price does not appear to have been a major consideration influencing the quantity of scrap supplied last year; the former falling 11.7% (basis annual averages) and the latter rising the above mentioned 2.7%.

The intra-year change in prices in 2001 (a fall of 1.5%) might imply a closer link between price and scrap. However, the decline in the price in 2001 through to late November was over 11%, by which time the vast majority of decisions and actions as regards scrap would have been taken.

Part of the reason for the weak link between prices and scrap is that the majority of silver scrap comes from the photographic and electronics industries and here issues other than price (or the level of fabrication demand) are important in determining the level of scrap generated. These include waste management regulation and changing technology (both in the way that silver is used in the product as well as how it is applied by the recycling industry in improving recovery processes).

Another issue, which came into play last year, is the potential for recycling of finished product inventories. This can lead to silver coming back onto the open market and can provide an in-house substitute for purchased new raw material. In 2001, the slowdown in the electronics sector was an important reason behind an increase in the amount of inventory recycled by manufacturers.

Last year, the supply of scrap from Europe saw a

modest 1% rise to 44.8 Moz (1,395 t). Part of this growth was attributable to a higher coin melt. Such coin melt was from both private and government stocks. In the case of the former, the coin melt was treated as scrap rather than included in our residual for investment/disinvestment (see Chapter 3 for how this is arrived at). When it comes to the government component, lack of data on the size of stocks before and after the coin melting has led us to also include this in our scrap category (this is explained further in Chapter 5). The melting of coin was most apparent in **Austria** though it also featured in other countries such as **France**. The dramatic changes in industrial and photographic fabrication in some EU countries (see Chapter 7) should have limited impact on their scrap volumes as these are more a function of the location of consumption rather than fabrication. In addition, digital inroads into photography will have a delayed effect on scrap supply due to time delays before processing X-ray films, as some of these could be held for a decade before being scrapped. (By contrast, the impact on the amount of silver won from spent fixer solutions is likely to be more immediate.)

The close to 7% rise in the scrap supply from the **United States** hides two underlying trends, which worked in opposing directions. On the one hand, the weakness of industrial fabrication demand resulted in some manufacturers recycling unsold inventory for use in their manufacturing process. This phenomenon,

Figure 29
World Scrap Supply

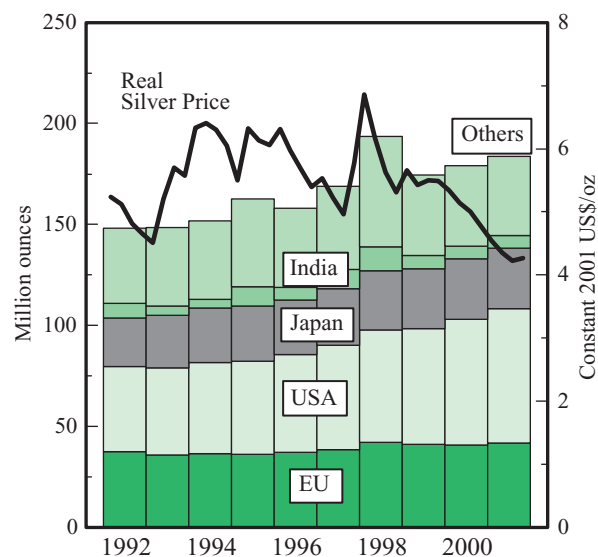


Table 3
Supply of Silver from the Recycling of Old Scrap
 Million ounces

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Germany	16.1	15.8	15.4	14.8	15.4	16.1	16.4	16.1	16.7	16.8
UK & Ireland	7.2	7.3	7.9	7.4	7.6	8.4	10.8	11.5	10.9	11.1
France	5.3	4.0	4.2	4.7	4.5	4.3	4.1	4.0	3.5	3.9
Italy	2.7	2.7	2.8	3.2	3.5	3.4	4.7	3.4	3.4	3.5
Austria	1.9	1.9	1.9	2.0	1.8	1.8	1.8	1.7	1.6	2.0
Netherlands	1.2	1.1	1.3	1.1	1.3	1.3	1.3	1.3	1.4	1.4
Sweden	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Belgium	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7
Norway	0.8	0.8	0.8	0.8	1.0	1.0	0.8	0.9	1.1	0.7
Denmark	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Czech & Slovak Republics	1.0	0.8	0.7	0.7	0.9	0.8	0.7	0.6	0.6	0.5
Portugal	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.4
Spain	0.3	0.3	0.3	0.4	0.5	0.5	0.4	0.4	0.4	0.4
Switzerland	0.7	1.5	0.6	1.6	1.7	0.8	0.4	0.3	0.3	0.3
Romania	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other	1.5	1.5	1.5	1.5	1.5	1.6	1.5	1.5	1.4	1.4
<i>Total Europe</i>	41.5	40.6	40.3	41.1	42.5	42.7	45.9	44.6	44.2	44.8
North America										
United States	42.3	43.2	45.2	46.0	48.4	51.8	55.7	57.4	62.4	66.6
Mexico	2.3	2.3	2.3	4.8	2.4	4.3	10.6	2.4	2.1	1.9
Canada	1.3	1.3	1.3	1.7	1.8	1.6	1.9	1.6	1.4	1.4
<i>Total North America</i>	45.9	46.7	48.7	52.5	52.6	57.7	68.3	61.4	65.9	70.0
Central & South America										
Brazil	1.9	1.9	1.9	1.9	1.9	1.6	1.6	1.8	1.5	1.0
Argentina	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7
Chile	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4
Other	0.8	0.8	0.7	0.7	0.7	0.7	0.9	0.9	0.8	0.8
<i>Total Central & South America</i>	3.9	3.8	3.8	3.8	3.8	3.4	3.7	3.7	3.4	2.9
Middle East										
Turkey	1.9	2.0	2.3	2.3	1.9	1.6	1.7	1.4	1.3	1.3
Egypt	0.6	1.0	0.9	0.8	0.7	0.3	0.4	0.3	0.9	1.1
Saudi Arabia & Yemen	0.6	0.8	1.9	3.0	1.3	3.2	2.1	1.1	0.7	0.8
Other	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4	0.3	0.4
<i>Total Middle East</i>	3.4	4.2	5.4	6.5	4.3	5.5	4.5	3.2	3.2	3.5
Indian Sub-Continent										
India	7.2	4.5	4.5	9.6	6.4	9.6	11.9	6.7	6.4	6.4
Other	0.2	0.2	0.2	0.3	0.2	0.3	0.5	0.4	0.4	0.5
<i>Total Indian Sub-Continent</i>	7.4	4.7	4.7	9.9	6.6	10.0	12.4	7.0	6.8	6.9
East Asia										
Japan	24.2	26.2	26.9	27.3	27.1	27.8	29.2	29.5	29.8	29.9
South Korea	2.6	2.9	3.0	3.3	3.4	3.6	7.8	5.3	5.3	5.4
Taiwan	0.9	0.8	0.7	0.7	0.7	0.8	0.8	0.9	0.9	0.9
Indonesia	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.4
Hong Kong	0.3	0.3	0.3	0.3	0.3	0.4	0.5	0.4	0.4	0.4
Thailand	0.3	0.3	0.3	0.3	0.4	0.8	1.0	0.4	0.3	0.4
Vietnam	0.3	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.3
Philippines	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Singapore	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Malaysia	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<i>Total East Asia</i>	29.3	31.5	32.4	33.2	33.2	34.7	40.8	37.9	38.2	38.4
Africa										
South Africa	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other	1.0	0.9	0.9	1.0	1.0	0.9	1.0	1.0	1.0	0.9
<i>Total Africa</i>	1.1	1.1	1.0	1.2	1.1	1.1	1.1	1.1	1.1	1.1

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

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Oceania										
Australia	2.3	2.4	2.5	2.5	2.3	2.3	2.4	2.4	2.4	2.4
<i>Total Oceania</i>	2.3	2.4	2.5	2.5	2.3	2.3	2.4	2.4	2.4	2.4
Western World Total	134.7	135.1	138.7	150.7	146.3	157.4	179.1	161.3	165.3	169.8
Other Countries										
China	3.7	3.7	4.1	4.3	4.5	4.6	5.8	5.9	6.0	6.2
Other	10.0	9.7	9.0	7.7	7.4	7.1	8.8	7.7	7.9	8.1
<i>Total Other Countries</i>	13.6	13.4	13.1	12.0	11.9	11.7	14.6	13.6	13.9	14.3
World Total	148.3	148.5	151.9	162.7	158.2	169.1	193.7	174.8	179.2	184.2

combined with an element of outright stock liquidation and sale back to the market, led to a tremendous rise in old scrap supply from industrial sources.

On the other hand, scrap supply from the ethylene oxide catalyst market is estimated to have fallen last year, by the order of 20%. This was due to a combination of weak demand, which meant that in some cases the catalysts could be run at below full capacity (thereby postponing the renewal process for those catalysts approaching the end of their shelf life). In addition, the weakness in ethylene prices (for much of last year) also delayed the recycling process as this it enabled catalysts to be run less efficiently. (Lower efficiency means ethylene losses which, in years of normal ethylene prices, would lead to the old catalysts being swiftly replaced.)

Notwithstanding the large increase in **Indian** fabrication, domestically generated scrap remained at the same level as in the previous year. This is hardly surprising given the decline in the silver price for most of the year, and the responsiveness of the Indian market to both changes in, and the level of, the price. As noted in Chapter 2, silver in local currency terms remained low for much of last year, most importantly keeping well below the psychologically significant 8,000 rupees/kg level (and in fact spending most of the year below the 7,500 level) which provided little incentive to sell back old silver jewelry and silverware. In fact, there were few price opportunities last year to offload any excess silver in scrap form.

An additional consideration to bear in mind in the context of Indian scrap is that it is not yet fully exposed to the pushes and pulls of the international market because of taxes on imports and restrictions on exports. In particular, this tends to limit the extent of

price arbitrage between the local and international markets. For instance, if the silver price increases markedly, Indian scrap merchants are reluctant to purchase significant quantities because they cannot easily hedge their price exposure, and more importantly, cannot ship excess material back to London. (There is the additional constraint that there are no London Good Delivery refiners in India).

Neither **Japanese** nor **Chinese** scrap levels increased much last year, with the former recording a minuscule 0.3% increase whilst the latter saw volumes rise by 3.3%. Part of the reason for the slowdown in Japanese recovery of silver that has been suggested to us is that there appears to be less coming out of hospitals nowadays, mainly because of the growth in non-silver imaging systems. Although it is difficult to identify with any precision exactly what impact this is having on overall scrap volumes, this was singled out by scrap collectors as having had a marked affect on their business last year.

6. Silver Bullion Trade

- Silver imports into India increased sharply in 2001, up by around 20% year-on-year. India absorbed much of the export volumes originating from China, which although slightly below the high of 1999, remained substantial.

Europe

Europe is a major importer of silver with the United Kingdom and Switzerland receiving the bulk of the region's metal. Trade flows in and out of Europe occur for a number of reasons. Firstly, Europe's refineries take mine production from all over the world. This production is converted into bars and other products and much is re-exported. Moreover, as well as being the location of key refineries, Europe is also home to the major physical bullion trade hubs of London and Zurich, and much of the international silver trade passes through the region. Finally, it should not be forgotten that Europe is a natural importer, with demand from manufacturing industries - amounting in 2001 to 226.4 Moz (7,041 t) - far outstripping domestic mine production of 55.5 Moz (1,726 t), scrap recycling of 44.8 Moz (1,393 t) and disharding.

United Kingdom bullion imports in 2001 increased by a substantial 53% to 96.3 Moz (2,996 t). The main reason for this rise was the loco-London lease rate spike that occurred at the end of 2001. Figure 30 clearly shows that imports were concentrated towards the end of 2001 and continued at a high level into January 2002, mirroring the lease rate profile. Imports from the United States were over 300% higher than 2000, at 18.4 Moz (572 t), with imports in December

alone amounting to 6.8 Moz (213 t). Imports from Switzerland also increased dramatically, from negligible amounts in 2000 to 4.8 Moz (149 t) in 2001. As with shipments from the United States, imports from Switzerland were concentrated in December, indicating that they related directly to the London premium. Looking to other origins, movements from Mexico, Peru and Kazakhstan were up while shipments from Russia and Canada were down.

United Kingdom bullion exports were down by 52% in 2001. This is a reflection of the high level of exports that occurred in 2000 and the fact that in 2001 the London price was, on average, at a premium to New York. (During 2000, by contrast, prices on Comex were above those in London, with the associated large export volumes from London exploiting this arbitrage opportunity.) Shipments to the United States were down from 32.0 Moz (995 t) to less than 1 Moz (25 t), whilst movements to Belgium were down by almost 50% to 5.7 Moz (177 t). Exports to India were down by 12% reflecting increased competition in that market from China, while exports to Japan fell sharply by 96%, mirroring the collapse in industrial demand in that market.

Italian official bullion imports in 2001 fell a significant 8% year-on-year to 58.9 Moz (1,831 t).

Figure 30
UK Bullion Imports

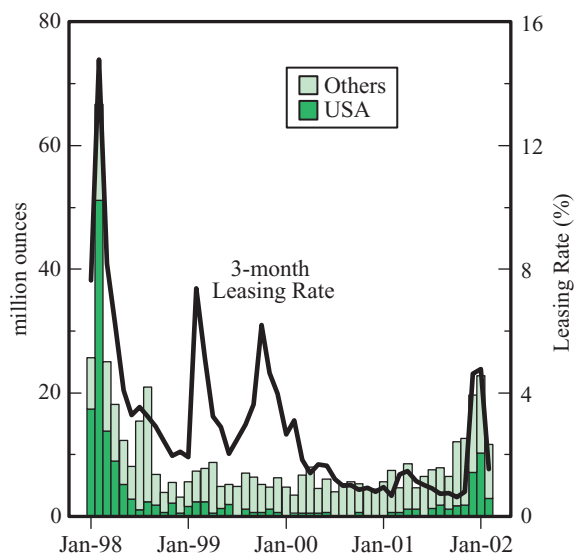
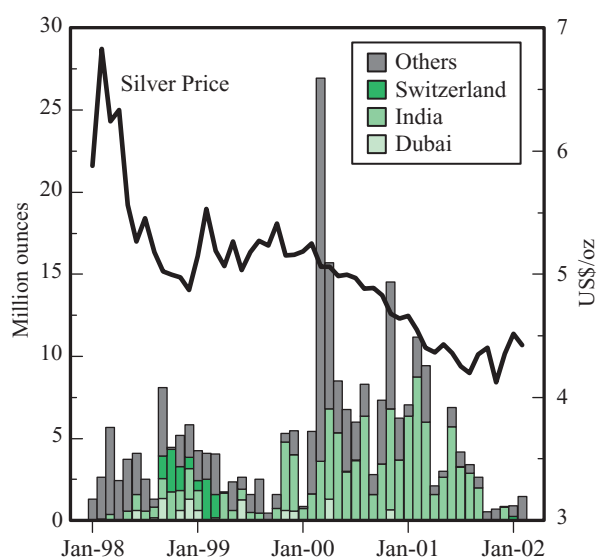


Figure 31
UK Bullion Exports



The scale of this fall, however, was much less than that for total fabrication in Italy, which slumped by 15%. The difference is explained by the ongoing switch from unofficial to official imports. This began in 2000 following a change in taxes on silver. During 2000, unofficial imports fell precipitously, though were still sizeable, while in 2001 they virtually disappeared. It is this change in the composition of imports that lies behind Figure 32's misleading impression of surging imports.

The second key feature to imports last year was their fourth quarter slowdown. Until August, cumulative imports were flat year-on-year, yet from then onwards the two years started diverging with fourth quarter imports down a substantial 21%. The September 11th attacks no doubt played their part but perhaps the key driver was the slowdown in domestic and global economic growth, which undermined fabrication demand.

North America

The slowdown in fabrication demand in the United States, which started towards the end of 2000, gathered pace last year. It is therefore perhaps not surprising that US bullion imports ended the year some 18% lower year-on-year. Much of the decline was due to the near absence of material from the United Kingdom. Excluding the United Kingdom, imports were over 10% higher last year. Shipments were more than 10% higher from Canada although imports from Mexico were marginally lower (a second half rise nearly

compensated for a weak first half). Imports from Peru, although up strongly, returned to a level approaching that of 1999. Similarly, shipments from Chile nearly doubled last year although they remained at close to half of the total imported into the United States two years ago. In the case of both Peru and Chile, this was partly in response to a shift in export destinations, principally between the United States and Japan. The latter had seen a sharp rise in imports of silver bullion in 2000, as industrial demand rose to a record level. The "normal" supply of silver from (mainly) imported concentrates could not satisfy demand (typically supplied on long-term contracts which cannot usually be amended in the short term) and so material was effectively "diverted" from the United States.

Finally, the 17% fall in domestic mine production last year arguably had little impact on bullion imports due to weakness in US industrial demand and this led to more metal being available to be shipped across the Atlantic than would otherwise have been the case.

In contrast to the lower level of imports, US exports more than doubled in 2001. This was almost entirely due to a rise in shipments destined for the United Kingdom, which saw a six-fold increase. Exports to the United Kingdom were higher nearly every month in 2001 (on a year-on-year basis) although the really dramatic surge in shipments only occurred in December. This was in response to sharply higher silver lease rates (mainly in the shorter dates, although rates were generally higher across the curve). This trend continued into early 2002 (3-month rates were

Figure 32
Official Italian Bullion Imports

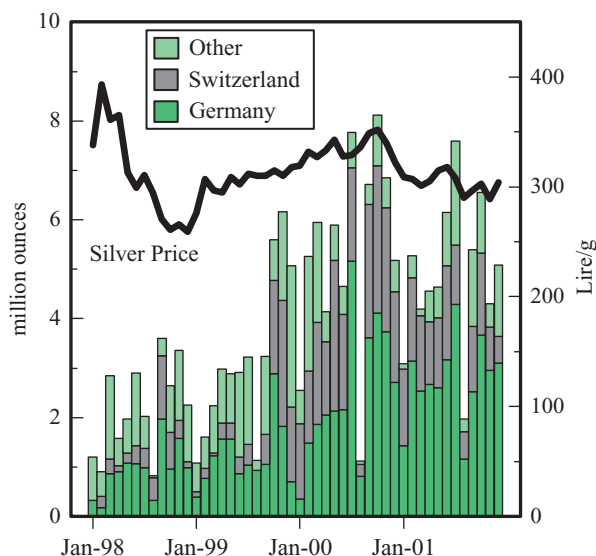


Figure 33
US Bullion Exports

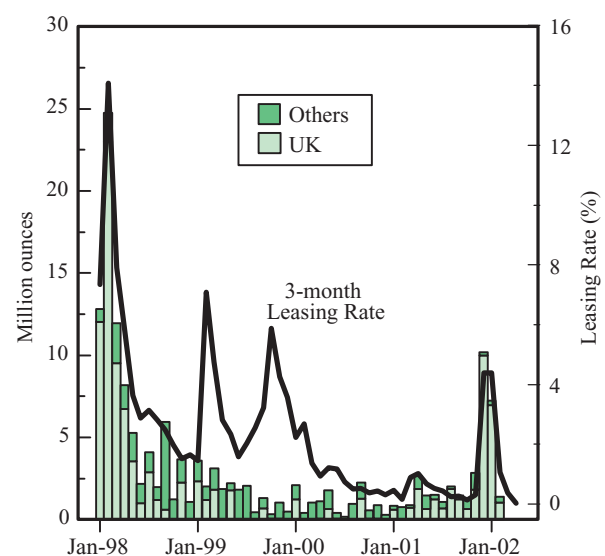
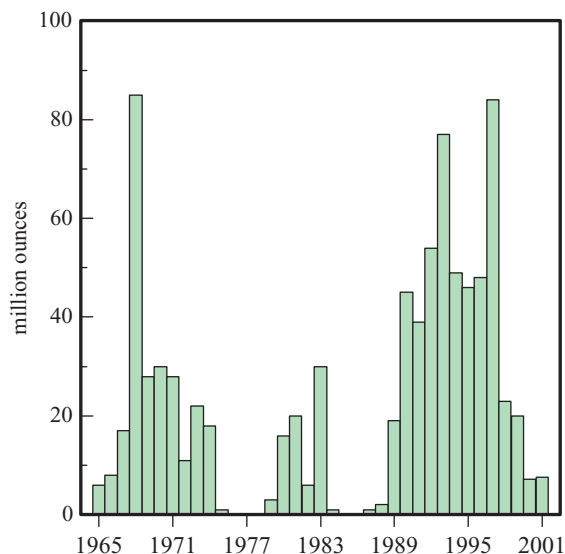


Figure 34
Dubai Bullion Imports



higher in January than before the New Year) but by February, as pressure on lease rates eased, the flow of metal across the Atlantic returned to more “normal” levels.

Middle East and Indian Sub-Continent

The flow of silver through the Istanbul Gold Exchange in Turkey is related to both the level of domestic mine production, which is treated locally (as opposed to exported as concentrates) and the strength of silver fabrication. The 48% fall in bullion imports last year reflected the weakness in domestic fabrication (see Chapter 7), as well as (but to a much lesser degree) the modest improvement in mine production, which was destined for the local market.

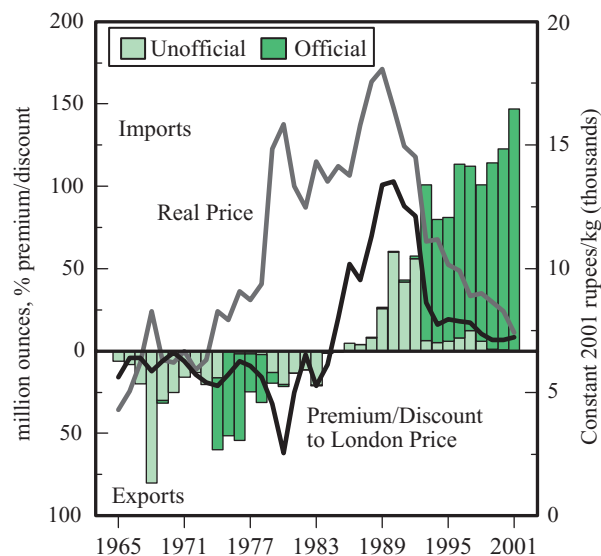
Egyptian bullion imports collapsed last year in the wake of falling demand and sustained weakness in the value of the Egyptian pound. As the year progressed, a discount emerged in Egypt (basis the black market rate combined with the 21% import duty), which made it unprofitable to import bullion.

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 2001 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 rose sharply in 2001, up by around 20% year-on-year, to post a record of almost 150 Moz (just over 4,600 t). As the table on page 41 illustrates all too clearly, Open General License (OGL) imports are the only really significant import category now. The reason for the collapse in Special Import License (SIL) shipments has been two fold. Firstly, the cost of using this import channel in the past has always been high which has discouraged its use, and secondly, from April 2001 the SIL import category was actually withdrawn. Imports by Non-Resident Indians (NRI’s) have never been particularly significant. With the exception of February last year, when around 1 Moz (30 t) was imported via the NRI channel, this remained true for the rest of 2001 (with imports being measured only in the thousands of ounces). In contrast to gold, where the import duty was reduced at the beginning of last year, the fixed duty of 500 rupees per kilogram for silver was left unchanged (equivalent to a rate of around 7% in 2001 due to the lower average silver price).

We have written at length in previous World Silver Surveys that the sources of silver feeding the Indian market have changed dramatically over the years. The ability to bring in consignment stocks and the smoother processing associated with OGL imports have meant that the Indian market is now fed from a wide variety of sources including countries in East Asia, South America, Europe and the CIS. According to GFMS data, China/Hong Kong was far and away the largest supplier of silver to India last year, accounting by our estimates for over 40% of the market. The next

Figure 35
Net Indian Bullion Imports and Exports



Indian Bullion Imports

Million ounces	1997	1998	1999	2000	2001
OGL	0.6	93.3	108.9	121.9	145.5
NRI	0.8	0.1	0.1	0.1	1.1
SIL	96.9	1.4	1.4	0.1	0.0
Replenishment	1.5	0.3	3.0	0.9	1.1
Sub-total	99.8	95.1	113.3	123.0	147.7
Unofficial	12.5	5.8	1.2	0.8	0.4
Total Imports	112.4	100.9	114.5	123.8	148.1
Local premium*	23%	9%	11%	12%	12%

*percent above London price at the official exchange rate

largest source of supply in 2001 was Europe, which supplied something in the order of 30% of India's needs.

The importance of Chinese silver in the context of the Indian market cannot be overstated. Contrary to what some others have suggested, GFMS believe that the flow of metal from China to India has been an important factor underpinning the weakness in the international price (see Chapters 2 and 5 for more on this). As anyone who has visited India over the past three years will be able to confirm, Chinese silver is ubiquitous, appearing in a variety of forms (various bar shapes and grain) and purities (most is 99.9% purity and higher, but there have been instances where the assay has been substantially lower than this). And although numerous complaints have been made about purity standards and contaminants (which have caused cracking in silverware for example), it appears as if the market is happy to accept Chinese metal, suggesting that these comments probably overstate the extent to

which there are problems. Indeed, in certain parts of the country it is difficult to find other brands of silver available in the market.

Looking at the rest of the table opposite, it is clear that smuggling of silver has effectively ceased, primarily because the premium available is too low to make this economically viable. On recent GFMS field trips to India, it has been suggested that smuggling on a small scale still occurs, and the number opposite makes allowance for these flows.

Although it is still difficult to source precise numbers on replenishment silver, GFMS data does point to an increase last year, primarily on the back of stronger jewelry exports to the United States, as was the case in 2000. (The replenishment scheme allows for duty free imports of silver to feed the export market.)

Looking to the rest of 2002, it seems likely that the change in tax structure in Maharashtra State (which has seen a reduction in sales tax) will see higher flows of silver into Bombay/Mumbai. It should be recalled that in the past Bombay/Mumbai was one of the main import centers but, due to the punitive tax regime in Maharashtra State, the silver trade there effectively came to a halt and moved to Ahmedabad.

East Asia

For more than 4 years, China has been an important supplier of silver to the international market. Indeed, as we discuss elsewhere in this survey, GFMS believe that these flows have been important in keeping the price under pressure.

Figure 36

Estimated Indian Bullion Imports by Scheme

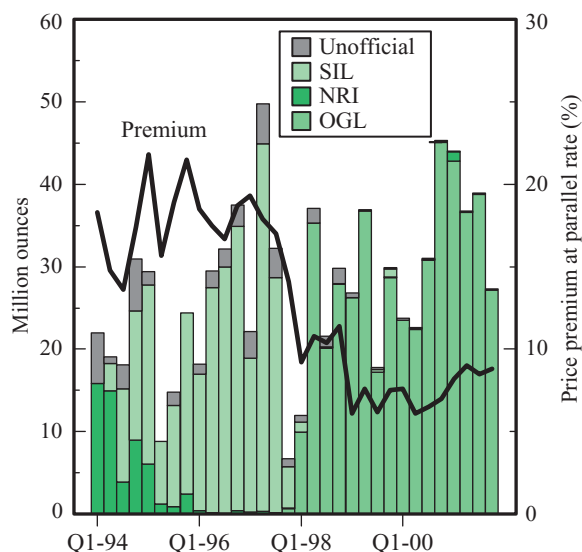
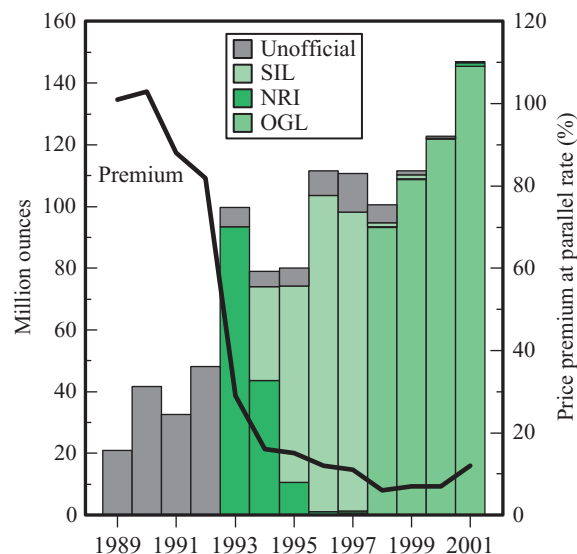


Figure 37

Estimated Indian Bullion Imports by Scheme



Before delving into the detail of these shipments, it is important to note that there is not universal consensus about their existence or their magnitude. Initially the dissident view suggested that China was in fact a major net importer of silver. Fortunately, the weight of evidence pointing to the fact that this was clearly not the case has won the day. However, this view has now been modified slightly, suggesting that instead of China being a net importer, they are only modest exporters of silver, with most of this having been generated from imported concentrates (Chapter 5 touches on this matter).

In setting the record straight, it is useful to begin by noting that GFMS believe China has actually been a net exporter of silver over the past decade, although the volumes in earlier years were relatively modest (typically around 3 Moz (100 t)). In fact, based on other proprietary data, we believe that China has been exporting silver, mostly unofficially, since the late 1980s. The main driver behind this was the fact that the People's Bank of China purchasing price for silver was consistently below the international price, which encouraged unofficial flows of the metal to Hong Kong.

The real sea change in activity occurred in 1998, when exports ratcheted up dramatically from the year before. Our view is that around half of these flows were what may be termed genuinely official shipments, with most of this material going to Europe. The term "genuinely" official is important, as GFMS have always distinguished between these and what we have termed "quasi-official" exports. As we discussed in some detail in last year's *World Silver Survey* and pick up in Chapter 5 again, it has long been our understanding that silver stocks in China have been built up and held directly by the People's Bank of China (what we term genuinely official), other public agencies ("quasi-official") and by what may be termed the private sector. (On our most recent trip to Shanghai in February 2002, it was pointed out that there are two main recycling and recovery centers in China, employing tens of thousands of people, which have effectively operated privately for the past decade.)

1998 turned out to be only a taster of things to come and the floodgates opened in 1999, with the outflow of metal from China increasing, basis GFMS estimates, by a factor of close to four. Although the volumes have fallen back slightly since then, they remained at elevated levels throughout 2001.

The destinations for these exports have remained essentially unchanged over the years and include

Europe, India, Thailand, Taiwan, Malaysia and Dubai amongst others. However, there were some fairly large shifts in the volumes being shipped, with flows to Europe having dropped markedly in 2001 (by over two-thirds).

Much was made of the liberalization of the Chinese market at the beginning of 2000, when the government ended its 50-year monopoly on sales and purchases of silver. The most obvious manifestation of this was the Huatong Silver Exchange, which was given exclusive rights to trade and manage the silver market. To date, this innovation has been something of a disappointment, with volumes on the exchange remaining at very low levels. In fact, most trading of silver within China is being done directly between counter parties, the reason being the ongoing dispute regarding the charging of value added tax (VAT).

It is our view that the elevated levels of exports since the opening of the market has been perpetuated, in part at least, by the high level of VAT (20%) applied to silver trades. It is no coincidence that as a consequence of the wrangling over VAT, export quotas for silver have increased dramatically since 2000 (although part of this is really just legislation catching up with reality). For instance, in 2000, four exporters were granted export quotas totaling 13.5 Moz (420 t). By 2001, this had grown to 37.9 Moz (1,180 t) via 16 exporters. (For 2002, the quota has reportedly been set at 57.8 Moz (1,800 t) via 20 companies.)

The official Hong Kong trade data also appears to be

Figure 38
Singapore Bullion and Semis Imports

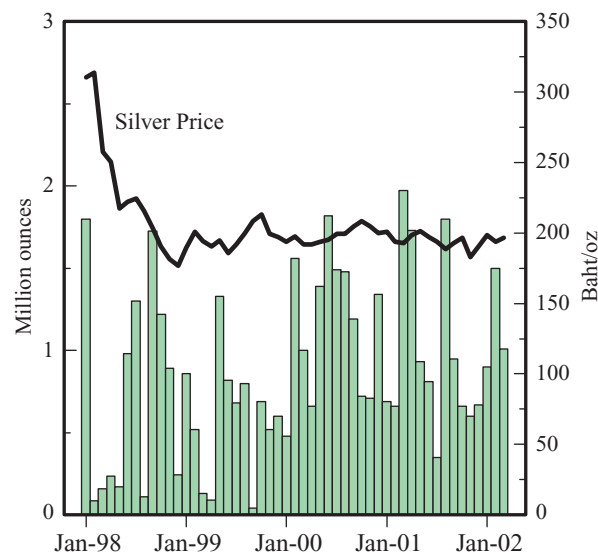
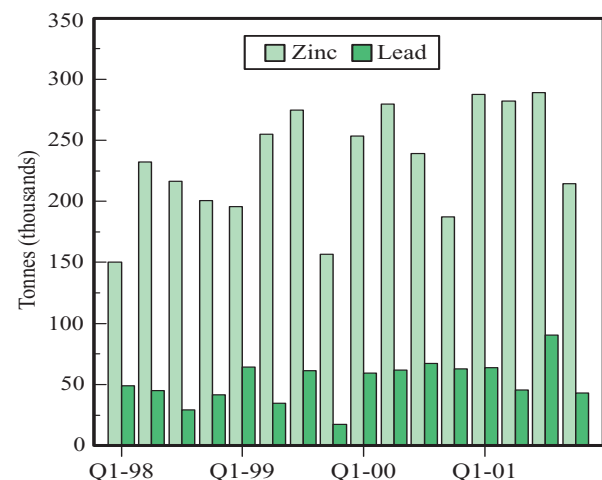


Figure 39

Korean Lead and Zinc Concentrate Imports



Source: WBMS

playing a bit of catch-up. Recorded imports rose from only 9.3 Moz (289 t) in 2000 to a massive 49.5 Moz (1,540 t) last year, most of which originated from China. The bulk of the re-exports last year were destined for India, Thailand and Dubai.

Silver imports into Japan in the form of bullion and concentrates declined sharply in 2001 according to GFMS data, by around 20% year-on-year. Considering the weakness of industrial demand this should not be too surprising. Bullion imports are calculated to have fallen by a massive 40% in 2001 accompanied by a 3.5% decline in imports of silver contained in concentrates.

Korean imports of bullion also fell sharply last year, dropping by 33% year-on-year to around 3.4 Moz (107 t). However, silver contained in concentrates more than offset this, rising by close to 16% over the previous year, resulting in total available silver increasing by over 4.5%. Not all of this was used locally, however, and GFMS estimate that around 38% of total available silver was exported last year.

Official silver bullion imports into Singapore totaled 11.8 Moz (367 t), a fall of 15% year-on-year. This is surprising considering continued growth in the important end-markets of Thailand and Indonesia but is explainable by two main reasons. Firstly, Singapore is still important as a distribution point for silver but there has been an increase in the volume of direct shipments (sometimes trans-shipped via Singapore) to the two destination countries mentioned. Secondly, silver coming from China provided an alternative (and

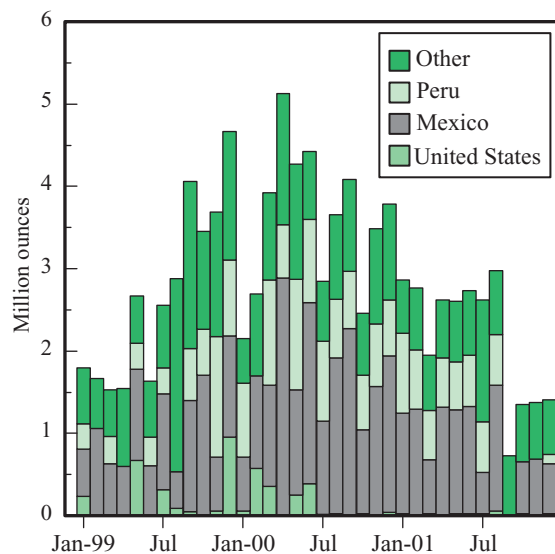
cheaper) source of metal, particularly for Thailand. It should also be noted that placing too much emphasis on the “official data” could be misleading, particularly in light of an examination of other trade flow data of neighboring countries such as Malaysia and Indonesia.

Given Thailand’s status as the third largest user of silver in Asia (behind Japan and China), the sources of silver and the importation routes tend to be varied with five countries each supplying more than 1.6 Moz (50 t) per annum on average. (GFMS estimate that 11 countries supplied more than 0.3 Moz (10 t) last year.) A still sizeable quantity of the metal arrives through unofficial channels, although as a proportion of total imports, this was less in 2001 than in 2000. Consequently, such bullion flows are difficult to identify (and therefore to measure).

Last year saw an increase in the quantity of silver sourced by Thailand from China and Hong Kong, rising by around 35% year-on-year. This reflected the still large quantities emanating from this region and finding their way into the main silver entrepôt and destination markets. The silver imported into Thailand is typically sold on directly into the local market to the smaller players, but is occasionally refined first to ensure that the metal has a consistent purity level above 99.9%. Thai imports from Singapore were marginally down whilst direct shipments from Australia fell by 85% year-on-year.

Figure 40

Japanese Bullion Imports



7. Fabrication Demand

- Total fabrication demand fell by 4.9%, or 44.2 Moz (1,376 t), last year. This stands in stark contrast to 2000 which saw growth of 4.7% .
- Lower economic growth and weakness in the technology sector were the main factors behind the 10.2% fall in the industrial applications category of silver demand. Demand from the electronics industry, for example, fell by 19.9% whilst silver use in brazing alloys and solders fell by 5.1%.
- Declines were seen in most of the major fabricating countries, with the chief exception of India. European fabrication dropped by 9.3%, US demand was down by 12.5% or 24.1 Moz (750 t) and Japan saw a 1.6% fall.
- Silver use in the photographic sector fell year-on-year by 4.2%. This was primarily due to slower economic growth, which adversely affected the consumer and graphic arts sectors, although the digital market continued to make inroads into the demand for traditional silver halide products.
- Jewelry and silverware fabrication grew by 2.2%, or 6.2 Moz (192 t), in 2001. This was due almost exclusively to exceptionally strong Indian demand, where an increase of 18.3 Moz (570 t) was recorded.

Slowing economic growth in the important economies of the United States and the European Union, combined with another moribund year for Japan, not surprisingly saw silver fabrication demand fall markedly in 2001. That it did not fall further was due to a rise in jewelry and silverware offtake, which pushed 2.2% higher over the previous year (this was primarily due to a strong rise in the Indian market, which recorded a 22% gain last year).

The 10% fall in industrial demand was the main reason for the decline in total fabrication, although weaker photographic offtake, down 4.2%, made a

sizeable contribution of its own. Despite European demand falling by more than 9% last year, the region retained its position as the foremost user of silver.

Total fabrication demand in North America fell back to below the 200 Moz (6,000 t) level for the first time since 1998 as a result of lower demand in most of the major fabricating areas. The decline in East Asian fabrication, primarily because of lower industrial demand (in fact, photographic offtake was actually higher last year), meant that the region's silver requirements also returned to below the 200 Moz (6,000 t) threshold.

Figure 41
World Silver Fabrication

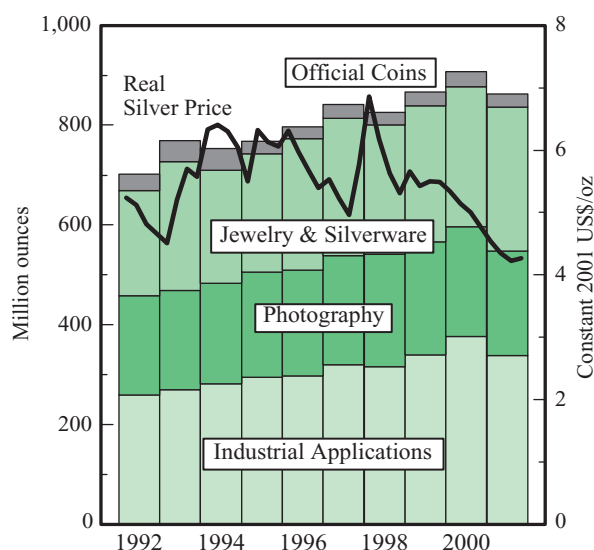


Figure 42
World Silver Fabrication

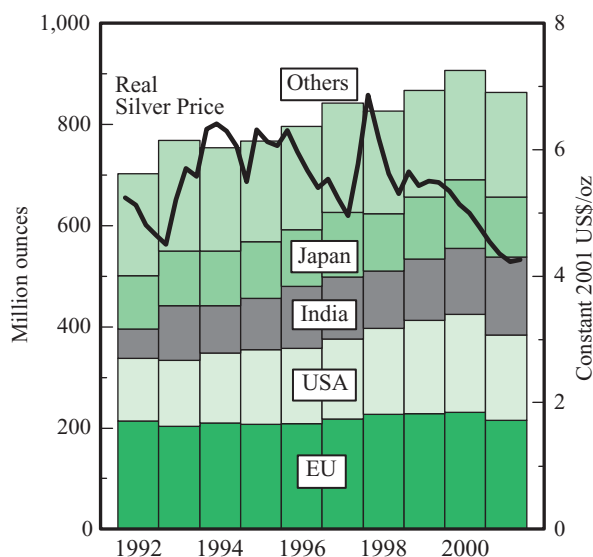
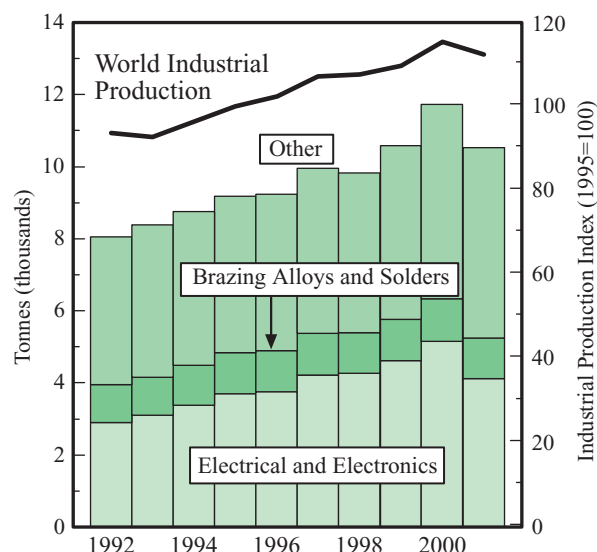


Figure 43

Main Components of Industrial Applications



Industrial Applications

- In comparison to 2000, when this category of fabrication demand grew by 10.7%, the sharp downturn in the technology sector saw last year's offtake fall by 10.2% to 338.5 Moz (10,529 t).
- Declines in industrial fabrication were seen in the vast majority of countries with the top two, the United States and Japan, falling by 16% and 23% respectively.

Europe

The industrial use of silver in **Germany** was essentially unchanged last year at 20.7 Moz (645 t), though there were marked changes within this category.

The demand for brazing alloys, for example, fell sharply last year. This was chiefly due to the recession in the domestic construction market and to a general fall, made worse by destocking, in the export demand for alloys going into temperature management applications (heating through to refrigeration).

Similar sharp falls are thought to have occurred in decorative uses and electronics but the fact that total industrial silver demand was steady came about through modest growth in the key electrical sector. A healthy 5% increase in car production plus strong export demand within Europe explained much of this growth and seems sufficient to have overcome the fall in domestic construction and weak US demand.

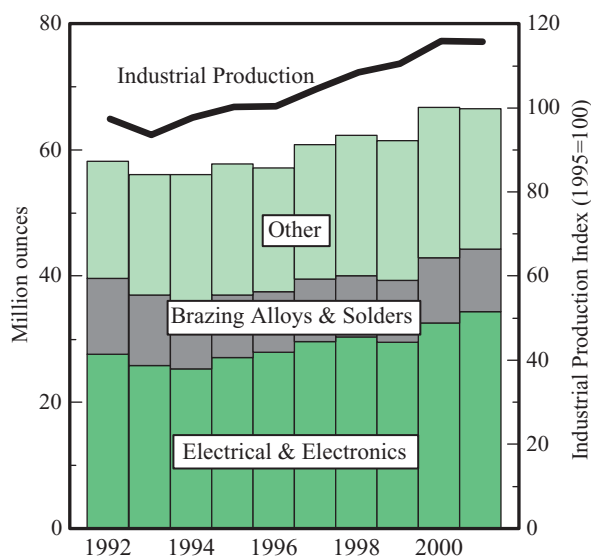
The longer term picture for industrial offtake could be better should the use of cadmium, in effect a rival to silver in brazing alloys and contacts, face additional restrictions on environmental grounds. Cadmium use has already been made illegal in certain European countries (though not yet Germany) but the pressure to further limit its use (a move often encouraged by manufacturers) appears generally stronger in Europe. It may well therefore be the case that it is offtake in Germany that would benefit the most (if in a modest, stepped fashion) from greater curbs on cadmium.

The sharp rise in **French** industrial silver fabrication, up 30% to 15.9 Moz (495 t), had very little to do with strong end-user demand and was instead much more a function of the net impact of intra-European industry reorganisation in the electrical and electronics sector. In fact, it appears consumption within France was poor with demand from the construction sector, for example, weak. In addition, there are signs that import competition rose, a development supported by the rise in imports of semi-manufactured items according to official trade data.

Italy is estimated to have seen a modest 4% fall in its industrial silver use to 10.7 Moz (332 t). The decline was limited as key sectors such as brazing alloys in construction were comparatively steady. Demand from the electronics sector is quite small proportionately in Italy and so the marked declines seen in this sector had less of an impact here than in many other countries.

Figure 44

EU Industrial Fabrication



EU Industrial Production

Index (1995=100)

1997	1998	1999	2000	2001
104.4	108.2	110.3	115.6	115.5

Source: OECD

The 12.5% fall in silver industrial fabrication in the **United Kingdom** was almost entirely due to weak domestic demand, which outweighed higher exports for a number of applications.

The collapse in the telecommunications market accounted for much of the fall in silver fabrication last year (partly related to the lack of investment due to the high cost of the Third Generation licenses) although the transfer of facilities out of the United Kingdom also impacted on demand. For example, although silver demand in the base station market remained surprisingly flat, demand for silver components was increasingly serviced from southern Asia.

In contrast, demand for brazing alloys and solders was over 14% higher last year as robust export growth compensated for a softer domestic market.

North America

Silver demand for industrial applications was over 16% lower last year at 78.7 Moz (2,449 t) although, to some extent, the sharp fall in electrical and electronics demand was mitigated by higher catalytic offtake. Notwithstanding the above, there were three main reasons why industrial fabrication fell to its lowest level since 1997.

Firstly, to fully understand why industrial demand in the **United States** was down so sharply last year, it is necessary to look at ordering patterns two years ago. In late 1999, "Y2K"-related concerns over a breakdown in the supply chain led to a build up in inventory levels. The following year, industrial demand was relatively strong but the stock build up outstripped the growth in a number of the end use categories (for example, telecommunications). As a result, the slowdown in the US economy, which emerged towards the end of 2000, resulted in a significant stock carry-over into 2001. As the

United States Industrial Production

Index (1995=100)

1997	1998	1999	2000	2001
111.1	117.2	121.9	127.4	122.5

Source: OECD

economic slowdown accelerated so industrial demand fell accordingly. However, the ongoing stock reduction meant that there was a greater than proportionate fall in the use of silver last year. Secondly, the economy suffered a further set back after "911" although it appears that military demand for silver components picked up after the terrorist attacks. This industry had been in decline up until this point but the rise in spending is now expected to continue for the foreseeable future.

A final reason, though it was by no means new to 2001, was the ongoing relocation of manufacturing facilities to outside of the United States, particularly to South East Asia although, in some cases, corporate restructuring has favored a move (back) to western Europe. At this stage however, the impact on silver demand in the United States is less clear cut. In some instances, silver-bearing materials have simply been shipped to a new location from the original supply source. In other cases, the relocated factory has sourced materials locally. This will naturally impact on demand at the country level, but corporate demand, for those with an international focus, may be less affected.

The rise in silver lease rates in December is also worthy of note, more for its impact on borrowers than on the absolute level of fabrication demand. The sudden increase resulted in a reduced willingness to hold stocks as well as an increasing tendency, where possible, to shift borrowing to shorter dated leases.

Turning to the individual sectors, the largest (albeit broad) category of industrial demand, electrical and

Figure 45
US Industrial Fabrication

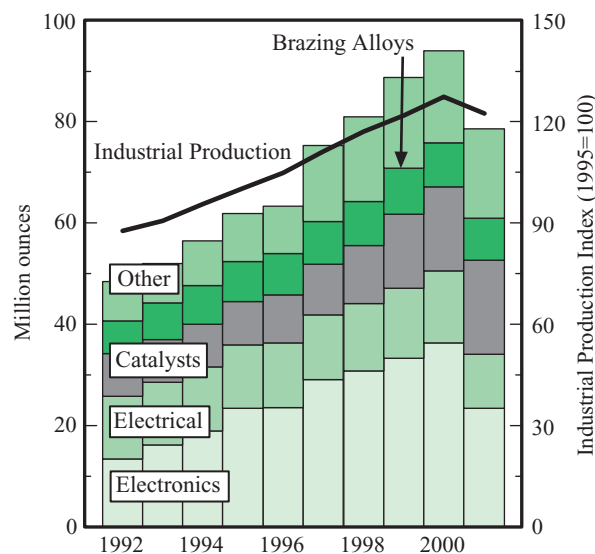


Table 4

World Silver Fabrication

(including the use of scrap)

Million ounces

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Italy	60.5	56.7	52.1	50.1	52.2	56.5	56.3	62.3	65.6	56.0
UK & Ireland	26.8	28.4	31.2	32.3	34.4	35.5	39.2	39.9	43.2	46.5
Germany	54.8	48.4	52.8	46.0	45.6	46.0	46.8	40.5	39.0	36.6
Belgium	20.2	20.7	21.1	23.4	25.3	27.2	33.8	37.5	35.3	32.1
France	30.9	30.2	28.2	31.1	27.2	28.7	28.7	26.6	28.5	25.5
Spain	6.6	6.1	10.7	9.9	9.3	8.7	8.8	7.5	6.3	5.5
Greece	3.5	3.7	3.9	3.8	4.2	4.5	4.1	4.1	4.3	4.1
Switzerland	6.7	6.2	7.1	7.3	7.8	9.6	10.7	11.1	9.0	3.5
Poland	2.1	2.3	2.6	3.1	3.0	3.4	3.6	3.7	3.9	3.4
Portugal	2.5	2.5	2.0	2.4	2.8	2.9	3.1	3.2	3.5	3.1
Norway	2.5	1.9	1.6	1.6	1.4	1.5	1.5	3.0	2.9	2.3
Netherlands	2.1	2.1	2.4	3.0	2.5	2.4	2.2	2.8	1.9	1.8
Austria	1.6	1.5	1.5	1.6	1.5	1.3	1.4	1.2	1.1	1.1
Sweden	1.6	1.6	1.5	1.4	1.5	1.7	1.4	1.4	1.3	1.0
Czech & Slovak Republics	1.0	0.7	0.6	0.8	0.7	0.8	0.9	0.8	0.8	1.0
Denmark	1.1	1.0	1.0	1.0	1.0	1.1	1.0	1.0	1.0	0.9
Finland	1.3	0.9	1.0	0.9	1.0	0.9	0.7	0.7	0.6	0.5
Romania	0.5	0.5	0.4	0.3	0.4	0.4	0.5	0.4	0.4	0.4
Cyprus & Malta	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3
Other	1.0	1.1	0.9	0.9	0.9	0.7	0.8	0.8	0.8	0.8
<i>Total Europe</i>	227.7	216.6	222.7	221.3	223.1	234.1	245.7	248.8	249.7	226.4
North America										
United States	124.8	129.9	138.4	148.2	149.5	158.9	169.2	184.2	193.4	169.3
Mexico	22.9	32.0	27.6	17.5	20.8	23.7	22.2	23.5	19.4	19.1
Canada	2.3	2.8	3.1	2.7	2.7	2.8	3.4	3.5	3.0	2.9
<i>Total North America</i>	150.0	164.7	169.1	168.4	173.0	185.3	194.8	211.3	215.8	191.4
Central & South America										
Brazil	6.6	6.9	8.3	9.4	8.4	8.4	8.1	7.7	6.8	6.6
Argentina	4.1	4.1	4.1	3.9	3.8	3.8	3.1	2.7	2.3	1.8
Peru	0.9	0.8	0.9	1.0	1.1	1.1	1.1	1.0	1.0	1.0
Colombia	1.1	1.1	1.1	1.1	1.1	1.1	1.1	0.9	0.8	0.7
Ecuador	0.4	0.5	0.7	0.7	0.7	0.7	0.7	0.5	0.5	0.5
Chile	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4
Other	0.6	0.6	0.5	0.6	0.9	1.3	1.6	1.8	1.1	0.9
<i>Total Central & South America</i>	14.1	14.5	15.9	17.1	16.4	16.8	16.2	15.1	12.8	11.8
Middle East										
Turkey	5.5	5.9	5.2	6.1	6.4	6.5	6.2	5.5	6.8	5.1
Israel	2.6	2.8	3.1	3.4	3.7	4.0	3.9	3.9	3.6	3.3
Egypt	2.3	1.9	2.5	2.2	2.3	2.1	1.9	2.0	2.0	1.8
Saudi Arabia	0.4	0.4	0.3	0.4	0.4	0.6	0.5	0.6	0.6	0.6
Other	2.7	2.0	2.4	2.5	2.6	2.6	2.5	2.6	2.6	2.7
<i>Total Middle East</i>	13.4	13.2	13.5	14.5	15.4	15.8	14.9	14.5	15.8	13.4
Indian Sub-Continent										
India	58.1	108.8	93.9	101.3	122.2	122.9	114.7	121.5	131.0	154.0
Bangladesh & Nepal	2.6	3.9	4.5	5.1	5.8	6.4	5.1	5.7	6.0	5.9
Other	2.8	3.4	2.8	3.8	2.7	4.1	2.8	3.4	3.2	2.2
<i>Total Indian Sub-Continent</i>	63.5	116.0	101.2	110.2	130.7	133.5	122.6	130.6	140.2	162.1
East Asia										
Japan	104.9	107.9	108.4	112.7	112.1	127.2	112.8	122.5	135.0	119.3
Thailand	31.6	38.7	29.1	27.7	27.6	27.1	24.2	26.7	30.2	32.5
South Korea	9.0	15.6	16.4	18.6	18.5	18.6	13.8	16.7	20.6	18.1
Taiwan	4.3	4.8	5.3	5.7	6.4	6.9	6.8	6.7	9.4	8.4
Indonesia	1.9	1.8	2.7	3.1	3.4	4.1	2.7	3.2	4.4	4.7
Hong Kong	2.3	2.6	3.4	3.4	3.7	4.4	3.6	3.9	4.4	3.2
Myanmar, Laos & Cambodia	1.0	1.0	1.0	1.1	1.1	1.0	0.8	0.9	0.8	0.9

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

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Vietnam	0.3	0.4	0.5	0.6	0.7	0.7	0.6	0.7	0.7	0.7
Malaysia	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6
Other	1.1	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.4	0.5
<i>Total East Asia</i>	156.9	173.7	167.5	173.7	174.2	190.6	165.9	182.1	206.6	189.0
Africa										
Morocco	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.5	0.6	0.6
Tunisia	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
South Africa	0.3	0.6	0.4	0.5	0.3	0.3	0.3	0.3	0.3	0.2
Algeria	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2
Other	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.4	0.4	0.4
<i>Total Africa</i>	1.8	2.0	1.9	2.0	1.8	1.8	1.7	1.7	1.8	1.7
Oceania										
Australia	6.9	7.0	6.3	5.3	5.2	5.2	5.6	5.8	6.6	5.6
New Zealand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Total Oceania</i>	6.9	7.0	6.3	5.3	5.2	5.2	5.7	5.8	6.7	5.7
Western World Total	634.3	707.6	698.2	712.7	739.8	783.2	767.5	809.8	849.2	801.4
Other Countries										
China	19.6	21.1	24.6	26.0	28.6	32.2	33.9	33.1	33.6	36.3
CIS	48.6	40.7	31.6	29.0	28.2	27.2	25.4	24.3	24.9	25.8
North Korea	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Total Other Countries</i>	68.2	62.0	56.2	55.0	56.9	59.4	59.3	57.5	58.6	62.2
World Total	702.6	769.6	754.4	767.7	796.6	842.6	826.8	867.3	907.8	863.6

electronics fabrication, was nearly one-third lower last year at 34.1 Moz (1,062 t).

A near collapse in the telecommunications industry accounted for much of the fall in offtake of multi-layer ceramic capacitors (MLCCs). Demand remained upbeat until late 2000 but thereafter orders rapidly dried up. As noted above, this was partly related to the stock overhang which remained from 2000.

To a lesser degree, the fall in MLCC demand was due to substitution in favor of base metals products but, arguably, much of the transition had already taken place in previous years. Looking ahead, it appears that in early 2002 the market may have turned the corner (the inventory drawdown appears to have largely run its course and new, albeit modest, orders have started to appear). However, any substantial upturn in the MLCC industry may be biased towards non-silver components.

The other main end uses (for electrical and electronics) also required less silver last year. Although housing starts were marginally higher in 2001, remodeling work of existing housing stock was sharply lower, resulting in weaker demand for contacts and circuit breakers. In addition, the double-digit fall

in auto sales led to a more than proportionate fall in silver demand, due to the diverse range of applications for which silver is required. Finally, the decline in the computer industry adversely affected demand for a range of applications, including semi conductors.

Turning to other categories of offtake, demand for brazing alloys and solders was just over 5% lower in 2001. The extent of the fall was relatively modest due to the diverse range of applications for which the alloys are required.

One area to see higher demand was the ethylene oxide (EO) catalyst market. This was due to at least two medium-sized plants coming on stream last year. As a rule of thumb, silver demand will equate to roughly 15-20% of the total EO volume and a typical plant, in today's market, will account for 6.4 Moz (200 t) of EO.

Turning to this year, industrial demand in the United States appears to have picked up modestly (although the year-on-year comparison is somewhat misleading given the weak state of the market early last year). However, a more substantive recovery is only anticipated during the latter part of 2002.

India

Indian industrial demand is estimated to have increased by around 10% in 2001, to 50.8 Moz (1,579 t), the highest level ever recorded in the *World Silver Survey* (and almost three times the level recorded 10 years ago). In terms of overall industrial applications of silver, India remains comfortably the third largest consumer after the United States and Japan.

By contrast with these two countries, however, the use of silver in industrial applications in India differs quite markedly. For example, based on GFMS estimates, India consumes only 6.4 Moz (200 t) of silver in electrical and electronics and in brazing alloys and solders, a small fraction of US and Japanese offtake in these categories. In the main, the largest use of silver in industrial applications is in relatively “low tech” areas such as decorative plating, foils and foodstuffs. As was the case in 2000, silver use in pharmacy and chemicals is estimated to have risen quite sharply, by around 10% year-on-year. The use of silver in jari thread is also estimated to have risen last year. By contrast, electrical and electronics uses of silver are thought to have declined slightly.

The growth in industrial demand in India has to be seen against the backdrop of two main economic drivers. The first is overall GDP and industrial output growth and the second is developments in the agricultural sector. This is important because the source of demand for electronics products is often quite different to that for jari for example. The former tends to be tied into the formal economy and how well it is doing whilst the latter is very much a function of how well the agricultural sector has been performing.

Figure 46
Indian Fabrication

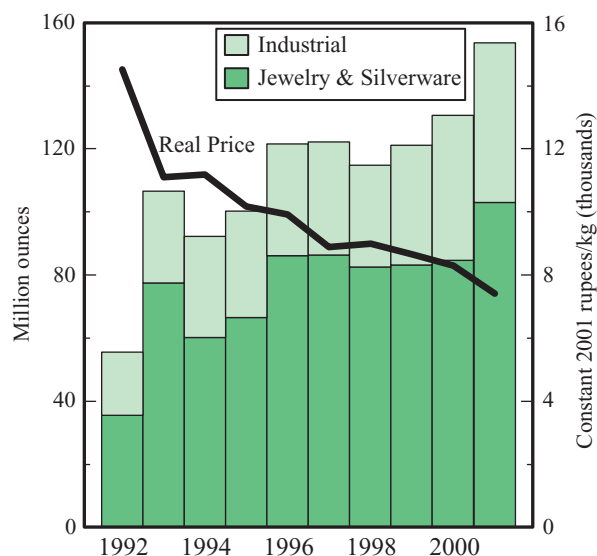
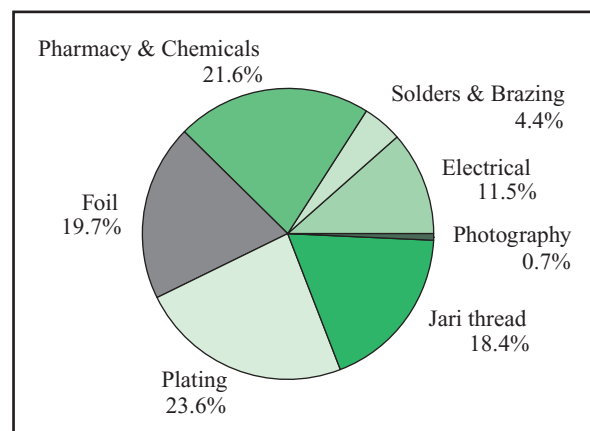


Figure 47

Indian Industrial Fabrication, 2001



The reason for the slowdown in electrical and electronics uses of silver, and the small increase in brazing alloys and solders, can best be understood in the context of a relatively moribund local economy and, of course, the slowdown in the global electronics market. India's real GDP growth in fiscal year 2001 is estimated by BMI (Business Monitor International) to have been only 4% in spite of official figures indicating a higher growth rate. To the extent that the official data can be believed, industrial production was even weaker, rising by only 2.6% in the first eleven months of the fiscal year, touching a low for the calendar year in May (when, on an annualized basis, it grew by only 1.5%). In the context of data like this, it is perhaps not surprising that “true” industrial offtake of silver was weak last year.

Looking at the electronics sector in particular, although Indian fabrication is still fairly small compared to many other Asian countries like Taiwan, it has been growing steadily over the past years (India has a massive software industry, but hardware production has lagged behind). Somewhat surprisingly, India now boasts one of the world's largest CD-R manufacturers. Notwithstanding its small size, the hardware industry has been buffeted by the same forces that have seen electronics uses of silver plummet in countries like Japan, although in India this effect was somewhat muted due to the various import/export policies in place.

Turning to “low tech” applications, the main drivers behind higher offtake appear to have been the lower silver price and reasonably good agricultural output (and rising incomes), especially in the north. Importantly, the average silver price last year was 7.2% lower than in 2000. As regular readers of the *World Silver Survey* will be aware, the Indian market is

extremely price sensitive and, with prices comfortably below the 7,500 rupees/kg level for much of the year, demand surged. An additional fillip to silver offtake appears to have been the relatively good agricultural performance seen in the main consuming areas of the north. Good monsoon rains in western Gujarat, Maharashtra, central Madhya Pradesh and northern Rajasthan appear to have stimulated offtake (see the section on jewelry and silverware later in this chapter for more on this).

East Asia

Total silver use in industrial applications in East Asia fell by close to 21%, to 80 Moz (2,490 t), after having registered very strong growth in the previous year. All of the main fabricating countries tracked by GFMS, bar China, registered declines in output, with the biggest percentage fall being registered in Hong Kong and the largest absolute decline being seen, not surprisingly, in Japan. (Japan is by far and away the largest industrial user of silver, accounting for close to 70% of the regional total.)

The collapse of electronics demand accounted for the bulk the decline in silver offtake last year (see page 57). The weakness of the electronics sector is reflected in the data put out by the Semiconductor Industry Association (SIA). According to their full year numbers, global billings fell by 32% year-on-year in 2001, with the biggest decline, of 44%, being seen in the United States. However, Japan was also badly hit, registering a drop of 30%.

Global Billings

(semi conductor shipments per year, millions)

	World	Americas	Europe	Japan	Asia
2000	204.4	64.1	42.3	46.7	51.3
2001	138.6	35.4	29.9	32.7	39.4
Change	-65.8	-28.6	-12.4	-14.0	11.8
Ch. yoy %	-32	-45	-29	-30	-23

Source: SIA

There were a number of reasons for the slump last year, not least of all the pricking of the technology bubble. The greatest weakness was in integrated circuits (ICs). For instance, Singapore's domestic exports of ICs (its top electronic export) contracted by 33%, reflecting the slump in global chip demand. But there was weakness in plenty of other key electronic sectors too, with disk drives, personal computers and telecommunication equipment also down significantly in 2001.

There can be little doubt that inventory build-up was

one of the major culprits in the eventual bursting of this bubble. One commentator on the market noted that money was being spent on the wrong products, which were in the wrong places at the wrong times. In essence, the management systems were simply not in place to effectively control inventory levels.

Japanese industrial uses of silver fell sharply in 2001, down by over 23% to 55.4 Moz (1,723 t). This decline should be seen, however, in the context of the large increase in offtake in the previous year. Needless to say, the primary reason for this precipitous decline was the collapse in the electronics market. (For more on this see the special section on electronics elsewhere in this Chapter.) There are numerous examples of just how weak the market was in 2001 at the point of final demand. One notable example was that of Murata Manufacturing Co Ltd, a major maker of cellphone and electronic components, which in June reported that orders were down by 49% year-on-year.

Japanese Non-Photographic Nitrate and Contact Production

Million ounces

	1998	1999	2000	2001
non-photo nitrates	10.5	13.7	17.1	12.0
contacts	9.1	9.5	11.5	7.9

In terms of end use categories, the largest decline in both percentage and absolute terms was seen in silver nitrate, which by our estimates fell by around 25%. Nitrate is used in a phenomenal variety of electronics and electrical applications, with one of its more important uses being to make paste for semiconductors. On GFMS' most recent research trip to Japan, one of the country's largest fabricators of nitrate noted that the decline in their production had been closely tied to the collapse in the use of palladium in multi-layer ceramic capacitors (MLCCs). MLCCs are ubiquitous, appearing in cellphones (up to 240 per telephone), computers and increasingly in less high tech end uses like toys. Unlike in 2000, when booming demand saw production of palladium MLCCs continuing to grow (albeit at a slower pace than the alternatives), the global slowdown has witnessed a dramatic collapse in their production. In effect, MLCC fabricators have for all intents and purposes completely switched their plants to technological alternatives like nickel. (There are still some final applications where palladium MLCCs are demanded but, in terms of overall production, this amount is trivial.)

Table 5

Silver Fabrication: Industrial Applications

(including the use of scrap)

Million ounces

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Germany	20.0	18.6	18.0	18.5	17.2	17.8	18.4	18.3	20.8	20.7
France	12.8	11.3	11.6	12.0	11.7	13.4	11.2	11.6	12.2	15.9
UK & Ireland	11.1	11.4	11.7	11.9	12.2	12.5	16.3	15.2	17.6	15.4
Italy	9.6	10.1	10.2	10.6	11.2	11.4	10.6	10.8	11.2	10.7
Switzerland	6.0	5.6	6.5	6.6	6.9	8.6	10.0	10.4	8.3	2.7
Netherlands	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.5
Spain	1.8	1.8	1.7	1.8	2.0	2.9	3.1	2.7	2.0	1.3
Poland	0.5	0.6	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7
Austria	0.6	0.6	0.6	0.7	0.6	0.6	0.5	0.5	0.5	0.5
Czech & Slovak Republics	0.5	0.5	0.4	0.5	0.5	0.4	0.4	0.5	0.3	0.3
Sweden	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.3
Belgium	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Other	1.1	1.1	1.1	1.1	1.1	1.1	1.1	2.2	1.9	1.4
<i>Total Europe</i>	66.5	64.1	65.0	67.0	66.6	71.9	74.7	75.3	78.0	71.9
North America										
United States	52.7	56.3	60.6	65.9	68.2	75.3	81.0	88.6	94.1	78.7
Mexico	2.6	2.6	2.8	2.5	2.6	2.9	3.2	5.1	5.5	5.1
Canada	0.7	0.7	0.6	0.7	0.6	0.6	0.5	0.5	0.5	0.5
<i>Total North America</i>	55.9	59.6	64.0	69.2	71.4	78.8	84.8	94.3	100.2	84.4
Central & South America										
Brazil	2.4	2.5	3.2	3.5	3.3	3.4	3.5	3.2	3.2	3.2
Argentina	1.3	1.3	1.3	1.2	1.2	1.2	1.2	1.0	0.8	0.6
Colombia	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2
Other	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
<i>Total Central & South America</i>	4.4	4.5	5.2	5.4	5.2	5.3	5.4	4.8	4.6	4.5
Middle East										
Israel	0.7	0.8	0.9	1.0	1.0	1.0	1.0	0.9	1.0	0.8
Turkey	0.9	0.9	0.8	0.9	0.9	1.0	0.9	0.8	0.9	0.7
Egypt	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Total Middle East</i>	2.0	1.9	1.8	2.0	2.1	2.1	2.0	1.9	2.0	1.7
Indian Sub-Continent										
India	20.0	29.0	32.1	34.1	35.5	36.0	31.9	37.9	46.1	50.8
Other	0.5	0.6	0.5	0.6	0.5	0.7	0.5	0.6	0.5	0.3
<i>Total Indian Sub-Continent</i>	20.4	29.5	32.6	34.8	36.0	36.7	32.4	38.5	46.7	51.1
East Asia										
Japan	44.1	45.8	51.1	53.6	52.1	59.4	52.8	60.8	72.1	55.4
South Korea	4.0	8.4	10.0	11.9	11.9	12.3	11.2	12.2	15.7	13.4
Taiwan	3.7	4.2	4.7	5.2	5.8	6.3	6.2	6.3	8.8	8.0
Hong Kong	1.3	1.6	2.4	2.5	2.8	3.4	3.0	3.3	3.9	2.7
Indonesia	0.7	0.4	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5
<i>Total East Asia</i>	53.8	60.4	68.6	73.6	73.1	81.9	73.7	83.0	101.1	80.0
Africa										
Morocco	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.3
South Africa	0.2	0.5	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1
Other	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
<i>Total Africa</i>	0.5	0.8	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.5
Oceania										
Australia	2.0	2.0	2.2	2.4	2.3	2.1	2.3	2.4	2.5	2.1
<i>Total Oceania</i>	2.0	2.0	2.2	2.4	2.3	2.1	2.3	2.4	2.5	2.1
Western World Total	205.6	223.0	240.1	255.2	257.2	279.5	275.9	300.9	335.6	296.2

Table 5

Silver Fabrication: Industrial Applications

(including the use of scrap)

Million ounces

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Other Countries										
China	14.1	14.9	17.3	18.2	19.1	20.3	20.7	20.9	21.9	22.3
CIS	39.5	31.9	24.0	21.9	21.1	20.6	19.6	18.8	19.6	20.1
Total Other Countries	53.6	46.8	41.3	40.1	40.1	41.0	40.4	39.8	41.5	42.3
World Total	259.3	269.8	281.4	295.3	297.3	320.4	316.2	340.6	377.1	338.5

Silver cyanide and silver potassium cyanide production also fell sharply last year, by around the same amount in percentage terms as nitrate. Both of these salts are used mainly for plating and, in Japan, this is invariably in electronics applications, including printed circuit boards and the production of contacts.

Japanese Industrial Production

Index (1995=100)

	1997	1998	1999	2000	2001
	106.0	99.0	99.8	105.4	97.8

Source: OECD

Turning to the use of silver in heavier current applications, contact/switch/relay production also fell in 2001, partly as a result of the weakness in electronics (where of course contacts and switches are required), but also because of the slowdown in the local and global economy. It is important to recognize that contacts are utilized in a plethora of end uses and, if electricity is employed, the chances are that some

sort of silver containing contact will be present.

The motor vehicle industry and construction are large consumers of contacts and switches and both experienced difficult operating conditions in 2001. For example, total vehicle output in Japan fell by approximately 3.6% last year, and new construction starts fell by around 10% in yen terms. To put the importance of vehicle demand in context, according to the largest producer of contacts in Japan who was interviewed by GFMS earlier this year, motor vehicles alone use around 400 different contacts. (For example, they are used in power windows and steering.)

In construction, contacts/switches/relays are also used widely and 2001 was another bad year for construction. The recent bankruptcy of the mid-sized builder, Sato Kogyo Co, which was the second mid-sized builder to fail in the past three months, is a reflection of this weakness. (The 140-year-old firm, with 590 billion yen (\$4.4 billion) in group debt, was Japan's ninth publicly-traded company to go under this calendar year.) The weakness of the construction sector also impacted negatively on the production of nitrate for use in mirrors, as well as in health applications. Having said this, the Japanese continue to find innovative and interesting new applications for silver in anti-bacterial uses, so the decline in this sector was somewhat smaller than might have been expected. Popular uses in construction now include curtain linings, kitchen surfaces and wall materials. On a more personal level, demand for anti-bacterial silver in socks and underwear has been growing steadily.

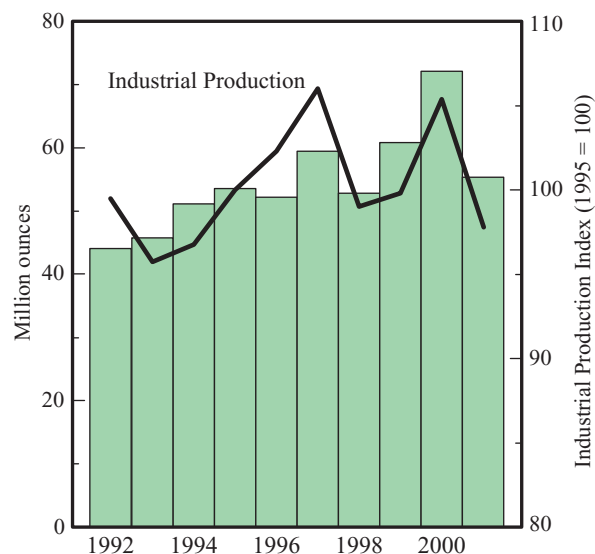
Silver oxide production also fell last year, by around 20%, as demand for batteries for use in watches and cameras weakened.

The drop in Japanese industrial offtake, whilst primarily the result of factors unique to 2001 such as the collapse in global electronics demand, was also a function of the secular move of production facilities to offshore locations, in particular China.

Chinese industrial demand is estimated by GFMS to have risen modestly year-on-year, by around 1.8% to

Figure 48

Japanese Industrial Fabrication



22.3 Moz (693 t). It should be stressed from the outset that collecting data on Chinese fabrication demand has been made more difficult because of the liberalization of the silver market in 2000. Due to the 20% value added tax regime that is currently in operation, most of the silver traded in China is now done directly from producer to end-user with very little paper work being completed. Whilst in the past the only official supplier of silver to the market was the People's Bank of China, this is no longer the case. Putting together a complete demand side picture is also complicated by the fact that the mainland has become a huge net exporter of metal. This means that it is difficult to put together a "supply" side analysis of final demand. Put another way, the typical GFMS methodology is to estimate the available silver in a market and to cross check this with demand side data. Because of the massive shipments of silver out of the country, it is rather tricky to calculate the total amount of metal available, which means that most of the findings in this section are derived from analysis of the demand side.

Notwithstanding these caveats, it has been possible to construct what seems to us to be a reasonable set of estimates of fabrication offtake. It is worthwhile noting that China was one of the strongest performing economies in the world last year, posting year-on-year growth of more than 7%. Having said this, there are plenty of reasons to doubt just how accurate these figures really are. The Economist newspaper, for instance, notes that the growth figures declared by individual provinces actually contradict the official figure. They note that only one province, Yunnan, reported that its output had grown more slowly than the national rate. Taken together, the provincial figures would produce a national growth rate nearly two points higher than the one officially declared! Some analysts have suggested that real GDP growth in China was probably only half of the official rate i.e. 3 to 4%. Based on recent field trips to China and feedback that we have received on industrial demand, we are more inclined to believe that real growth was indeed lower than the official data indicates.

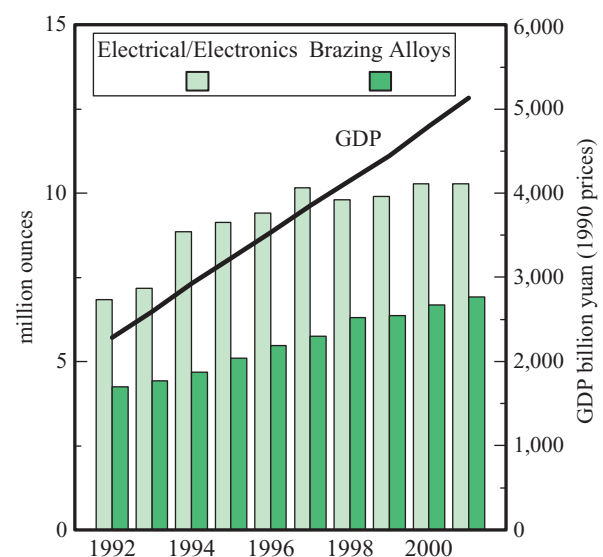
Growth of 3-4% is not trivial, however, and our information suggests that the generally favorable domestic economic environment helped China's IT market maintain stable growth in 2001, which helped sustain offtake in electrical and electronics applications at similar levels to the previous year. Looking at China's IT industry as a whole, output last year was pegged at 340 billion yuan (US\$40.9 billion) in industrial gross output value, an increase of 21.4% compared with that of the previous year.

Indeed, the data from China's IT industry would appear to indicate (at first sight) that production should in fact have increased. For example, according to official statistics, in 2001, sales in China's hardware market grew by 13.5% (the software market grew by 23.9% and the information services market by 25.5% compared with the previous year). In terms of hardware output, mainframe products made up around 43% of China's market (selling 8.11 million units, up 18.9% over the previous year). Personal computer output rose to 8.058 million units, an increase of 18.8% year-on-year. In terms of straight chip production, CCID Consulting estimates that 773 million were sold last year, 34% more than in 2000. What data there is also points to exports of computers having increased last year. For instance, according to statistics from China's General Administration of Customs, from January to October this year, Guangdong Province exported \$11 billion worth of computers and related products, an increase of 29% year-on-year.

This would seem to suggest that demand for silver should have increased in 2001, contrary to our data which points to it having been flat. Whilst it is of course possible that we have underestimated final offtake, our information is that a large proportion of this production is still made from imported components, including materials like silver potassium cyanide as well as higher value added products like chipsets. In terms of the methodology used in the *World Silver Survey*, these items are not counted as Chinese fabrication demand.

By contrast with computers, which still retain a high import component, white goods fabrication in China

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.

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 when done at temperatures above 600 degrees 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.

involves a far higher proportion of domestically produced parts (which means that increases in local production of say air-conditioners has a direct impact on the manufacturing of brazing alloys and solders).

According to various sources of information, it seems as if both domestic production and exports of white goods increased last year, which is why brazing alloy and solder demand rose. The China Household Electrical Appliance Association reports that exports of electrical products rose by around 24% last year. Quite remarkably, many sectors of the industry are now more dependent on the export markets than they are on local demand. For instance, according to the Association's data, 69%, or 12.52 million sets, of microwave ovens produced in China were exported last year, and more than half the electric cookers manufactured in 2001 were sold abroad. Data released by Euromonitor Corp., which publishes reports on household appliances, points out that Chinese manufacturer, Haier Refrigerator, is now ranked second in terms of global market share (with 5.3% of the market). Among the global washing machine brands, Haier Washing Machine was ranked third.

South Korean industrial offtake fell by a relatively modest 14%, to 13.4 Moz (418 t). We say modestly because offtake might have been expected to fall by a similar percentage to Japanese demand, which was all of 23% lower year-on-year (Korea has similar exposure to the electronics market). That it did not fall as sharply was partly due to the strength of demand for brazing alloys and solders and partly due to the fact that electronics and electrical offtake did not fall as sharply as might have been predicted.

In the case of the former, our data points to production actually having increased quite robustly in 2001, in spite of the global slowdown. Most of the increase in production was due to stronger exports to countries like the United States and Japan. At first sight, this may appear surprising but it seems that the price competitiveness of Korean alloys and solders, coupled to their high quality, has facilitated this process. (It was suggested to us that part of the reason for the increase in exports to Japan had to do with the cadmium content of the alloys and solders. Evidently, although it is now difficult to produce cadmium containing products in Japan, they can still be imported, hence the rise in shipments from Korea.)

Turning to the electrical and electronics areas, GFMS estimate that contact production dropped by around 10% last year. This was due mainly to weaker demand from the automotive sector (production was down by 5.4% year-on-year according to the Korean Automobile Manufacturers Association) and lower

Korean Industrial Production

Index (1995=100)

1997	1998	1999	2000	2001
113.5	106.2	131.9	154.0	156.7

Source: OECD

production of home appliances, offset to some extent by higher exports to markets like China.

Genuine electronics demand for silver containing products did, of course, fall sharply. GFMS estimate that silver potassium cyanide (SPC) production for the electronics industry fell by around 50% in 2001 (very little SPC is exported), with the collapse in lead frame production being the main culprit.

To get a sense of how dire the year was on the electronics front, one needs look no further than the two companies which hold the first and third position, respectively, in worldwide DRAM production, and account for more than 90% of South Korea's chip exports. Samsung Electronics Co. Ltd.'s net profit fell by over 50%, while Hynix increased its loss by around 70%. On a more positive note, semiconductor production rose 9.8% year-on-year in December, accelerating from a 6.4% rise in November, and indications are that silver demand has risen sharply in 2002 to date.

Taiwanese industrial offtake fell far more modestly than the other large fabricators in the region, dropping by "only" 9%. This is a reflection of the fact that demand in Taiwan is, surprisingly, less dependent on the semiconductor industry than are some of the others. Although production of plating salts for use in this sector did drop sharply (GFMS estimate by over 30%), silver use in CDs, CD-Rs and DVDs, especially the recordable variety, grew strongly.

Crucially, many CD and DVD manufacturers are making increasing use of local raw materials to reduce production costs, which gives Taiwanese fabrication statistics an additional boost. As regular readers of the *World Silver Survey* will recall, GFMS estimates of silver offtake have often been lower than would have been expected because of the large quantities of imported semi-fabricated products used in manufacturing. Imported plating salts, for example, have been used extensively by the local industry for many years. To reiterate a point that has been made many times before, GFMS statistics do **not** count these imports in the Taiwanese statistics (they appear instead, for example, in the Japanese fabrication numbers). What has been happening in recent years is that a greater proportion of the raw materials are being produced locally and so enter our statistics.

Table 5a

Silver Fabrication: Electrical and Electronics

(including the use of scrap)

Million ounces

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
United States	25.8	28.6	31.6	36.0	36.3	41.9	44.1	47.1	50.6	34.1
Japan	20.3	20.9	22.5	23.9	22.7	25.8	23.7	30.0	36.7	26.6
Germany	12.1	11.3	10.9	11.9	11.6	11.9	12.2	12.2	14.3	15.0
France	6.2	5.0	5.4	6.1	6.3	7.7	6.7	6.8	7.3	11.0
China	6.9	7.2	8.9	9.1	9.4	10.2	9.8	9.9	10.3	10.3
South Korea	0.5	4.5	5.3	6.4	6.4	6.5	6.0	6.6	8.6	7.6
Taiwan	2.7	2.9	3.3	3.6	4.2	4.7	4.8	4.8	7.0	6.5
United Kingdom	4.5	4.5	4.6	4.7	5.0	5.1	6.8	5.7	6.8	4.9
India	2.4	2.4	2.6	3.0	3.2	4.2	4.2	4.5	4.8	4.7
Italy	3.1	3.2	2.7	2.7	3.3	3.2	2.9	3.0	3.1	2.8
Mexico	1.2	1.2	1.2	1.1	1.1	1.2	1.3	2.9	3.1	2.6
Hong Kong	0.9	1.2	1.8	1.9	2.2	2.7	2.5	2.9	3.5	2.5
Brazil	1.0	1.0	1.5	1.6	1.4	1.4	1.4	1.3	1.3	1.3
Turkey	0.9	0.9	0.8	0.9	0.9	1.0	0.9	0.8	0.9	0.7
Australia	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6
Netherlands	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5
Switzerland	2.6	2.8	3.5	3.8	4.1	5.5	7.3	7.5	5.3	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	0.9	1.0	0.9	0.9	0.9	0.9	1.0	1.0	0.3	0.0
Total	93.3	100.0	109.0	119.2	120.5	135.4	137.2	148.5	165.5	132.5

Table 5b

Silver Fabrication: Brazing Alloys and Solders

(including the use of scrap)

Million ounces

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
United States	6.5	7.2	7.7	8.0	8.2	8.4	8.6	9.0	8.7	8.3
China	4.3	4.4	4.7	5.1	5.5	5.8	6.3	6.4	6.7	6.9
Japan	4.2	3.8	4.7	4.8	5.1	5.0	4.2	4.2	4.4	3.5
Germany	4.8	4.5	4.0	3.5	2.9	3.1	3.1	3.0	3.2	2.8
United Kingdom	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.2	2.3	2.6
Italy	1.6	1.7	1.9	2.1	2.1	1.9	1.8	2.2	2.3	2.3
India	1.5	1.5	1.6	1.9	2.1	1.6	1.5	1.6	1.8	1.8
Switzerland	2.4	1.8	1.8	1.8	1.7	1.7	1.6	1.5	1.6	1.3
South Korea	0.3	0.8	1.0	1.2	1.2	1.1	0.8	0.8	1.0	1.2
Spain	0.5	0.4	0.3	0.3	0.6	0.9	1.0	1.1	1.1	1.0
Taiwan	0.6	0.7	0.8	1.0	1.1	1.1	1.0	1.0	1.2	0.9
France	2.4	1.8	1.4	1.3	1.4	1.4	1.0	0.9	1.0	0.9
Brazil	0.5	0.6	0.8	0.9	0.9	0.8	0.8	0.7	0.7	0.7
Australia	0.6	0.6	0.6	0.7	0.7	0.6	0.7	0.7	0.8	0.6
Mexico	0.9	0.9	1.0	0.9	0.9	0.9	1.0	0.6	0.6	0.5
Canada	0.4	0.4	0.4	0.5	0.4	0.4	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	0.3	0.2
Austria	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Israel	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total	34.2	33.9	35.6	36.9	37.3	37.4	36.6	36.8	38.2	36.3

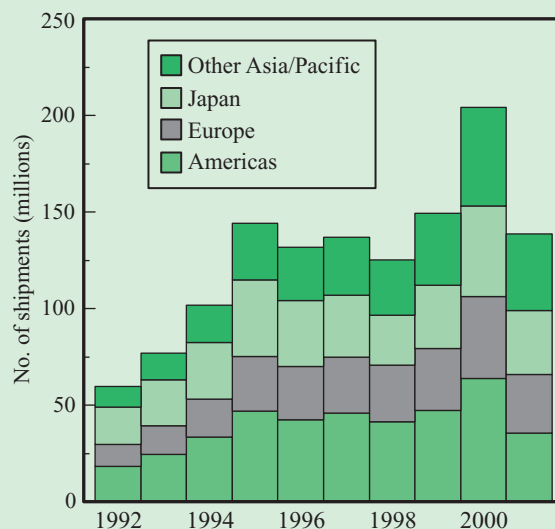
The Collapse in the Electronics Market

The fall in silver use by the electronics industry was the key factor behind the decline in overall fabrication demand last year. As shown in Table 5a, offtake by the electrical and electronics sector fell by 33.0 Moz (1,024 t) while total fabrication fell 44.2 Moz (1,376 t). Even this statistic, however, masks weakness specifically within electronics as, in most countries, electrical demand fared better than did electronics. Offtake by the latter is likely to have fallen significantly faster than the 20% year-on-year decline for the combined group. Global semiconductor billings (a key indicator of the health of the electronics sector), for example, fell by 32% last year according to the SIA.

Silver has many applications in electronics and, in this focus box, we concentrate on one of its most significant uses, that in semiconductors (also known as integrated circuits or microchips). As a reminder, semiconductors are tiny electronic circuits etched on silicon, designed to process, store and move information. Their principal areas of use include cellphones, personal computers (PCs), car engine management systems and digital watches.

Sales of semiconductors fell last year for two key reasons on top of the background slowdown in global GDP growth. The first was that the demand for technology products, at both a consumer and business level, slumped in 2001. Global cellphone sales in 2001, for example, according to Dataquest, Inc. (a unit of Gartner, Inc.), fell by 3% - the first time ever that sales of these had registered an overall decline. This drop was chiefly ascribed to the removal of prepaid subsidies, strong growth in SIM (Subscriber Identity Module)-only subscriptions and the US economic downturn. Turning to sales of PCs in 2001, Dataquest, Inc. estimate that global volumes fell by 4.6% whilst International Data

Figure 50
Global Semiconductor Billings



Source: SIA

Corporation put the decline a little greater at 6.7%.

The demand for semiconductors was hit more harshly than the percentage fall for new technology products mainly as a result of a second key factor, the run down in the large industry inventory that had built up in previous years.

Stocks are a critical issue for this industry as a result of the structure of semiconductor production, being manufactured in large sterile fabrication units. These units are expensive to set up and bringing them on line takes around two years. In addition, the suspension of production incurs substantial penalties; for example, when operations need to be restarted, the re-sterilization costs incurred are high. All this means the response to demand changes is invariably slow and awkward. The industry is therefore characterized by periods of chronic over and under supply and volatile prices.

Photography

- Demand in the photographic sector was down for the second year in a row, falling 4.2% to 210.2 Moz (6,539 t).
- Reflecting the weak economic situation, demand in Europe dropped by 5.3% whilst offtake in the United States was 9.2% lower.

Production of silver nitrate in the **United States** for use in photography fell by over 9% last year to 65.5 Moz (2,038 t). There were several factors that together brought about a decline on this scale.

Firstly, demand for silver-bearing photographic products was lower. In large measure this resulted from the weakening US economy and the impact this had on domestic sales, particularly in the consumer sector. In addition, exports to foreign markets were also softer in 2001. The picture further darkened in the aftermath of the terrorist attacks on America, when, for example, sales of consumer film slumped as air travel declined.

Secondly, at the manufacturing level, the effect of weak GDP growth was magnified due to the carry over of raw material and finished goods stocks from 2000. Indeed, it seems that in some cases such excess

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

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Belgium	19.7	20.1	20.6	22.8	24.8	26.6	33.2	36.9	34.7	31.6
UK & Ireland	13.1	13.6	15.9	16.7	18.2	19.0	19.1	21.0	21.8	27.7
France	14.3	14.7	13.7	15.9	13.2	12.7	14.5	11.9	13.1	6.5
Germany	15.8	15.4	16.1	14.8	13.8	14.5	9.9	6.7	1.7	1.6
Czech & Slovak Republics	0.2	0.0	0.0	0.0	0.0	0.1	0.3	0.0	0.3	0.5
Hungary	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Romania	0.3	0.3	0.2	0.1	0.2	0.2	0.3	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
Poland	0.5	0.5	0.5	0.5	0.3	0.2	0.0	0.0	0.0	0.0
Spain	0.6	0.4	0.2	0.1	0.0	0.0	0.0	0.0	0.0	0.0
<i>Total Europe</i>	64.8	65.2	67.4	71.1	70.7	73.5	77.4	76.9	72.0	68.2
North America										
United States	52.7	53.2	56.3	60.8	61.8	64.5	68.6	71.8	72.1	65.5
Mexico	2.6	3.2	3.2	3.3	3.4	4.1	3.4	2.9	0.0	0.0
<i>Total North America</i>	55.4	56.3	59.5	64.1	65.2	68.6	72.0	74.7	72.1	65.5
Central & South America										
Brazil	2.6	2.6	3.2	4.0	3.4	3.4	3.2	3.2	2.4	2.3
Argentina	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.6	1.3	1.0
<i>Total Central & South America</i>	4.4	4.4	5.0	5.8	5.2	5.2	5.0	4.8	3.7	3.3
Indian Sub-Continent										
India	2.6	2.3	1.6	0.6	0.6	0.6	0.3	0.3	0.3	0.3
Other	0.2	0.3	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.1
<i>Total Indian Sub-Continent</i>	2.8	2.5	1.8	0.9	0.9	1.0	0.7	0.7	0.7	0.5
East Asia										
Japan	58.0	57.2	55.1	56.9	57.9	58.6	58.2	59.9	61.2	62.2
Taiwan	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Total East Asia</i>	58.1	57.3	55.2	56.9	57.9	58.6	58.2	60.0	61.2	62.2
Oceania										
Australia	2.3	2.1	1.9	1.6	1.6	1.6	1.6	1.7	2.7	2.4
<i>Total Oceania</i>	2.3	2.1	1.9	1.6	1.6	1.6	1.6	1.7	2.7	2.4
Western World Total	187.7	187.9	190.8	200.4	201.6	208.5	215.0	218.8	212.5	202.0
Other Countries										
China	4.7	5.1	5.6	5.6	5.8	6.0	6.1	3.7	3.9	5.1
Soviet Union/CIS	7.2	6.3	5.2	5.0	4.7	4.5	3.8	3.4	3.2	3.1
<i>Total Other Countries</i>	11.9	11.4	10.8	10.5	10.4	10.5	9.9	7.1	7.1	8.2
World Total	199.6	199.3	201.6	210.9	212.0	219.0	225.0	225.9	219.5	210.2

inventory was still affecting silver demand in the first quarter of 2002. Improvements in inventory management have only served to exacerbate the above-mentioned problem.

Thirdly, and at the margin, the more widespread use of digital technology has encroached on the silver halide market. This was most noticeable in the graphic arts sector but it has also been one of the reasons behind the demise of the traditional instant

photography business (best exemplified by Polaroid filing for Chapter 11 bankruptcy in October last year).

Finally, manufacturers of photographic products who have facilities across the globe can shift part or all of the production process from one plant to another. In recent years, for example, this phenomenon has boosted US output at the expense of Japan. Last year, a partial reversal of this trend led to some relocation of silver nitrate demand to outside the United States.

US silver nitrate demand has remained fairly soft in the first few months of this year. The prospects for an improvement in the numbers largely hinge on the, at present, fragile recovery in the US economy being confirmed in the second half of 2002. Manufacturers are understandably cautious. Kodak, for instance, declared in its first quarter report that it expected the balance of 2002 would continue to be “challenging”.

European silver nitrate output for the photographic market is estimated to have fallen by 5% to 68.2 Moz (2,121 t). This was primarily due to the economic slowdown in several of the main consuming countries as well as the impact of “911”. These two developments impacted both on consumer imaging (for example, less holidays being taken) and the professional graphic arts market, which felt the impact of a reduction in company expenditure in the form of lower printing volumes. In addition, digital technology continued to make inroads into the graphic arts sector and this trend also accounted for much of the slowdown in silver-based medical demand. These developments contributed to the 9% fall in **Belgian** demand. Elsewhere, the impact of the economic slowdown was masked by industry reorganization. There was a sharp rise in nitrate output in the **United Kingdom**, up 27% as a result of higher export demand. Equally, the sharp fall in **French** output was primarily due to industry restructuring as well as the impact of slower consumer demand.

GFMS estimate that **Japanese** photographic demand

Worldwide Film and Paper Consumption and Photographic Fabrication Demand

	1997	1998	1999	2000	2001
Film**	3,404	3,332	3,441	3,511	3,433
Paper^	1,511	1,556	1,699	1,750	1,760
Fabrication*	219	225	226	220	210

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

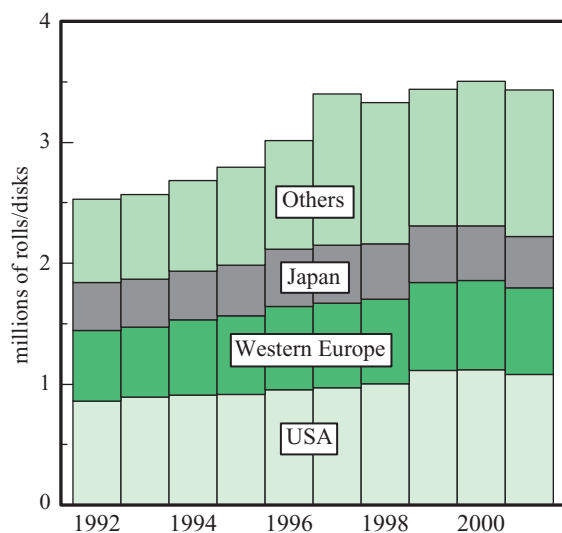
Source: Photofinishing News, GFMS

rose by around 1.7 %, to 62.2 Moz (1,935 t) from a revised 2000 figure of 61.2 Moz (1,902 t). Based on field research and other proprietary data, we believe that two of the three large fabricators experienced declines in their production of silver containing photosensitive products whilst the other saw output increase year-on-year. Crucially, if it had not been for the fact that production, which had previously been offshore, was brought back onshore, total silver offtake would have fallen.

There were two key reasons for the background weakness seen in 2001. Firstly, the global slowdown coupled to the stagnation of the Japanese economy hit domestic consumption particularly hard and also saw exports slow. Secondly, the inroads being made by digital photography was also a factor underpinning the decline in offtake (this is addressed in more detail below and in the focus box on page 60).

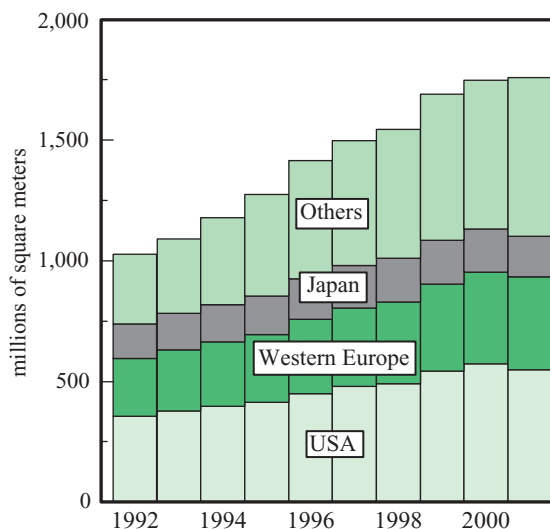
Looking at Japanese **consumption** of amateur film

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 fell sharply in 2001, principally due to the weak global economic situation. Hardest hit has been the consumer sector, with purchases of films particularly affected. However, on top of the effect of the insecure economic environment, consumers also continued the shift towards digital cameras, sales of which rose by 37% to over 19 million units. This can be compared with sales of conventional cameras, which although remaining dominant at 68 million units, were flat year-on-year.

As with 2000, the graphic arts segment of silver demand in 2001 was adversely 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.

Demand for silver in the motion picture industry was impacted more by the economic slowdown and aftermath of September 11th than by any switch to digital, with a number of motion picture film releases and television show productions delayed or postponed following the terrorist attacks. The impact of digital technology has been fairly modest in this sector, with few theaters having made the expensive transition to digital technology.

Although digital technology has begun to impact on the growth of medical 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 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 2001, although some of this fall must also be attributed to the economic slowdown experienced in key regions.

Turning to the medium term outlook for silver demand in the photographic sector, it appears as though the impact of digital technology will grow, affecting demand specifically in photographic film but also to an

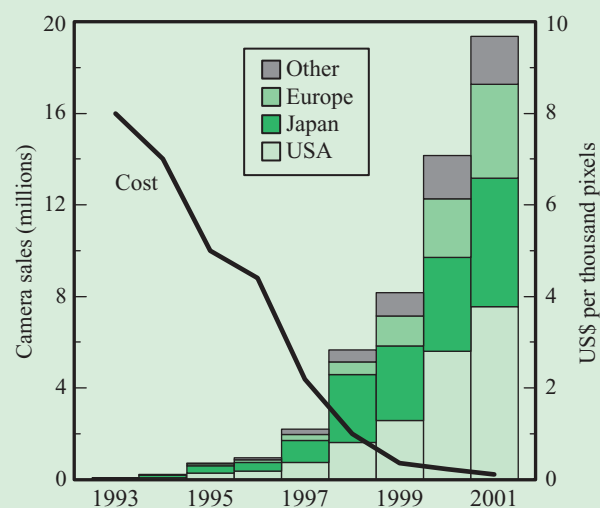
extent in paper.

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.

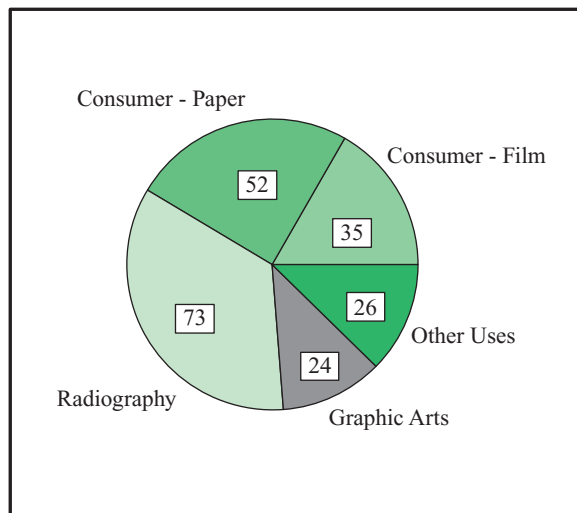
In addition to the impact of digital technology on film sales, the effect on photographic paper must also be considered. Many users of digital cameras only choose to print selective pictures and often pictures are not printed at all, but saved electronically. If home PC penetration figures continue to rise, this practise could increase. A further development that has the potential to impact on photographic paper sales is the digital photo kiosk, which has begun to appear in shopping malls in the United States. These kiosks offer digital camera users the opportunity to plug in their camera and instantly either print out, burn onto a CD or upload onto the internet their pictures.

Figure 53
Digital Cameras: Sales and Cost per Pixel*



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

Figure 54
Photographic Uses of Silver
million ounces



and paper, data seen by GFMS suggests that it probably fell by as much as 8%, although, at the time of writing, the final figures were still not available. Interestingly, film sales fell by more than paper sales, a reflection of the fact that printing from digital is often done on halide paper. (One data source that we have seen points to paper production for local consumption having been up.) Although the impact of digital was probably one of the more important variables explaining this fall, one of our contacts in the Japanese film industry suggested that another reason for the weakness in offtake in recent years has been the decline in the number of babies being born (and photographed endlessly) in Japan!

Looking at the fabrication totals, we estimate that amateur film and paper, which probably account for 15% of the total market, rose by a couple of percent last year, with weaker local consumption offset by a rise in shipments to markets like Hong Kong (for China) and the rest of Asia.

Medical uses of silver, which account for around 50% of total silver photographic demand, were up slightly year-on-year, again because of higher exports to the Asian markets.

Not surprisingly, graphic arts uses of silver, which still account for around 30% of total market offtake, fell again in 2001, continuing its long downward trend, affected in the main by the introduction of digital technologies. By our estimates, the fall was significantly more than the decline in the amateur

market. Finally, motion picture demand (around 5% of the total market) was stable year-on-year.

The view of the industry in Japan is that digital is now really beginning to have an impact on local silver demand. The balance to date between declining film sales and rising paper offtake has been a fine one (digital images still being printed on halide paper), but this no longer appears to be the case. Indeed, it seems as if the negative impact of capturing images digitally is now outweighing any increase in printing in Japan. In fact, one of the major fabricators in Japan with whom we spoke is of the view that the rise in digital camera sales has actually had an overall negative impact on silver use right from the start because of fewer pictures being printed. Their in-house research suggests that, in Japan, less than 10% of pictures taken digitally are actually printed out as people tend to be a lot more selective than they would with conventional technologies.

It is worth noting that digital penetration is extremely high in Japan. For example, based on estimates from Photo Market Magazine, digital cameras accounted for over 60% of total camera sales in Japan last year (this includes APS, digital and 35mm camera sales). But although this trend does appear to have impacted negatively on silver, it is interesting to note that all of the main manufacturers have developed systems that combine digital and traditional technologies, with the bias from a printing perspective still being towards halide paper. Certainly in the short to medium term, traditional paper will continue to be important because it is currently a much cheaper and quicker alternative to inkjet printing.

Chinese photographic demand rose sharply in 2001, up by over 30% to 5.1 Moz (160 t). This was due to a combination of both higher domestic demand for final products and an increase in the amount of nitrate manufactured locally for use in photosensitive products.

The home market is still fed from a combination of domestically produced film and unofficially imported products from Hong Kong. From a consumption perspective, it is estimated that local fabricator Lucky Film Co Ltd. holds around a 20-25% share of China's film market, about the same as Fuji. Kodak, after its acquisitions of recent years, is now the market leader with something in the order of 50% of the market. (All of these numbers are, at best, estimates considering the volume of unofficial film and paper entering China from Hong Kong.)

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

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Italy	50.4	46.2	41.4	39.0	40.5	44.8	45.3	51.2	54.2	45.1
Germany	13.5	11.6	11.6	10.3	10.0	10.0	10.1	10.0	9.3	9.4
Greece	3.5	3.7	3.9	3.8	4.2	4.5	4.1	4.1	4.3	4.1
UK & Ireland	2.2	2.7	2.9	3.0	3.3	3.4	3.3	3.1	3.2	2.9
France	1.7	2.0	1.9	2.0	2.0	2.2	2.6	2.7	2.8	2.7
Poland	1.0	1.0	1.1	1.6	1.8	2.3	2.7	2.9	3.0	2.5
Spain	3.7	3.7	4.0	4.1	4.5	4.0	4.1	3.4	3.0	2.4
Portugal	2.2	2.1	1.5	1.7	1.9	1.9	1.9	2.1	2.1	1.8
Norway	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.5	1.6	1.5
Denmark	0.9	0.9	0.9	0.9	0.9	1.0	0.9	0.9	0.9	0.8
Sweden	1.3	1.2	1.2	1.0	1.1	1.3	1.0	1.0	0.9	0.6
Finland	1.0	0.8	0.9	0.7	0.8	0.8	0.6	0.6	0.5	0.4
Cyprus & Malta	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3
Austria	0.5	0.5	0.4	0.4	0.4	0.4	0.5	0.4	0.3	0.2
Czech & Slovak Republics	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1
Other	1.1	1.1	1.0	1.0	0.9	0.9	1.0	0.9	0.9	1.0
<i>Total Europe</i>	84.7	79.0	74.3	71.2	74.0	79.2	79.7	85.3	87.6	75.8
North America										
United States	10.9	11.3	12.0	12.5	12.4	12.5	12.6	13.1	13.7	13.0
Mexico	9.0	9.2	8.7	11.0	14.2	16.3	15.3	15.1	13.2	12.9
Canada	0.9	0.9	1.0	1.2	1.3	1.5	1.8	1.5	1.4	1.5
<i>Total North America</i>	20.8	21.3	21.6	24.8	28.0	30.4	29.7	29.7	28.4	27.4
Central & South America										
Brazil	1.6	1.8	1.8	1.9	1.8	1.6	1.4	1.3	1.2	1.2
Peru	0.7	0.8	0.8	0.9	1.0	1.1	1.0	1.0	0.9	0.9
Colombia	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0.6	0.5
Ecuador	0.3	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.4
Argentina	1.0	1.0	1.0	0.9	0.8	0.8	0.2	0.2	0.2	0.1
Other	0.7	0.7	0.6	0.7	1.0	1.4	1.7	1.9	1.2	0.9
<i>Total Central & South America</i>	5.1	5.5	5.7	5.9	6.0	6.3	5.8	5.4	4.5	4.1
Middle East										
Turkey	4.6	5.0	4.3	5.1	5.5	5.5	5.2	4.7	5.9	4.3
Israel	1.8	2.0	2.1	2.3	2.6	3.0	2.8	2.9	2.6	2.4
Egypt	2.2	1.8	1.8	2.0	2.1	2.0	1.7	1.9	1.9	1.6
Saudi Arabia	0.4	0.4	0.3	0.4	0.4	0.6	0.5	0.6	0.6	0.6
Other	2.4	2.0	2.4	2.5	2.6	2.6	2.4	2.5	2.6	2.7
<i>Total Middle East</i>	11.4	11.2	11.0	12.4	13.3	13.6	12.8	12.6	13.7	11.6
Indian Sub-Continent										
India	35.6	77.5	60.2	66.6	86.0	86.3	82.5	83.2	84.6	102.9
Bangladesh & Nepal	2.6	3.9	4.5	5.1	5.8	6.4	5.1	5.7	6.0	5.9
Other	2.1	2.5	2.1	2.9	2.0	3.1	1.9	2.4	2.3	1.7
<i>Total Indian Sub-Continent</i>	40.3	83.9	66.8	74.6	93.8	95.8	89.5	91.4	92.8	110.5
East Asia										
Thailand	31.6	38.5	28.9	27.4	27.1	26.8	23.9	26.5	30.0	32.4
South Korea	5.0	7.2	6.4	6.8	6.6	6.3	2.6	4.5	4.9	4.6
Indonesia	1.2	1.4	2.3	2.7	2.9	3.6	2.2	2.7	3.9	4.3
Japan	2.8	2.5	2.2	2.2	2.1	1.9	1.8	1.8	1.7	1.7
Myanmar, Laos & Cambodia	1.0	1.0	1.0	1.1	1.1	1.0	0.8	0.9	0.8	0.9
Vietnam	0.3	0.4	0.5	0.6	0.7	0.7	0.6	0.7	0.7	0.7
Malaysia	0.4	0.5	0.4	0.4	0.4	0.4	0.4	0.5	0.5	0.6
Hong Kong	1.0	1.0	1.0	0.9	0.9	1.0	0.6	0.6	0.5	0.5
Taiwan	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.3
Other	0.3	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
<i>Total East Asia</i>	44.0	53.2	43.4	42.8	42.6	42.5	33.6	38.9	43.9	46.4

Table 7

Silver Fabrication: Jewelry and Silverware

(including the use of scrap)

Million ounces

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Africa										
Morocco	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.3	0.3	0.3
Tunisia	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Algeria	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Other	0.5	0.4	0.5	0.5	0.4	0.4	0.3	0.4	0.4	0.4
<i>Total Africa</i>	1.3	1.2	1.3	1.3	1.2	1.2	1.2	1.1	1.2	1.1
Oceania										
Australia	0.5	0.6	0.6	0.6	0.5	0.6	0.7	0.7	0.8	0.7
New Zealand	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Total Oceania</i>	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.8	0.8	0.7
Western World Total	208.1	256.0	224.6	233.5	259.4	269.6	253.0	265.2	272.7	277.7
Other Countries										
China	0.4	0.7	1.0	1.4	2.4	3.1	4.7	6.3	6.7	7.4
CIS	1.8	2.4	2.2	2.0	1.9	1.7	1.7	1.8	2.0	2.5
<i>Total Other Countries</i>	2.2	3.1	3.2	3.4	4.3	4.8	6.4	8.1	8.7	9.9
World Total	210.3	259.1	227.8	236.9	263.7	274.4	259.4	273.2	281.4	287.6

Competition has been especially fierce in the past few years, and this has been reflected in the financial performance of Lucky Film, the country's only significant indigenous producer of photosensitized materials. Net profit for the year fell 35%, with the company blaming stiff competition and rampant film smuggling for their poor results. The market is still rife with rumors that Lucky will have to strike a cooperation deal with one of the bigger international players such as Fuji, Konica or Agfa-Gevaert because it lags Kodak in many key technical areas.

Jewelry & Silverware

- Jewelry and silverware was the sole bright spot for fabrication demand, rising 2.2% to a record 287.6 Moz (8,944 t).
- Asia accounted for most of the global gain with Indian offtake growing particularly strongly (up over 20% to 102.9 Moz (3,200 t)).
- Europe, North America and the Middle East all saw declines (13%, 3% and 15% respectively).
- Excluding India, jewelry and silverware offtake actually fell year-on-year.

Europe

Jewelry and silverware fabrication demand in **Italy** saw a marked fall last year of 17% to 45.1 Moz (1,402 t). This is the first year since 1995 that offtake here has fallen; jewelry demand dropped for the first time in

this period and therefore could no longer outweigh the secular decline in silverware.

One of the key reasons for the drop was the decline in jewelry exports (the official trade statistics show a fall of around 5%). Greater care needs to be exercised as regards the official numbers these days as the disappearance of customs borders within the EU raises the possibility that errors could slip in, especially given that three of Italy's top five markets for silver jewelry are within the EU. Fortunately, there is near unanimity within the industry that exports last year were at best flat. The principal loss in exports was to the United States (down 9%). However, it is possible that figure understates the true scale of the decline; the second largest absolute fall was to Panama and this is thought to have largely come about through the loss of its entrepôt role to wholesalers in the United States, a shift which would have boosted that country's imports.

As with gold jewelry, one reason for export difficulties is increasing competition from countries such as Thailand or China. Increasing emphasis on quality, design and mechanization should help the Italian fabricators to maintain market share but it is not impossible that we will see some relocation of production to countries with lower labor costs.

There were also signs that domestic demand for silver jewelry was weak last year. Destocking as seen elsewhere no doubt contributed but this was exacerbated in Italy by another retail change. Over the past few years as gold jewelry consumption has fallen,

many traditional jewelers took to stocking silver in an attempt to bolster sales. However, now that gold sales have stabilized, the pressure to diversify thus has lifted.

As for silverware fabrication, losses were once again much greater than for jewelry. Here it is less producer competition or flagging exports but more weak domestic consumption where the blame lies. This remains very much a result of the long standing generational shift away from giving silver as presents at weddings, christenings or first communions. There is also little to suggest this move is coming to an abrupt halt, raising the question of whether silverware will ever stabilize.

Fortunately, there are some signs this may be possible in the not too distant future. A further fall in the consumption of traditional items in the south of the country can still be expected but demand within the north has to some extent already been “modernized”. This “modernization” involves a proportionate shift from traditional flatware and cutlery to items better termed “giftware” that might be given on other occasions, say at Christmas or birthdays. Cutlery production, for example, has been doing particularly badly in recent years as sales of full canteens have sunk to minimal levels. Having bottomed out, this could start to be replaced by the growth being seen in single piece, less utilitarian items such as nutcrackers, grape scissors or bread knives.

There has also been good growth in “giftware” demand overseas, particularly in the United States, and

the share of fabrication going to exports is rising noticeably. Nevertheless, heavy competition from rival gifts such as porcelain and crystal will force silverware manufacturers to maintain interest with innovative product ranges and marketing campaigns.

Overall jewelry and silverware demand in **Germany** is thought to have held steady at 9.4 Moz (292 t) but this disguises significant differences between the two elements, both largely stemming from generational factors. Jewelry saw modest gains, in part through the new light weight, branded ranges introduced for the youth market. In contrast, silverware demand continued to slide as, in a manner similar to Italy, the younger generations remain uninterested in these products in an age of stainless steel and dishwashers.

Jewelry and silverware demand in the **United Kingdom** was 10% lower last year at 2.9 Moz (90 t). Although a 6% rise was recorded in the hallmarking statistics, the increase was due to higher imports, notably from Italy, Thailand and China, which took a greater share of the local market. In recent years, the low-cost nature of production in south and east Asia, together with the strong pound, has encouraged a number of companies to relocate their facilities abroad and this trend continued into 2001. In addition, last year, UK jewelry fabricators lost out as new demand for diamond-set pieces was satisfied mainly by imports. The local market received a further setback following the foot and mouth crisis as rural tourism fell dramatically, hitting small and medium-sized operations.

North America

Jewelry and silverware demand in the **United States** slipped back to just below the 1999 level. The decline in the silver jewelry market was due to a combination of factors. Firstly, the slowdown in consumer demand and the impact of “911” led to a reduction in silver purchases. Secondly, imports appear to have taken a greater share of the local market. Although shipments to the United States declined by 5%, the fall was less severe than the drop in local fabrication. This was due to increasing price competition as well as a relocation of manufacturing facilities outside of the United States (a trend which was by no means new last year). In particular, this helped to explain the sharp rise in Chinese exports to the United States.

Silverware demand was also lower last year for the reasons outlined above (for example, flatware orders from high-end department stores were noticeably

Figure 55
Official Italian Jewelry Exports

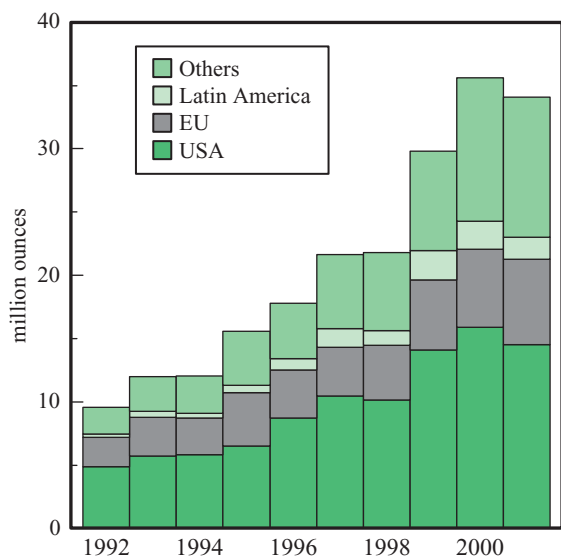
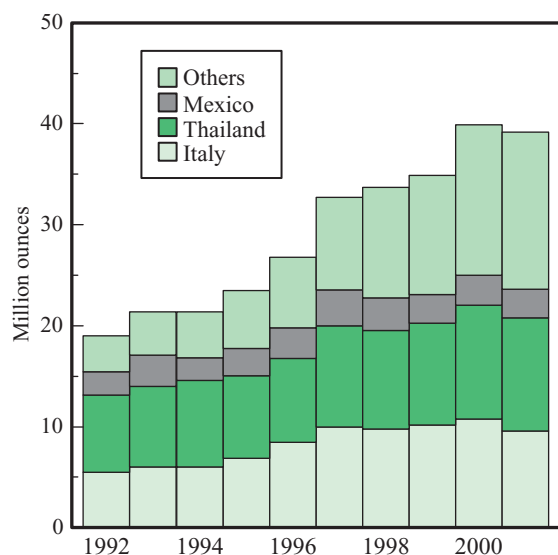


Figure 56
US Silver Jewelry Imports



lower after “911”). In contrast to the jewelry market, new designs play only a marginal role in influencing demand. Instead, it is the traditional designs which have maintained their popularity.

Due to the large unofficial market centered, albeit not exclusively, on the city of Taxco, it is difficult to gauge with precision the level of **Mexican** jewelry and silverware production. Even establishing whether output is lower or higher can be a challenge unless there is a clear trend in output. These observations fully apply to our analysis of the Mexican market last year. There was no obvious rise or fall in the level of production in 2001. On the basis of our estimates for raw material supply to manufacturers, the volume of goods produced does seem to have fallen, although only by a few percent. This conclusion is supported by two other developments last year. First, a rise in the level of silver jewelry, mainly of Italian origin, imported into Mexico (to some extent displacing local fabrication) and, second by, according to US trade data, a small decline in the amount of Mexican jewelry imported by the United States, which is comfortably Mexico’s largest foreign market for silver jewelry.

Middle East

The 27% fall in **Turkish** fabrication was almost entirely due to a slowdown in the local market coupled with lower tourist purchases after “911”. Before the terrorist attacks, tourist demand was quite buoyant and may have softened the impact of the sharp fall in local purchases, which were adversely affected by the

economic and financial crisis which beset Turkey. In contrast to the local market, export demand remained quite robust and, somewhat surprisingly, shipments to the United States were markedly higher. In many respects, we may be seeing a similar trend to that witnessed in the Turkish gold market, in other words manufacturers may be turning their attention to other markets, in the wake of falling home demand.

Egyptian jewelry and silverware demand fell back to 1.6 Moz (51 t) in 2001, a level last seen a decade earlier. Local demand remained at a low ebb throughout the year, partly as a result of low consumer demand (for example, corporate giftware orders were markedly lower) but also because of the ongoing problems experienced by manufacturers in obtaining trade finance. In addition, a series of currency devaluations during the second half of the year, which pushed up local prices, also affected the local market. Somewhat surprisingly, the impact of the new sales tax in July (stages two and three, both of 1%, are targeted at the wholesale and retail sectors) appeared to be limited as its introduction occurred during a period of seasonally weak demand. In contrast to the local market, tourist purchases only declined significantly in the wake of “911”. However, this coincided with the onset of the main tourist season and so its impact was not insignificant. (Arrivals remained at a low level throughout most of the first quarter of 2002.)

The ongoing political problems in **Israel** (related to the Palestinian territories) took their toll on the silver jewelry market, principally in the form of lower tourist-related purchases. In contrast, both domestic and export-led silverware demand (mainly to the United States) remained broadly unchanged, at least until September 11th. Thereafter, demand softened in both markets, leaving total jewelry and silverware demand nearly 8% lower year-on-year.

Indian Sub-Continent

Indian jewelry demand surged in 2001, up 21.7% to 102.9 Moz (3,200 t), the largest volume ever recorded in the *World Silver Survey*. As we discuss in Chapters 1 and 2, there is little doubt that in the absence of this increase, the silver price would have moved even lower than it did last year. Significantly, India’s share of global jewelry and silverware demand rose from 30% in 2000 to close to 36%. Perhaps even more remarkably, Indian demand in this category rose from around 9% of total global fabrication demand to close to 12% last year. It is sobering to note that Indian

jewelry and silverware demand last year was more than double that of Italy, the next largest manufacturer in this sector.

Why was demand so strong last year? It has to be said that there is no single event or cause that stands out as having been the primary driver, although the price was clearly influential.

The average price last year was 7.2% lower than in 2000, at 7,418 rupees/kg. As regular readers of the *World Silver Survey* will be aware, the Indian market is extremely price sensitive and, with prices comfortably below the psychologically important 8,000 rupees/kg level for the whole year, demand surged.

Another driver of demand, especially in the first half, was the expectation that, agriculturally, the year was going to be a good one. Indeed, to some extent, these expectations boosted demand ahead of the rains. On GFMS' field trip to India early in 2001, the bazaars were awash with rumors that the monsoon was going to be good and this in itself seems to have stimulated pre-emptive buying (of both gold and silver).

Quite why this was the case in 2001 and not in previous years is not entirely clear. The southwest monsoon, which provides around 80% of India's precipitation, usually begins around June and is of profound importance not only for silver (and gold) demand but also for the economy generally, and is always keenly anticipated.

All India Monsoon Rainfall

(rainfall % of normal)

1997	1998	1999	2000	2001
102	106	96	92	92

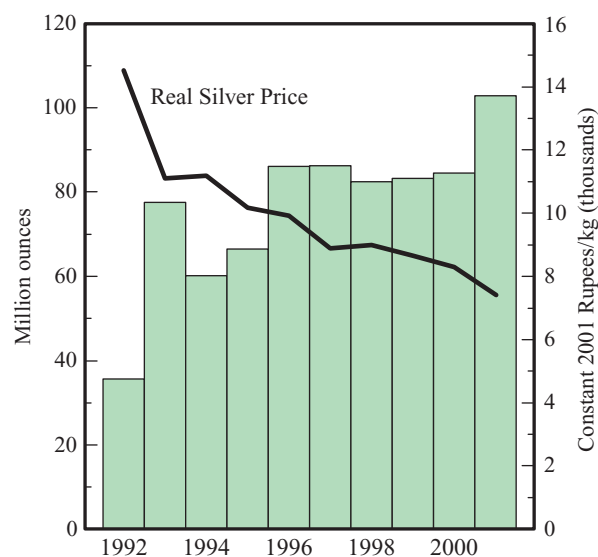
(source: National Informatics Centre)

Expectations of a good monsoon, however, turned out to be only partially correct. According to the National Informatics Centre, on a scale of 100, the monsoon in 2001 was at 92 and could be classified as normal. This was the same level as 2000, in spite of many of the early reports indicating that rainfall had in fact been better than in the previous year. Apparently, although the rains were more equitable during 2001, the levels were the same as in the previous year.

Readers of the GFMS *Gold Survey* may be wondering at this juncture why gold and silver jewelry/silverware demand diverged so much in the second half of last year if agricultural demand is such a key variable. For the record, as we noted in *Gold Survey 2002*, gold jewelry demand in the second half of 2001

Figure 57

Indian Jewelry and Silverware Fabrication



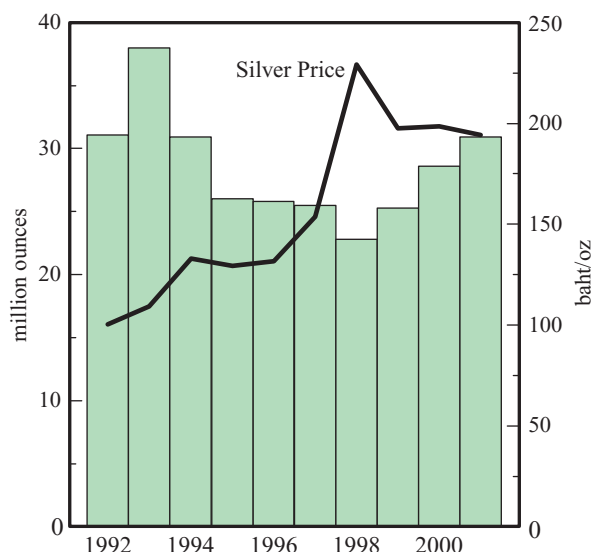
slumped compared with the first half, falling by 36%. By contrast, overall silver demand in this category fell by "only" 17%.

Our preliminary interpretation of this difference is that it seems as if the growth in farm incomes between the north and south of the country may have diverged last year. For instance, on a recent field trip to Kerala and Tamil Nadu, most of the jewelers that we visited identified falling commodity prices, in particular coconut prices and its negative impact on farmers' incomes, as one of the main reasons for the lack of growth in gold jewelry demand over the past few years. Coconut oil is the primary source of income for tens of thousands of farmers in Kerala and, in recent years, prices have fallen so low that many small farmers could not make a living (in 2001 the average international price for coconut oil was down by 34% year-on-year). Crucially, the south of India is predominantly a gold consuming area. By contrast, the price of grains (particularly wheat and maize), which is a major source of agricultural income in the northern states like the Punjab, actually rose last year, which may have seen farmers' incomes there holding up better than those in the south of the country.

Although the data is patchy, there is also sufficient information to suggest that monsoon rains in the key silver consuming areas of the north were in fact quite good last year (which would have given an additional filip to silver offtake). Decent monsoon showers were recorded in western Gujarat, Maharashtra, central Madhya Pradesh and northern Rajasthan, all of which

Figure 58

Thai Jewelry and Silverware Fabrication



are important silver consuming regions.

The importance of the rural market to total Indian demand is reflected in the fact that silver demand grew in spite of the rather weak performance of the non-agricultural sector last year. For example, BMI estimate that real GDP growth in the financial year 2001 was only around 4% (compared with 6% in 2000). Elsewhere, it is reported that many public sector units did not declare bonuses in 2001, in addition to there having been a lot of retrenchment, which impacted negatively on disposable income. All of this would have been expected to impact negatively on urban silver demand.

In terms of the split between jewelry and silverware offtake last year, our data suggests that the latter grew more strongly than the former, with demand for various utensils being particularly strong. Jewelry offtake was, by contrast, only slightly up on the previous year.

East Asia

Last year saw **Thailand** experience another increase in fabrication demand, with silver offtake growing by 8% year-on-year, albeit at a lower rate than that seen in the previous two years when the average gain was 12% per annum.

A move to the production of higher value added pieces, particularly by incorporating various semi-precious and precious gems (even diamonds), has been a familiar course of action for Thai jewelry manufacturers (both in gold and silver) over the past

few years. This has been necessary to avoid competing at the low end of the market against the likes of Chinese and Indonesian fabricators who have cheaper but less skilled labor. Last year did see a slight shift in demand towards lower value pieces that created pressure on Thai fabricators to supply their normal ranges at lower prices and also more interest in less costly styles. Several Thai manufacturers lamented that profits did not keep pace with increased sales volumes.

The lower growth rate in Thai offtake in 2001 was mainly a result of the flat level of exports to the United States (compared to the 12% increase seen in 2000). The impact of this is easy to understand when considering Thailand exported around 41% of its silver jewelry (in fine silver volume terms) to this important market last year. Static US exports were largely a result of the well-documented slowdown in consumer spending, particularly on discretionary items. A “silver lining” to this poor result was that silver did not suffer as much as some other jewelry categories (for example diamonds and gold) and in fact benefited from the switch to lower priced items as customers looked for alternative, more affordable, pieces. The continued popularity of the “white” look in jewelry combined with the appeal of fashionable silver designs to the younger generation also helped to insulate sales.

In sharp contrast to the above, many Thai fabricators reported good sales growth to western European countries such as the United Kingdom, Germany, France and Italy. Exports to Japan were also quite strong, a somewhat surprising result on the surface, given the country’s well publicized economic problems including low levels of consumer spending. As well as the shift by Japanese consumers to lower priced goods in times of economic adversity, another explanation can be found by considering the large fall in the popularity of the more expensive white metal, platinum, with sales of that metal in jewelry form estimated to have fallen by a third last year according to Johnson Matthey. More than one Thai manufacturer has boosted production of rhodium plated silver pieces to replicate the platinum look.

Tax on silver bullion imports still remains an issue for the industry in Thailand, particularly when considered in the light of the removal of VAT on gold bullion imports in September 2000 and its resultant effect of increasing gold imports through official channels. GFMS estimate that over a third of silver imported into Thailand arrived through unofficial

channels last year. Such large unofficial shipments are at the start of the “cash economy” value chain. Typically, the avoidance of tax on silver imports leads to the fabricator continuing to keep the silver “off the records” by selling the finished product on a cash basis (obviously income tax is also a consideration).

At the end of the “cash value chain”, exports find their way into the international markets also via unofficial routes, such as the “cash & carry” or “back pack” methods (where buyers hand-carry their goods back to their own country, typically to be sold in markets and other less formal retail channels). Last year, the Thai Customs Department undertook a large-scale random audit program targeting the smaller operators springing up around the southern end of Silom Road in Bangkok and also made an attempt to curtail the burgeoning back packer trade. The Thai Gem and Jewelry Traders Association has been the main instigator in pushing for the removal of VAT from silver bullion imports.

Whilst a minnow in terms of silver jewelry fabrication volumes, the **Indonesian** silver jewelry sector experienced another good year, growing by 11% year-on-year. Exports into Europe (mainly Denmark) and Japan accounted for much of the growth, whilst a small 3% increase was recorded for exports to the United States. At present, the industry is quite fragmented with several hundred fabricators operating primarily on the island of Bali. Perhaps consolidation and increased investment (as occurred in the gold

jewelry industry based in Surabaya) could see Indonesia make further progress in becoming a larger player in the East Asian silver jewelry sector.

Coins and Medals

- Coin demand fell by 8.6% last year to 27.2 Moz (846 t).
- Fabrication in the two largest silver coin manufacturing countries, the United States and Germany, was lower in 2001.

World silver coin fabrication has consistently remained below the level of the early 1990s. In today’s market, coin demand is largely dictated by just two countries, namely the United States and Germany, both of which experienced a fall in offtake last year.

Coin demand in the **United States** was over 10% lower in 2001. The decline was partly due to a fall in demand for the one-ounce Eagle, especially during the first half of the year. However, there was a significant (but short-lived) response to the events of September 11th; in the two months following the terrorist attacks, Eagle sales nearly doubled. In addition, production of the silver proof set was considerably lower than in 2000, although that year marked the first year in which silver was included in the proof set, which sparked additional interest from the public. In contrast, minting of the silver proof Eagles was marginally higher at 0.7 Moz (23 t).

Figure 59
World Coin Fabrication

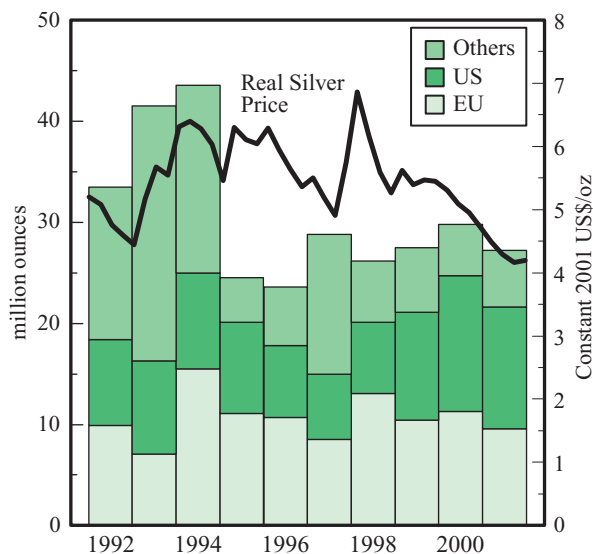


Figure 60
US Silver Eagle Coin Sales

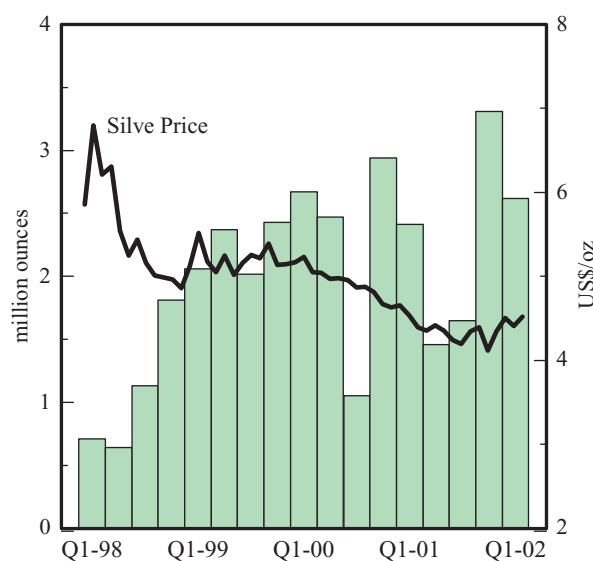


Table 8

Silver Fabrication: Coins and Medals

(including the use of scrap)

Million ounces

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
United States	8.5	9.2	9.5	9.0	7.1	6.5	7.0	10.7	13.4	12.0
Germany	5.6	2.8	7.1	2.4	4.6	3.7	8.4	5.4	7.2	4.9
Spain	0.4	0.3	4.8	4.0	2.8	1.8	1.7	1.5	1.3	1.8
China	0.4	0.4	0.7	0.8	1.4	2.8	2.4	2.3	1.2	1.5
Portugal	0.1	0.3	0.4	0.5	0.8	0.8	1.0	0.9	1.2	1.2
Mexico	8.7	17.1	13.0	0.6	0.5	0.4	0.2	0.4	0.7	1.1
Canada	0.8	1.2	1.5	0.7	0.7	0.7	1.1	1.4	1.0	0.9
Australia	2.1	2.3	1.6	0.7	0.8	0.8	1.0	0.9	0.7	0.5
UK & Ireland	0.5	0.7	0.8	0.7	0.6	0.6	0.6	0.6	0.6	0.5
Switzerland	0.4	0.3	0.3	0.4	0.6	0.6	0.3	0.4	0.4	0.4
France	2.1	2.1	1.0	1.1	0.3	0.3	0.3	0.3	0.3	0.4
Austria	0.5	0.5	0.5	0.6	0.4	0.3	0.3	0.3	0.2	0.3
Italy	0.4	0.4	0.5	0.5	0.5	0.4	0.4	0.3	0.3	0.3
Poland	0.1	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.2	0.2
CIS	0.1	0.1	0.2	0.1	0.6	0.4	0.2	0.2	0.1	0.2
Thailand	0.1	0.2	0.2	0.3	0.5	0.3	0.2	0.1	0.2	0.2
Other	2.7	3.5	1.3	1.9	1.3	8.3	1.0	1.8	0.8	0.8
World Total	33.5	41.5	43.6	24.5	23.6	28.8	26.2	27.6	29.8	27.2

In addition, two commemorative issues accounted for 0.6 Moz (19 t) of silver in 2001: the “American Buffalo” silver dollar (which sold out in a matter of weeks) and the “Capitol Visitors Center” silver commemorative coin. Both were minted with 90% silver and carried a fine weight of 26.73 grams.

It appears that in 2001 the US Mint’s silver requirements were once again satisfied by Defense Logistics Agency (DLA) stocks, although in 2002, silver purchased from the open market (this was the first time such purchases were made) was used for the coin programs.

The fall in **German** demand in 2001 occurred for two reasons. Firstly, one less commemorative issue was minted last year and secondly, the number of coins per issue was lower by 500,000 coins. Looking ahead to 2002, the face value of the commemorative coin will be changed from DM10 to Euro10 and the weight will be increased from 15.5 to 18 grams. (925 silver will continue to be used for these coins.) It is worth noting that the total shown in Table 8 relates to the volume of silver that was used for the circulating coin programs. However, it appears that the amount of blanks that were actually produced last year may have been considerably lower, with the balance made up of

unused blanks from previous years. (This will not be repeated in 2002 as the characteristics of the blanks will have changed.)

Spanish coin offtake was higher for the first time in seven years. Although fabrication of the Pta2,000 silver circulating coin continued to fall, additional demand for a Euro commemorative coin compensated for the decline.

Mexican coin demand was sharply higher in 2001 at 1.1 Moz (35 t). A national advertising campaign, which was launched at the end of 2000, sparked interest in the country’s coin programs. As a result, coin sales were higher last year for both the regular bullion coins and the newly launched “Endangered Species in Mexico” coin program.

Australian demand was nearly one-third lower, although the level of fabrication prior to 2001 was partly boosted by the Olympic coin program. In contrast, **Chinese** demand rose by 26% to 1.5 Moz (47 t) due to higher sales of both the Panda coin (which accounted for just over a third of the total) and strong demand for a commemorative coin to celebrate the award of the 2008 Olympic Games. Another issue is scheduled to mark the Games themselves.

Appendix I

Table 1
World Silver Supply and Demand
(tonnes)

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Supply										
Mine Production	15,162	14,614	14,038	14,915	15,175	16,270	16,907	16,894	18,077	18,351
Net Official Sector Sales	-	187	548	788	589	-	1,232	2,961	2,430	2,666
Old Silver Scrap	4,613	4,620	4,724	5,061	4,920	5,260	6,026	5,438	5,575	5,730
Producer Hedging	40	832	-	287	-	2,150	170	-	-	634
Implied Net Disinvestment	2,812	3,685	4,439	2,826	4,555	2,549	1,381	2,081	3,039	-
Total Supply	22,627	23,938	23,750	23,877	25,239	26,229	25,716	27,374	29,121	27,381
Demand										
Fabrication										
Industrial Applications	8,064	8,391	8,752	9,185	9,247	9,966	9,836	10,595	11,728	10,529
Photography	6,208	6,197	6,271	6,561	6,594	6,812	6,997	7,025	6,828	6,539
Jewelry & Silverware	6,540	8,059	7,087	7,369	8,203	8,533	8,067	8,499	8,752	8,944
Coins & Medals	1,041	1,291	1,355	763	734	895	816	857	926	846
Total Fabrication	21,852	23,938	23,466	23,877	24,778	26,207	25,716	26,975	28,235	26,859
Net Official Sector Purchases	775	-	-	-	-	22	-	-	-	-
Producer Hedging	-	-	284	-	461	-	-	399	886	-
Implied Net Investment	-	-	-	-	-	-	-	-	-	522
Total Demand	22,627	23,938	23,750	23,877	25,239	26,229	25,716	27,374	29,121	27,381
Silver Price (London US\$/oz)	3.946	4.313	5.285	5.197	5.199	4.897	5.544	5.220	4.951	4.370

Figure 61
World Silver Supply

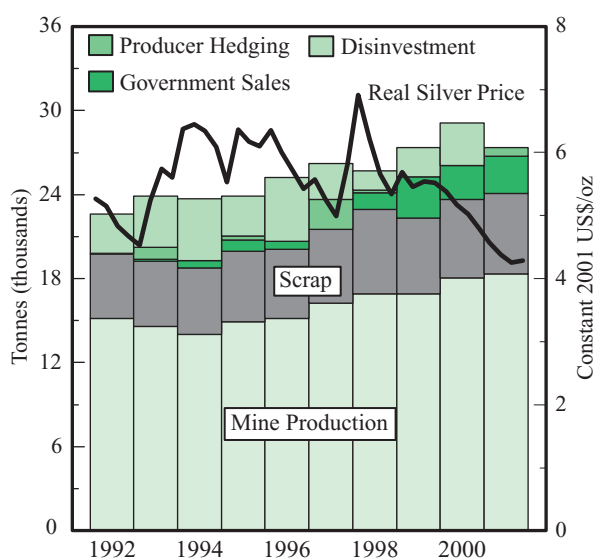


Figure 62
World Silver Demand

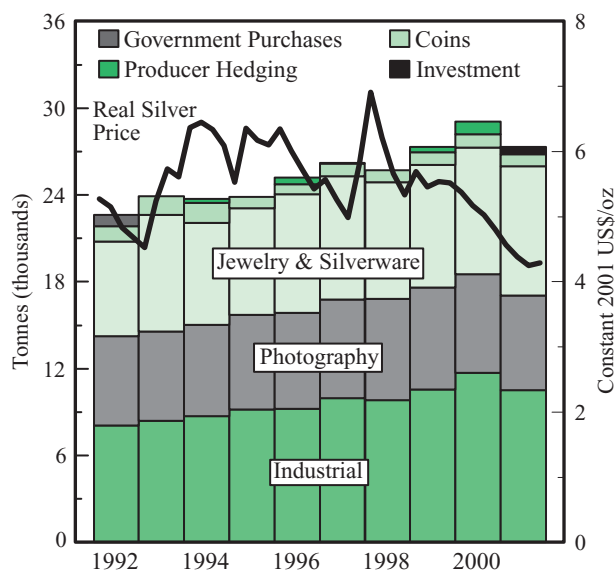


Table 2
World Silver Mine Production
Tonnes

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Poland	798	915	859	984	953	1,050	1,119	1,115	1,140	1,183
Sweden	282	278	252	250	241	265	268	275	294	275
Spain	233	183	176	124	103	66	47	95	117	68
Greece	61	59	45	45	16	36	45	40	31	62
Romania	48	45	42	44	44	43	39	43	38	35
Serbia	102	52	37	58	92	65	56	31	29	26
Bulgaria	84	96	56	44	35	31	25	21	18	24
Portugal	38	36	32	39	34	34	31	27	21	23
Ireland	13	13	17	14	15	13	11	15	25	23
Czech & Slovak Republics	20	16	12	10	7	8	8	8	7	7
France	13	12	3	4	3	2	1	1	1	1
Italy	12	5	14	14	9	4	4	2	1	0
Norway	11	7	7	5	4	4	4	0	0	0
Other	2	2	2	2	0	0	0	0	0	0
<i>Total Europe</i>	1,717	1,719	1,554	1,636	1,554	1,620	1,658	1,673	1,722	1,727
North America										
Mexico	2,096	2,215	2,215	2,258	2,529	2,701	2,848	2,338	2,790	2,824
United States	1,804	1,645	1,480	1,560	1,570	2,180	2,060	1,950	1,970	1,635
Canada	1,169	879	740	1,245	1,243	1,213	1,131	1,166	1,174	1,235
<i>Total North America</i>	5,069	4,739	4,435	5,063	5,341	6,094	6,039	5,454	5,934	5,694
Central & South America										
Peru	1,668	1,671	1,742	1,908	1,968	2,077	2,025	2,231	2,438	2,674
Chile	1,025	970	983	1,042	1,145	1,092	1,341	1,381	1,181	1,349
Bolivia	317	333	351	429	383	386	407	424	437	425
Argentina	46	43	38	37	31	34	69	103	94	166
Honduras	35	24	27	30	38	45	46	49	53	50
Brazil	21	21	18	15	14	9	8	8	8	8
Dominican Republic	13	17	9	21	17	12	7	3	0	0
Other	15	15	39	10	9	10	9	9	6	8
<i>Total Central & South America</i>	3,140	3,094	3,207	3,491	3,604	3,664	3,913	4,208	4,217	4,679
Asia										
Indonesia	100	90	97	238	237	250	311	269	262	289
Turkey	78	72	67	65	90	90	87	108	109	112
Japan	172	137	134	100	89	87	94	94	104	80
Papua New Guinea	95	96	77	66	60	49	58	59	73	69
India	26	51	50	38	36	50	52	60	56	54
Philippines	29	33	31	33	25	20	19	18	23	34
Saudi Arabia	15	16	16	17	16	16	14	11	9	10
Thailand	5	3	4	7	8	3	4	5	5	6
Malaysia	15	14	13	11	10	10	7	3	0	0
Other	76	61	79	78	72	77	83	82	85	84
<i>Total Asia</i>	611	573	568	653	643	653	730	708	726	739
Africa										
Morocco	152	237	258	204	200	260	306	278	289	291
South Africa	182	195	192	178	171	163	157	152	144	131
Namibia	89	72	62	66	42	39	14	0	17	19
Zambia	18	18	11	8	9	7	8	5	5	5
Zimbabwe	34	24	22	22	10	10	6	5	5	5
Dem. Republic of the Congo	30	11	1	1	1	1	1	1	1	1
Other	11	10	11	11	11	10	11	10	10	9
<i>Total Africa</i>	516	567	556	490	443	489	502	452	470	460

Table 2
World Silver Mine Production
Tonnes

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Oceania										
Australia	1,218	1,152	1,045	920	1,010	1,106	1,469	1,720	2,060	1,970
New Zealand	23	26	24	30	31	33	26	24	23	27
Fiji	1	1	1	2	2	2	2	2	2	2
<i>Total Oceania</i>	1,242	1,179	1,070	952	1,043	1,141	1,497	1,746	2,085	1,999
Western World Total	12,296	11,871	11,391	12,285	12,628	13,661	14,338	14,241	15,154	15,298
Other Countries										
China	975	986	1,050	1,080	1,134	1,339	1,350	1,375	1,500	1,520
Kazakhstan	933	809	684	650	482	440	430	499	637	755
Russia	792	778	746	730	758	649	605	617	628	624
Uzbekistan	85	83	80	80	83	77	82	64	62	59
Other CIS	5	7	7	8	21	37	37	37	37	37
Mongolia	23	26	27	28	29	31	33	32	33	33
North Korea	53	56	53	53	40	36	32	29	26	25
<i>Total Other Countries</i>	2,867	2,743	2,648	2,630	2,547	2,609	2,569	2,653	2,923	3,053
World Total	15,162	14,614	14,038	14,915	15,175	16,270	16,907	16,894	18,077	18,351

Figure 63
World Silver Mine Production

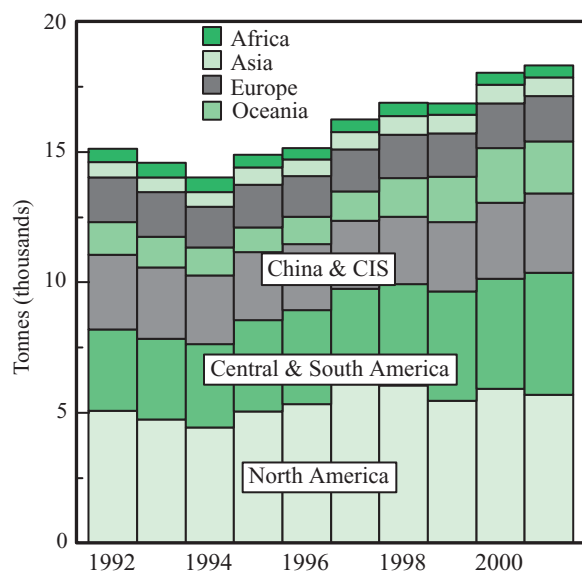


Figure 64
Silver Producer Hedging: Outstanding Positions

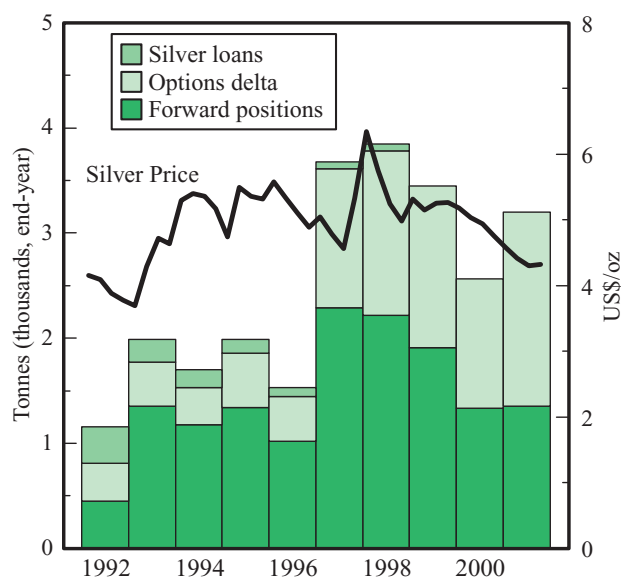


Table 3
Supply of Silver from the Recycling of Old Scrap
Tonnes

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Germany	500	490	480	460	480	500	510	500	520	523
UK & Ireland	225	228	245	231	236	261	337	358	338	346
France	166	124	130	145	140	133	127	124	110	122
Italy	85	85	87	100	110	105	145	105	105	110
Austria	60	60	60	63	55	56	57	52	50	62
Netherlands	36	35	39	35	39	40	40	40	45	42
Sweden	34	34	34	34	34	35	34	34	33	33
Belgium	20	20	20	20	20	20	20	20	20	21
Norway	24	24	24	24	30	30	25	29	33	21
Denmark	20	20	20	19	19	19	19	19	18	18
Czech & Slovak Republics	30	24	22	23	28	25	22	19	19	14
Portugal	12	12	12	12	13	14	14	14	14	13
Spain	10	10	10	12	14	14	13	12	13	13
Switzerland	21	48	19	51	52	24	14	10	10	10
Romania	3	3	3	3	3	3	3	3	3	3
Other	46	47	48	46	48	49	48	48	45	44
<i>Total Europe</i>	1,292	1,264	1,253	1,278	1,321	1,328	1,428	1,387	1,376	1,395
North America										
United States	1,317	1,343	1,405	1,432	1,505	1,612	1,733	1,785	1,941	2,072
Mexico	70	70	70	150	75	134	330	75	65	60
Canada	41	41	41	52	55	50	60	50	45	45
<i>Total North America</i>	1,428	1,454	1,516	1,634	1,635	1,796	2,123	1,910	2,051	2,177
Central & South America										
Brazil	60	60	60	60	60	50	50	55	48	30
Argentina	20	20	20	20	20	20	20	20	20	23
Chile	14	14	14	14	14	14	17	13	12	12
Other	26	25	23	23	23	23	29	27	25	24
<i>Total Central & South America</i>	120	119	117	117	117	107	116	115	105	89
Middle East										
Turkey	60	63	70	72	60	50	53	43	40	40
Egypt	20	32	28	25	22	10	13	10	28	35
Saudi Arabia & Yemen	19	25	58	94	40	101	64	35	22	24
Other	6	11	11	11	11	11	12	11	10	11
<i>Total Middle East</i>	105	131	167	202	133	172	142	99	100	110
Indian Sub-Continent										
India	225	140	140	300	200	300	370	207	200	200
Other	5	7	6	9	5	10	15	11	13	15
<i>Total Indian Sub-Continent</i>	230	147	146	309	205	310	385	218	213	215
East Asia										
Japan	752	816	836	850	842	865	908	917	927	931
South Korea	81	90	92	102	107	111	244	164	164	168
Taiwan	28	24	22	22	22	24	26	28	28	28
Indonesia	7	7	9	10	11	11	12	13	15	13
Singapore	9	9	12	12	11	11	12	12	12	12
Hong Kong	8	8	8	9	9	11	15	11	11	11
Thailand	10	10	10	10	11	25	30	12	10	11
Vietnam	8	7	10	11	11	12	12	12	11	10
Philippines	5	5	5	5	6	6	7	7	7	6
Malaysia	3	3	3	3	3	3	4	3	3	3
<i>Total East Asia</i>	911	979	1,007	1,034	1,033	1,080	1,270	1,179	1,187	1,193
Africa										
South Africa	3	4	4	4	4	4	4	4	4	4
Other	30	29	27	33	31	29	30	30	30	30
<i>Total Africa</i>	33	33	31	37	35	33	34	33	34	33

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

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Oceania										
Australia	71	75	78	78	73	71	74	75	76	74
Total Oceania	71	75	78	78	73	71	74	75	76	74
Western World Total	4,189	4,202	4,315	4,688	4,551	4,897	5,571	5,016	5,143	5,286
Other Countries										
China	114	115	128	135	139	143	180	182	187	192
Other	310	303	281	238	230	220	275	240	245	252
Total Other Countries	424	418	409	373	369	363	455	422	432	444
World Total	4,613	4,620	4,724	5,061	4,920	5,260	6,026	5,438	5,575	5,730

Figure 65
World Silver Scrap Supply

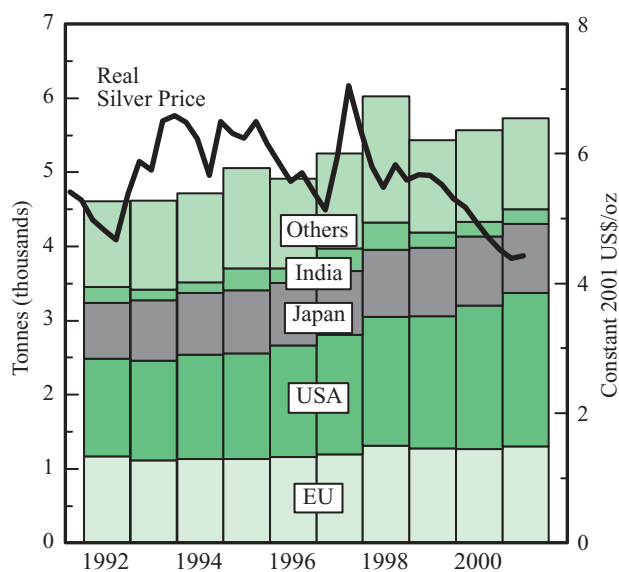


Figure 66
World Scrap Supply, 2001

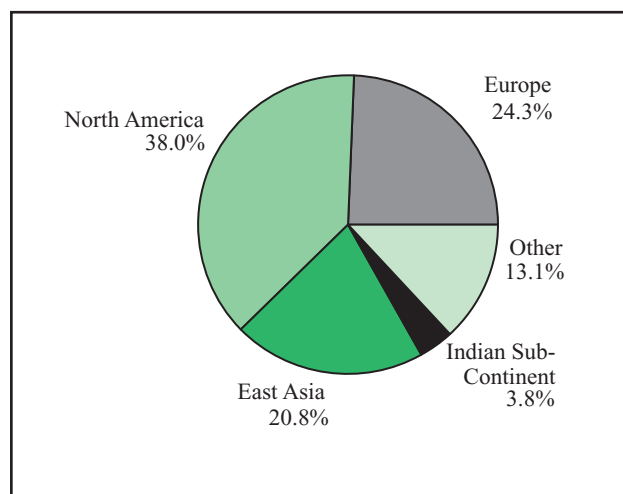


Table 4
World Silver Fabrication
(including the use of scrap)
Tonnes

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Italy	1,882	1,765	1,619	1,557	1,624	1,757	1,752	1,938	2,040	1,742
UK & Ireland	835	882	971	1,005	1,071	1,104	1,219	1,241	1,344	1,446
Germany	1,706	1,507	1,642	1,431	1,419	1,431	1,455	1,259	1,213	1,138
Belgium	629	642	655	728	788	847	1,052	1,167	1,098	999
France	962	938	876	968	845	892	892	826	886	794
Spain	206	191	333	309	288	271	275	234	197	172
Greece	110	115	120	118	130	140	126	126	135	128
Switzerland	208	194	221	229	243	298	332	344	281	108
Poland	64	70	79	96	94	104	111	117	120	107
Portugal	78	77	64	76	88	89	96	100	107	97
Norway	78	60	51	50	45	46	47	94	89	71
Netherlands	66	64	74	92	77	74	70	88	60	57
Austria	50	48	46	51	46	42	42	38	33	34
Sweden	51	49	47	43	46	52	43	42	41	31
Czech & Slovak Republics	31	21	18	24	23	24	28	24	25	31
Denmark	33	30	30	33	31	35	32	31	32	28
Finland	40	28	31	27	30	29	21	21	17	14
Romania	16	14	13	9	13	11	16	13	13	12
Cyprus & Malta	8	8	11	12	13	12	11	12	12	10
Other	32	34	27	28	28	23	24	23	25	25
<i>Total Europe</i>	7,083	6,736	6,928	6,884	6,939	7,282	7,643	7,738	7,766	7,041
North America										
United States	3,881	4,041	4,306	4,610	4,651	4,941	5,263	5,730	6,017	5,267
Mexico	712	994	859	544	646	736	690	732	602	595
Canada	73	88	96	83	83	87	106	109	92	91
<i>Total North America</i>	4,665	5,123	5,261	5,236	5,380	5,764	6,059	6,571	6,711	5,953
Central & South America										
Brazil	206	215	257	291	262	260	253	238	210	204
Argentina	126	126	126	122	118	118	97	84	70	56
Peru	29	26	28	31	34	35	34	32	30	32
Colombia	34	33	33	33	33	33	33	27	24	22
Ecuador	12	17	21	21	21	21	21	17	17	14
Chile	15	15	15	15	15	15	15	14	13	13
Other	17	18	15	19	27	41	50	56	35	27
<i>Total Central & South America</i>	438	451	495	532	510	523	503	468	399	368
Middle East										
Turkey	170	185	161	189	198	203	191	173	213	158
Israel	80	88	95	105	116	125	120	120	112	102
Egypt	72	59	78	67	70	65	58	63	64	55
Saudi Arabia	12	14	10	12	12	20	16	18	20	18
Other	83	64	76	79	82	81	77	80	82	84
<i>Total Middle East</i>	417	409	420	452	479	493	462	452	490	416
Indian Sub-Continent										
India	1,808	3,383	2,920	3,152	3,801	3,824	3,567	3,779	4,075	4,789
Bangladesh & Nepal	82	120	140	160	180	200	160	178	187	185
Other	86	105	88	117	84	127	87	105	98	67
<i>Total Indian Sub-Continent</i>	1,976	3,608	3,148	3,429	4,065	4,151	3,814	4,062	4,360	5,041
East Asia										
Japan	3,263	3,356	3,373	3,504	3,487	3,955	3,508	3,809	4,200	3,711
Thailand	984	1,205	905	862	859	843	751	829	939	1,012
South Korea	280	484	510	579	575	579	429	519	641	562
Taiwan	134	149	164	179	198	214	210	210	293	263
Indonesia	60	57	83	97	104	126	84	99	136	147
Hong Kong	71	81	106	107	117	138	112	120	138	100

Table 4

World Silver Fabrication

(including the use of scrap)

Tonnes

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Myanmar, Laos & Cambodia	31	31	31	33	34	30	25	28	26	28
Vietnam	9	12	16	20	21	22	19	22	22	23
Malaysia	12	14	11	12	12	13	12	15	17	18
Other	36	12	11	11	11	10	11	12	13	14
<i>Total East Asia</i>	4,879	5,402	5,210	5,404	5,418	5,928	5,161	5,663	6,425	5,878
Africa										
Morocco	15	14	14	17	18	20	18	17	18	19
Tunisia	6	7	8	8	9	10	10	10	10	10
South Africa	9	18	12	14	9	8	8	8	8	7
Algeria	10	9	9	9	8	7	6	6	6	6
Other	17	16	16	15	13	12	11	12	12	12
<i>Total Africa</i>	57	64	59	63	57	56	53	53	54	53
Oceania										
Australia	214	217	196	166	162	161	176	180	207	175
New Zealand	0	0	0	0	1	1	1	1	1	1
<i>Total Oceania</i>	215	217	196	166	162	162	177	181	208	176
Western World Total	19,730	22,009	21,717	22,167	23,010	24,359	23,872	25,188	26,414	24,926
Other Countries										
China	609	657	765	809	890	1,003	1,055	1,030	1,047	1,129
Soviet Union/CIS	1,513	1,265	983	901	878	846	789	757	775	804
North Korea	0	7	0	0	0	0	0	0	0	0
<i>Total Other Countries</i>	2,122	1,929	1,749	1,710	1,768	1,848	1,844	1,787	1,822	1,933
World Total	21,852	23,938	23,466	23,877	24,778	26,207	25,716	26,975	28,235	26,859

Figure 67

World Silver Fabrication

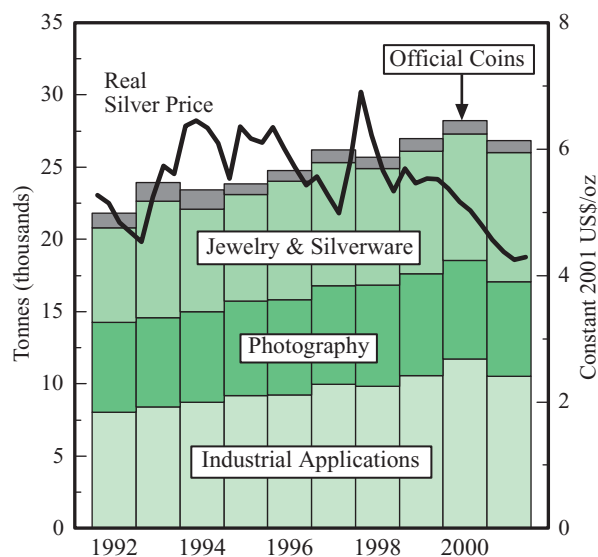


Figure 68

World Silver Fabrication, 2001

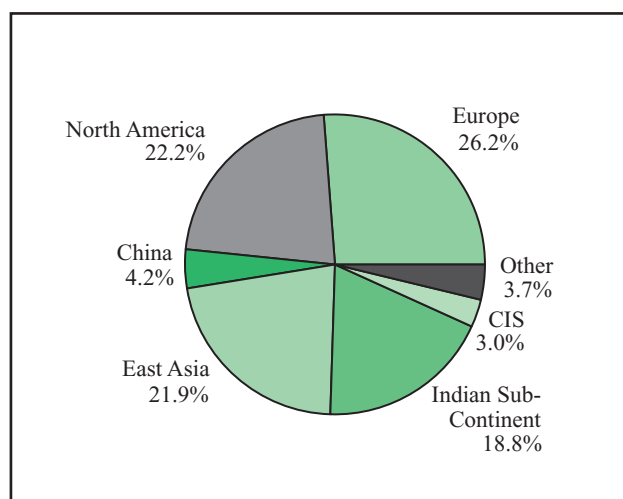


Table 5
Silver Fabrication: Industrial Applications
(including the use of scrap)
Tonnes

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Germany	622	580	560	575	535	555	571	571	647	645
France	399	352	360	374	363	418	349	362	381	495
UK & Ireland	344	354	363	371	381	388	506	472	549	480
Italy	300	315	316	329	348	354	331	337	347	332
Switzerland	188	174	203	206	215	269	311	322	259	85
Netherlands	54	54	54	54	54	52	52	52	52	48
Spain	57	57	54	55	61	91	95	83	62	40
Poland	15	19	24	26	24	23	23	23	23	22
Austria	19	19	19	22	19	18	17	17	17	17
Czech & Slovak Republics	17	16	13	16	17	13	13	16	8	11
Sweden	10	10	10	10	10	11	11	11	11	10
Belgium	10	10	10	10	10	10	10	10	10	8
Other	35	35	36	36	34	35	35	68	60	44
<i>Total Europe</i>	2,070	1,995	2,022	2,084	2,071	2,236	2,324	2,344	2,426	2,237
North America										
United States	1,638	1,751	1,886	2,050	2,120	2,343	2,520	2,757	2,928	2,449
Mexico	80	80	86	79	81	89	100	160	172	159
Canada	22	23	20	23	20	20	17	17	17	16
<i>Total North America</i>	1,740	1,854	1,992	2,152	2,221	2,452	2,637	2,934	3,117	2,624
Central & South America										
Brazil	75	78	100	108	102	105	108	98	98	98
Argentina	40	40	40	38	36	36	36	30	25	20
Colombia	9	9	9	9	9	9	9	7	6	6
Other	14	14	14	14	14	14	14	14	14	15
<i>Total Central & South America</i>	138	141	163	169	161	164	167	149	143	139
Middle East										
Israel	21	26	28	30	33	31	31	30	30	26
Turkey	27	29	26	29	28	31	28	24	28	22
Egypt	4	3	3	3	4	3	4	4	4	4
Other	9	0	0	0	0	1	1	1	1	1
<i>Total Middle East</i>	61	58	57	63	64	66	63	58	63	52
Indian Sub-Continent										
India	621	901	999	1,062	1,105	1,120	992	1,180	1,435	1,579
Other	15	18	15	20	14	22	15	18	16	10
<i>Total Indian Sub-Continent</i>	636	919	1,014	1,082	1,119	1,142	1,007	1,198	1,451	1,589
East Asia										
Japan	1,371	1,425	1,591	1,667	1,622	1,848	1,643	1,890	2,244	1,723
South Korea	125	260	311	369	370	382	349	379	489	418
Taiwan	115	131	146	163	181	197	193	196	274	250
Hong Kong	41	51	76	79	88	107	93	101	121	85
Indonesia	22	12	11	12	13	15	16	16	16	14
<i>Total East Asia</i>	1,674	1,879	2,135	2,289	2,273	2,549	2,294	2,582	3,144	2,490
Africa										
Morocco	2	2	2	5	7	7	7	7	8	8
South Africa	7	16	10	10	5	5	5	5	5	4
Other	7	7	7	7	7	5	5	5	5	5
<i>Total Africa</i>	16	25	19	22	19	17	17	17	18	17
Oceania										
Australia	61	63	67	76	70	66	72	76	77	65
<i>Total Oceania</i>	61	63	67	76	70	66	72	76	77	65
Western World Total	6,395	6,935	7,468	7,937	7,999	8,692	8,581	9,358	10,438	9,212

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

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Other Countries										
China	439	464	538	567	593	632	645	651	681	693
Soviet Union/CIS	1,230	992	746	682	655	642	610	586	609	624
Total Other Countries	1,669	1,456	1,284	1,249	1,248	1,274	1,255	1,237	1,290	1,317
World Total	8,064	8,391	8,752	9,185	9,247	9,966	9,836	10,595	11,728	10,529

Figure 69
Main Components of Industrial Demand

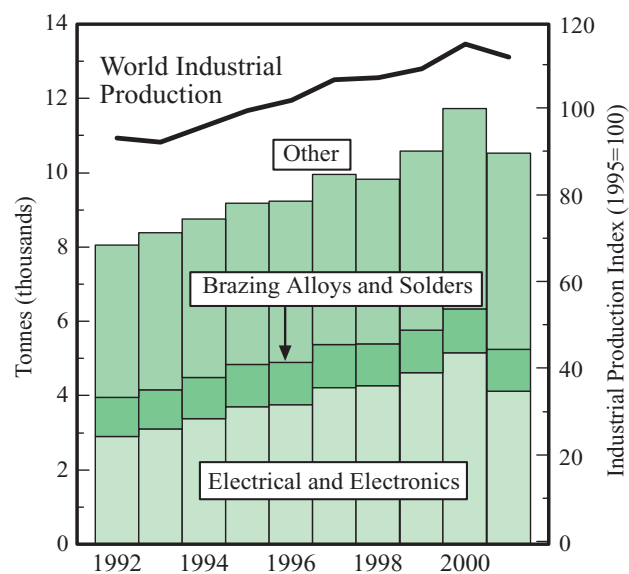


Figure 70
World Silver Industrial Fabrication, 2001

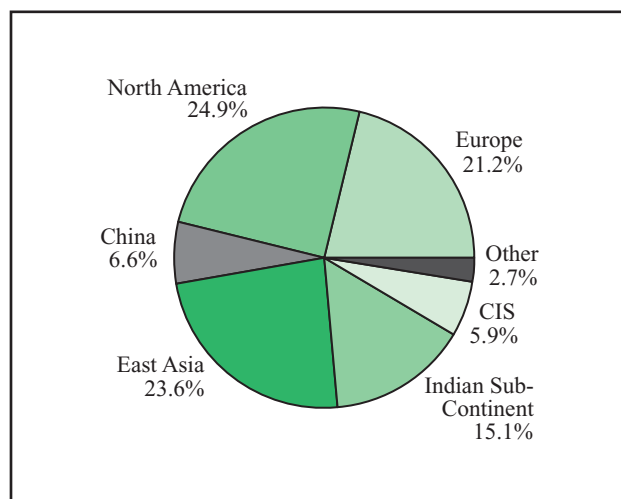


Table 5a

Silver Fabrication: Electrical and Electronics

(including the use of scrap)

Tonnes

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
United States	802	890	983	1,120	1,129	1,303	1,373	1,464	1,573	1,062
Japan	631	650	701	743	706	804	738	933	1,140	828
Germany	375	350	340	370	360	370	380	380	445	468
France	193	155	168	190	195	238	207	210	228	342
China	213	223	276	284	293	316	305	308	320	320
South Korea	16	140	164	200	199	201	188	206	268	237
Taiwan	85	89	102	113	130	146	148	150	216	203
United Kingdom	139	141	143	145	155	160	210	179	211	153
India	76	76	80	92	100	130	130	140	150	145
Italy	96	100	85	85	103	100	90	92	95	86
Mexico	36	36	38	34	34	36	40	90	97	80
Hong Kong	27	37	57	59	68	85	77	90	110	77
Brazil	31	32	46	49	45	45	45	40	40	40
Turkey	27	29	26	29	28	31	28	24	28	22
Australia	13	14	14	17	16	15	17	18	19	18
Netherlands	20	20	20	20	20	18	18	18	18	16
Switzerland	80	86	108	117	127	172	228	232	165	12
Austria	7	7	7	7	7	7	7	7	7	7
Romania	3	3	3	3	3	3	4	4	4	4
Egypt	4	3	3	3	4	3	4	4	4	4
Spain	28	30	28	28	28	29	30	30	9	0
Total	2,902	3,112	3,391	3,709	3,749	4,212	4,266	4,618	5,147	4,123

Table 5b

Silver Fabrication: Brazing Alloys and Solders

(including the use of scrap)

Tonnes

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
United States	202	224	239	249	255	260	269	280	272	258
China	132	138	146	159	170	179	196	198	208	215
Japan	130	119	147	150	160	155	130	131	137	109
Germany	150	140	125	110	90	95	97	94	101	88
United Kingdom	70	71	72	72	72	72	75	68	72	82
Italy	50	54	58	66	65	59	56	68	72	71
India	45	45	50	60	65	50	47	50	55	57
Switzerland	75	55	56	56	52	52	49	48	50	41
South Korea	9	25	30	38	36	35	25	26	31	38
Spain	15	11	9	9	18	29	32	33	33	30
Taiwan	20	23	25	32	35	34	31	32	37	29
France	74	55	45	40	42	43	32	29	30	29
Brazil	17	18	26	27	27	25	25	23	23	23
Australia	18	19	20	23	21	20	22	23	24	20
Mexico	28	28	31	27	27	28	30	20	20	17
Canada	13	13	13	16	13	13	10	10	10	9
Netherlands	8	8	8	8	8	8	8	8	8	7
Austria	5	5	4	4	3	3	3	3	3	3
Israel	1	2	2	2	3	3	3	3	3	2
Total	1,063	1,053	1,106	1,149	1,161	1,163	1,140	1,146	1,189	1,128

Table 6

Silver Fabrication: Photographic Use

(including the use of scrap)

Tonnes

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Belgium	614	626	640	708	770	828	1,034	1,149	1,080	983
UK & Ireland	406	422	495	519	566	592	593	652	678	862
France	445	458	425	495	411	395	452	370	407	202
Germany	490	480	500	460	430	450	307	208	52	49
Czech & Slovak Republics	5	0	0	0	0	3	8	1	9	14
Hungary	10	8	8	8	7	7	6	6	7	6
Romania	10	8	6	2	6	5	8	6	6	5
Bulgaria	1	1	1	1	1	1	0	0	0	0
Poland	15	15	15	15	9	7	0	0	0	0
Spain	20	11	6	3	0	0	0	0	0	0
<i>Total Europe</i>	2,016	2,029	2,096	2,210	2,200	2,287	2,408	2,392	2,240	2,121
North America										
United States	1,641	1,654	1,752	1,891	1,922	2,006	2,133	2,233	2,244	2,038
Mexico	82	98	98	104	107	127	107	91	0	0
<i>Total North America</i>	1,723	1,752	1,850	1,995	2,029	2,133	2,240	2,324	2,244	2,038
Central & South America										
Brazil	80	82	100	123	105	105	100	100	76	70
Argentina	56	56	56	56	56	56	56	49	40	32
<i>Total Central & South America</i>	136	138	156	179	161	161	156	149	116	102
Indian Sub-Continent										
India	80	70	50	20	20	20	10	10	10	10
Other	6	8	7	8	9	10	12	12	12	4
<i>Total Indian Sub-Continent</i>	86	78	57	28	29	30	22	22	22	14
East Asia										
Japan	1,805	1,779	1,713	1,770	1,800	1,822	1,810	1,864	1,902	1,935
Taiwan	3	3	3	1	1	1	1	1	0	0
<i>Total East Asia</i>	1,808	1,782	1,716	1,771	1,801	1,823	1,811	1,865	1,902	1,935
Oceania										
Australia	70	65	60	50	49	51	51	52	85	74
<i>Total Oceania</i>	70	65	60	50	49	51	51	52	85	74
Western World Total	5,838	5,843	5,934	6,233	6,269	6,485	6,688	6,804	6,608	6,284
Other Countries										
China	146	159	174	174	180	187	190	114	120	160
Soviet Union/CIS	224	195	163	154	145	140	119	107	100	95
<i>Total Other Countries</i>	370	354	337	328	325	327	309	221	220	255
World Total	6,208	6,197	6,271	6,561	6,594	6,812	6,997	7,025	6,828	6,539

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

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Europe										
Italy	1,568	1,436	1,288	1,212	1,260	1,392	1,410	1,592	1,685	1,402
Germany	420	360	360	320	310	310	315	312	290	292
Greece	110	115	120	118	130	140	126	126	135	128
UK & Ireland	69	85	89	92	104	105	102	98	100	90
France	53	63	60	63	62	69	81	84	87	84
Poland	31	32	35	49	57	71	83	89	92	78
Spain	115	115	125	127	140	124	126	105	93	76
Portugal	69	64	47	54	58	59	60	66	66	55
Norway	36	37	37	37	33	33	35	47	51	46
Denmark	27	27	27	27	28	32	29	28	29	25
Sweden	40	36	37	32	35	40	31	30	29	20
Finland	32	26	27	23	26	26	18	18	14	11
Cyprus & Malta	8	8	11	12	13	12	11	12	12	10
Austria	15	15	12	12	13	13	15	11	8	7
Czech & Slovak Republics	6	5	5	5	5	6	5	5	5	4
Other	35	33	31	32	28	29	32	29	28	30
<i>Total Europe</i>	2,634	2,457	2,311	2,215	2,302	2,462	2,480	2,652	2,724	2,358
North America										
United States	339	351	373	389	387	389	391	407	427	406
Mexico	280	285	270	343	442	508	477	470	410	401
Canada	27	27	30	38	41	47	55	48	45	47
<i>Total North America</i>	646	663	673	770	870	944	923	925	882	854
Central & South America										
Brazil	50	55	57	60	55	50	45	40	36	36
Peru	23	24	26	29	32	33	32	30	28	29
Colombia	24	24	24	24	24	24	24	20	18	16
Ecuador	10	15	19	19	19	19	19	15	15	12
Argentina	30	30	30	28	26	26	5	5	5	4
Other	21	22	20	23	31	45	54	59	37	29
<i>Total Central & South America</i>	158	170	176	183	187	197	179	169	139	126
Middle East										
Turkey	143	156	134	160	170	171	163	147	184	135
Israel	57	61	66	72	82	92	88	89	80	74
Egypt	68	56	55	64	67	62	54	58	60	51
Saudi Arabia	12	14	10	12	12	20	16	18	20	18
Other	74	63	75	79	82	80	76	79	81	83
<i>Total Middle East</i>	354	350	341	386	412	425	397	391	425	361
Indian Sub-Continent										
India	1,107	2,412	1,871	2,070	2,676	2,684	2,565	2,589	2,630	3,200
Bangladesh & Nepal	82	120	140	160	180	200	160	178	187	185
Other	65	79	66	89	61	95	60	75	70	53
<i>Total Indian Sub-Continent</i>	1,254	2,611	2,077	2,319	2,917	2,979	2,785	2,842	2,887	3,438
East Asia										
Thailand	982	1,199	899	852	844	834	744	825	934	1,007
South Korea	155	224	199	210	205	197	80	140	152	144
Indonesia	38	45	72	85	92	111	68	83	120	133
Japan	87	77	69	67	65	60	55	55	54	53
Myanmar, Laos & Cambodia	31	31	31	33	34	30	25	28	26	28
Vietnam	9	12	16	20	21	22	19	22	22	23
Malaysia	12	14	11	12	12	13	12	15	17	18
Hong Kong	30	30	30	28	29	31	19	19	17	15
Taiwan	16	15	15	15	16	16	16	13	13	10
Other	8	8	7	8	9	9	9	9	10	11
<i>Total East Asia</i>	1,368	1,655	1,349	1,330	1,326	1,322	1,047	1,209	1,365	1,442

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

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Africa										
Morocco	13	12	12	12	11	13	11	10	10	11
Tunisia	5	6	7	7	8	9	9	9	9	9
Algeria	8	7	7	7	7	6	5	5	5	5
Other	14	13	14	15	12	11	11	11	12	11
<i>Total Africa</i>	40	38	40	41	38	39	36	35	36	36
Oceania										
Australia	17	18	19	19	17	18	22	23	24	22
New Zealand	0	0	0	0	1	1	1	1	1	1
<i>Total Oceania</i>	17	18	19	19	18	19	23	24	25	23
Western World Total	6,471	7,962	6,987	7,263	8,069	8,385	7,868	8,247	8,482	8,637
Other Countries										
China	13	21	32	45	75	96	145	195	208	229
Soviet Union/CIS	56	76	68	61	59	52	54	57	62	78
<i>Total Other Countries</i>	69	97	100	106	134	148	199	252	270	307
World Total	6,540	8,059	7,087	7,369	8,203	8,533	8,067	8,499	8,752	8,944

Figure 71
World Silver Jewelry Fabrication

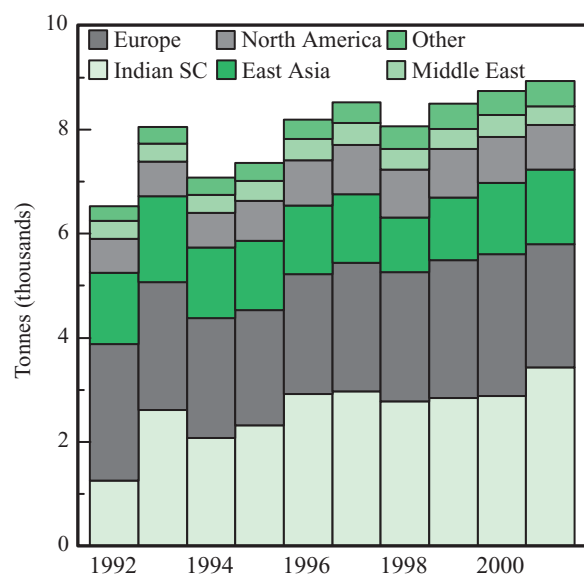


Figure 72
World Silver Jewelry Fabrication, 2001

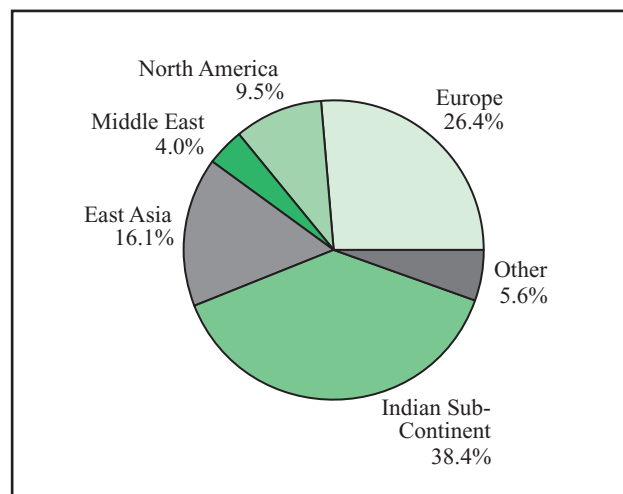


Table 8
Silver Fabrication: Coins and Medals
(including the use of scrap)
Tonnes

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
United States	263	285	295	280	222	203	219	333	418	374
Germany	174	87	222	76	144	116	262	168	224	152
Spain	14	8	148	124	87	56	54	46	42	56
China	12	13	21	24	43	88	75	71	38	47
Portugal	4	8	12	17	25	25	31	29	36	38
Mexico	270	531	405	18	16	12	6	11	20	35
Canada	24	38	46	22	22	20	34	44	30	28
Australia	66	71	50	21	26	26	31	29	20	14
UK & Ireland	16	21	24	23	20	19	19	19	17	14
Switzerland	11	10	9	13	18	20	9	12	12	13
France	65	65	31	36	9	10	10	10	11	13
Austria	16	14	15	17	14	11	10	10	8	10
Italy	14	14	15	16	16	11	11	9	8	8
Poland	3	4	5	6	4	3	5	5	5	7
Soviet Union/CIS	3	2	6	4	19	12	6	7	4	7
Thailand	2	6	6	10	15	9	7	4	5	5
Other	84	114	45	56	34	254	27	50	28	25
World Total	1,041	1,291	1,355	763	734	895	816	857	926	846

Appendix II

Silver Prices, 1981-2001

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	Italy** Lire/g	Germany** DM/kg	Mexico Peso/oz
1981	10.487	2,650	228.83	744	2,296	383	762	0.26
1982	7.922	2,675	182.20	634	1,862	344	618	0.45
1983	11.430	3,435	262.89	873	2,851	558	938	1.37
1984	8.145	3,514	192.53	622	2,111	460	745	1.37
1985	6.132	3,880	166.53	470	1,715	376	580	1.58
1986	5.465	4,105	143.71	296	1,549	262	382	3.34
1987	7.016	5,124	180.46	326	1,855	292	405	9.67
1988	6.532	6,231	165.23	269	1,536	273	369	14.85
1989	5.500	6,803	141.34	244	1,187	243	332	13.54
1990	4.832	6,779	123.62	225	1,099	186	251	13.59
1991	4.057	6,993	103.51	176	956	162	216	12.24
1992	3.946	7,580	100.24	161	991	156	198	12.21
1993	4.313	6,163	109.15	154	1,110	214	229	13.44
1994	5.285	6,846	132.92	174	1,365	274	276	17.84
1995	5.197	6,864	129.49	157	1,289	272	239	33.36
1996	5.199	7,291	131.79	182	1,345	258	252	39.51
1997	4.897	7,009	153.60	191	1,498	268	273	38.78
1998	5.544	8,016	229.30	233	2,498	309	314	50.65
1999	5.220	8,022	197.54	191	1,995	305	309	49.90
2000	4.951	8,002	198.61	171	1,800	335	338	46.82
2001	4.370	7,418	194.15	171	1,814	0.16	157	40.82

*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 2001, prices are in Euro.

2. Real Prices *** (Constant 2001 money)

	London US\$/oz	India Rupee/kg	Thailand Baht/oz	Japan Yen/10g	Korea Won/oz	Italy** Lire/g	Germany** DM/kg	Mexico Peso/oz
1981	20.422	13,346	494.07	937	5,948	1,208	1,193	183.93
1982	14.537	12,482	373.79	778	4,497	932	920	182.77
1983	20.323	14,335	519.83	1,051	6,657	1,317	1,352	291.18
1984	13.885	13,538	377.48	732	4,819	979	1,048	173.93
1985	10.096	14,163	318.68	543	3,822	734	799	127.07
1986	8.827	13,778	270.07	340	3,368	482	526	143.96
1987	10.935	15,810	331.01	374	3,904	514	558	180.37
1988	9.784	17,573	291.82	306	3,018	458	502	129.24
1989	7.857	18,072	236.90	271	2,206	382	439	98.14
1990	6.548	16,529	195.59	243	1,881	275	323	77.83
1991	5.275	14,970	154.97	184	1,495	225	269	57.15
1992	4.982	14,517	144.07	165	1,459	207	237	49.36
1993	5.288	11,098	151.48	156	1,560	272	263	49.49
1994	6.314	11,186	175.14	202	1,806	334	307	61.43
1995	6.038	10,176	162.05	200	1,633	315	262	85.11
1996	5.871	9,919	155.89	199	1,624	287	272	75.01
1997	5.403	8,898	171.98	187	1,732	293	290	61.01
1998	6.022	9,002	237.47	230	2,688	332	330	68.74
1999	5.549	8,647	203.94	189	2,128	322	323	58.10
2000	5.092	8,306	201.92	171	1,878	344	347	49.78
2001	4.370	7,418	194.15	171	1,814	0.16	157	40.82

*** 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
1976	5.0840	3.8300	4.3532	5.1370	3.8340	4.3506
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

2. US Prices in 2001

	Comex Spot Settlement			Monthly Averages			
	High	Low	Average		3-month	6-month	12-month
January	4.8570	4.4900	4.6877	January	0.96%	1.18%	1.59%
February	4.8100	4.4080	4.5427	February	0.67%	0.89%	1.37%
March	4.4880	4.2880	4.3763	March	1.36%	1.32%	1.41%
April	4.4530	4.3130	4.3654	April	1.48%	1.54%	1.64%
May	4.6030	4.2940	4.4202	May	1.15%	1.18%	1.47%
June	4.4700	4.2930	4.3557	June	1.02%	1.07%	1.38%
July	4.2820	4.1870	4.2307	July	0.92%	1.09%	1.35%
August	4.2650	4.1450	4.1906	August	0.73%	0.89%	1.11%
September	4.7180	4.1420	4.3545	September	0.76%	0.97%	1.22%
October	4.6650	4.2030	4.3888	October	0.63%	0.85%	1.18%
November	4.2070	4.0280	4.0900	November	0.81%	1.03%	1.38%
December	4.5880	4.1280	4.3276	December	4.61%	3.54%	3.22%

Appendix IV

Leading Primary Silver Mines				2000	2001
Rank	Mine	Country	Operator	Moz	Moz
1	Cannington	Australia	BHP Billiton	32.45	29.99
2	Proaño*	Mexico	Industrias Peñoles SA de CV	23.92	28.74
3	Greens Creek	United States	Kennecott Minerals/Hecla Mining Company	9.28	11.00
4	Uchucchacua	Peru	Compañía de Minas Buenaventura SA	8.45	9.78
5	Tizapa	Mexico	Industrias Peñoles SA de CV	6.80	8.13
6	Imiter	Morocco	Société Métallurgique d'Imiter	7.90	**7.90
7	Rochester	United States	Coeur d'Alene Mines Corporation	6.68	6.35
8	Galena	United States	Coeur d'Alene Mines Corporation	4.01	4.51
9	Arcata	Peru	Minas de Arcata SA	5.15	4.44
10	Quiruvilca	Peru	Pan American Silver Corp	3.61	3.26
11	Lucky Friday	United States	Hecla Mining Company	5.01	3.22
12	Huaron	Peru	Pan American Silver Corp	0.00	2.90
13	San Martin	Mexico	First Silver Reserves Inc.	2.32	2.39
14	Caylloma	Peru	Hochschild Group	1.86	2.25
15	La Encantada	Mexico	Industrias Peñoles SA de CV	2.09	1.62

*part of the Fresnillo Group, which includes Naica and El Monte
 **estimate

Silver Mine Production by Source Metal				
Million ounces				
	1998	1999	2000	2001
Primary				
Mexico	45.6	35.5	42.7	45.9
Australia	19.8	26.2	32.5	30.0
United States	36.6	33.5	31.9	28.8
Other	57.1	56.2	39.1	42.5
Total	159.1	151.4	146.2	147.2
Gold				
Chile	9.1	8.7	21.5	22.3
Canada	12.0	15.2	17.5	20.2
United States	13.6	13.5	17.5	10.7
Other	31.6	34.6	36.2	36.0
Total	66.3	72.0	92.7	89.2
Copper				
Poland	35.3	35.1	36.0	37.4
CIS	19.8	20.8	25.3	28.7
Chile	14.6	16.5	16.3	20.7
Other	59.1	54.6	58.4	54.4
Total	128.8	127.0	136.0	141.2
Lead/Zinc				
Peru	36.1	40.0	43.7	51.1
Mexico	32.9	27.6	33.1	32.7
Australia	26.5	28.6	32.6	31.9
Other	85.8	89.5	90.2	88.8
Total	181.3	185.7	199.6	204.5
Other	8.0	7.1	6.7	8.0
Total	543.6	543.2	581.2	590.0

Silver Mine Production by Main Region and Source Metal				
Million ounces				
	1998	1999	2000	2001
North America				
Primary	82.1	69.0	74.7	74.7
Lead/Zinc	48.8	44.0	46.2	45.0
Copper	26.3	22.8	23.1	21.6
Gold	35.0	37.7	45.1	40.1
Other	1.9	1.9	1.7	1.7
Total	194.2	175.4	190.8	183.1
Central & South America				
Primary	40.4	39.7	21.4	25.1
Lead/Zinc	51.0	55.7	59.9	67.2
Copper	20.9	22.8	23.8	26.8
Gold	13.4	16.9	30.4	31.1
Other	0.1	0.1	0.1	0.1
Total	125.8	135.3	135.6	150.4
China & CIS				
Primary	6.8	6.4	6.8	6.4
Lead/Zinc	34.7	37.0	39.1	40.5
Copper	30.8	32.8	38.4	40.5
Gold	6.2	5.7	6.2	7.1
Other	4.0	3.3	3.4	3.7
Total	82.6	85.3	94.0	98.2
Rest of World				
Primary	29.8	36.3	43.4	41.0
Lead/Zinc	46.8	49.1	54.4	51.8
Copper	50.7	48.5	50.6	52.3
Gold	11.7	11.7	11.2	10.9
Other	1.8	1.6	1.3	2.3
Total	141.0	147.2	160.8	158.4
Total	543.6	543.2	581.2	590.0

Appendix V

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

	Comex				LBMA Clearing Turnover ³		
			No. of Contracts		Ounces transferred (millions)	Value (US\$bn)	Number of transfers
	Futures		Options				
	Turnover ¹	Open Interest ²	Turnover ¹	Open Interest ²			
Jan-99	315,165	80,995	54,145	72,202	214.2	1.1	420
Feb	550,271	98,954	71,617	64,476	277.3	1.5	514
Mar	355,559	78,260	72,105	77,834	188.8	1.0	448
Apr	424,822	75,328	53,915	67,547	198.2	1.0	423
May	274,002	75,735	52,214	70,271	189.0	1.0	454
Jun	373,662	76,274	46,312	52,076	161.3	0.8	400
Jul	288,480	82,457	42,827	54,589	191.3	1.0	387
Aug	422,653	73,844	70,670	55,928	196.1	1.0	413
Sep	328,907	91,223	73,260	73,130	176.3	0.9	371
Oct	318,256	79,505	86,082	88,505	182.4	1.0	407
Nov	344,289	71,574	56,365	57,902	125.9	0.6	322
Dec	161,434	76,387	46,373	64,209	119.9	0.6	300
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

1 Monthly total; 2 Month-end; 3 Daily average

Precious Metals Seminar, Toronto, 14-15 November 2002

Following last year's successful event in Toronto, GFMS and The Silver Institute are hosting the 3rd Autumn Precious Metals Seminar on 14th and 15th 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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