THE SILVER INSTITUTE

World SILVER SURVEY 1999



World Silver Survey 1999

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THE SILVER INSTITUTE
1112 Sixteenth Street, N.W., Suite 240
Washington, D.C., 20036
Telephone: (202) 835-0185 Facsimile: (202) 835-0155
www.silverinstitute.org

e-mail: info@silverinstitute.org

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The cover depicts silver grain, a form of silver favored in particular by industrial and jewelry users of the metal. The grain for this photograph was kindly provided by Johnson Matthey plc.

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

Contents

1.	Summary and Outlook	5
2.	Silver Prices	
	Price Volatility and Trading Ranges	
	Gold/Silver Price Ratio	12
	Silver Price and Income Elasticity	12
3.	Investment	
	Comex	
	OTC Market	
	Physical Investment	
	Tocom	16
4.	Mine Supply	17
	By-product Analysis	24
	Production Costs	
	Producer Hedging	26
5.	Supply from Above-ground Stocks	28
	Stocks	
	Scrap	
6.	Silver Bullion Trade	35
7.	Fabrication Demand	41
7.		
7.	Industrial Applications	42
7.		42 53
7.	Industrial Applications	42 53 59
Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles	42 53 59 64
Ta Ta	Industrial Applications	42 53 59 64
Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply	42 53 59 64 5
Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply	42 53 59 64 5 18
Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication	42 53 59 64 5 18 32 44
Ta Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication ble 5 Industrial Uses	42 53 64 5 18 32 44
Ta Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication ble 5 Industrial Uses ble 5a Electrical and Electronics	42 53 59 64 5 18 32 44 48 52
Ta Ta Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication ble 5 Industrial Uses ble 5a Electrical and Electronics ble 5b Brazing Alloys and Solders	42 53 59 64 5 18 32 44 48 52 52
Ta Ta Ta Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication ble 5 Industrial Uses ble 5a Electrical and Electronics ble 5b Brazing Alloys and Solders	42 53 64 5 18 32 44 48 52 54
Ta Ta Ta Ta Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication ble 5 Industrial Uses ble 5a Electrical and Electronics ble 5b Brazing Alloys and Solders ble 6 Photographic Use	42 53 59 64 5 18 32 44 52 52 54 58
Ta Ta Ta Ta Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication ble 5 Industrial Uses ble 5a Electrical and Electronics ble 5b Brazing Alloys and Solders ble 6 Photographic Use ble 7 Jewelry and Silverware ble 8 Coins and Medals ppendices	42 53 64 5 32 44 48 52 52 54 58
Ta Ta Ta Ta Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication ble 5 Industrial Uses ble 5a Electrical and Electronics ble 5b Brazing Alloys and Solders ble 6 Photographic Use ble 7 Jewelry and Silverware ble 8 Coins and Medals pendices I Tables 1-8: tonnes	42 53 64 5 32 44 48 52 52 54 58
Ta Ta Ta Ta Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication ble 5 Industrial Uses ble 5a Electrical and Electronics ble 5b Brazing Alloys and Solders ble 6 Photographic Use ble 7 Jewelry and Silverware ble 8 Coins and Medals pendices I Tables 1-8: tonnes II Silver Prices: London, India, Thailand, Japan, Korea, Italy,	42 53 59 64 5 44 52 52 54 58 56
Ta Ta Ta Ta Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication ble 5 Industrial Uses ble 5a Electrical and Electronics ble 5b Brazing Alloys and Solders ble 6 Photographic Use ble 7 Jewelry and Silverware ble 8 Coins and Medals pendices I Tables 1-8: tonnes II Silver Prices: London, India, Thailand, Japan, Korea, Italy, Germany and Mexico, nominal and real, 1978-1998	42 53 64 5 18 32 44 48 52 54 54 54
Ta Ta Ta Ta Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals bles ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication ble 5 Industrial Uses ble 5a Electrical and Electronics ble 5b Brazing Alloys and Solders ble 6 Photographic Use ble 7 Jewelry and Silverware ble 8 Coins and Medals pendices I Tables 1-8: tonnes II Silver Prices: London, India, Thailand, Japan, Korea, Italy, Germany and Mexico, nominal and real, 1978-1998 III Silver Prices, in US dollars per ounce	42 53 64 5 18 32 44 48 52 54 54 54
Ta Ta Ta Ta Ta Ta Ta Ta Ta	Industrial Applications Photography Jewelry and Silverware Coins and Medals ble S ble 1 Silver Supply/Demand ble 2 Mine Supply ble 3 Scrap Supply ble 4 Total Fabrication ble 5 Industrial Uses ble 5a Electrical and Electronics ble 5b Brazing Alloys and Solders ble 6 Photographic Use ble 7 Jewelry and Silverware ble 8 Coins and Medals pendices I Tables 1-8: tonnes II Silver Prices: London, India, Thailand, Japan, Korea, Italy, Germany and Mexico, nominal and real, 1978-1998 III Silver Prices, in US dollars per ounce	42 53 59 64 5 44 52 52 54 58 66

This is the fifth 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 this Survey is as complete and accurate as possible.

Gold Fields Mineral Services Ltd, London

May, 1999

GFMS Staff

Philip Klapwijk

Hester le Roux Paul Walker

Philip Newman Nambia Ferguson

8

Managing Director

Director Director Analyst

Marketing Manager

Consultants

Stewart Murray Deborah Russell Madhusudan Daga Irena Podleska

Gold Fields Mineral Services Ltd

Goodwins House 55-56 St Martin's Lane London

WC2N 4EA

Tel: (+44) 171-539 7800 Fax: (+44) 171-539 7818 e-mail: silver@gfms.co.uk Web site: www.gfms.co.uk

Units used:

supply and demand data are given in units of million troy ounces (Moz)

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 PM fix of the London Silver Market.

Table Rounding:

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

1. Summary and Outlook

Silver's prospects seemed bright at the start of 1998. The price was increasing and investment interest was lively. Indeed, at the beginning of the year there had been a lot of talk about the potential for a spike of long duration into double-digit territory. But it is probably fair to say that some investors felt let down by the performance of the silver price in 1998, in spite of it rising 13% year-on-year. Did they misread the market?

This seems difficult to refute. After all, following the tremendous rise in the price over the first six weeks of 1998 (silver peaked at \$7.81 on 6th February), the metal has basically traded in a \$4.80-\$6.00 range since May last year. Both the extent and duration of the rally did not match up to some peoples' expectations, for reasons considered in detail in this Survey. In summary, however, the rally ran out of gas because of the rapid and substantial response of silver supply and demand to the rise in the price.

As regards supply, the sharp increase in the price and in silver leasing rates in the first quarter not only initiated a wave of demand from short covering and fresh buying, but also resulted in an enormous amount of metal being mobilized for sale and lending. Silver came to the market from a variety of sources, including unregistered private and government stocks.

Similarly, on the demand side, the price-elastic response to higher prices was stronger and more rapid than many had expected. In particular, the "swing" role played in the market by India and the discretionary nature of much of the country's silver consumption was severely underestimated. In fact, the rise in the price prompted a collapse in Indian demand during the first quarter (see Chapters 6 and 7).

The question which now faces the market is: In the wake of last year's dramatic events, have the prospects for higher silver prices become worse or better?

At the time of writing the silver price is comfortably above \$5/oz, with any sorties much below this level in 1999-to-date having been firmly resisted. Even discounting the first quarter rally, silver did very well last year compared to most other commodities that have trended down since 1997 on the back of falling world GDP growth rates. Silver's resilience in the face of difficult economic conditions and the perception that its downside below \$5/oz may be limited helps to explain why investors and speculators generally remain on the long side of the market.

Another plus is that silver stocks are probably now in tighter hands. There was a huge transfer of bullion

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Supply									
Mine Production	518.2	506.0	480.8	463.0	448.1	478.8	485.9	519.3	545.5
Net Official Sector Sales	0.7	_	-	13.0	25.8	33.4	26.8	7.0	52.5
Old Silver Scrap	134.8	141.6	147.8	147.7	151.3	162.3	157.8	168.7	190.4
Hedging	15.2	19.0	1.3	26.7	-	6.6	-	66.7	5.1
Implied Disinvestment	52.0	56.1	107.7	134.7	154.9	100.6	154.8	98.2	47.2
Total Supply	720.9	722.8	737.6	785.1	780.0	781.7	825.3	859.9	840.6
Demand Fabrication Industrial Applications Photography Jewelry and Silverware Official Coins Total Fabrication Net Official Sector Purchases Hedging	278.3 221.1 188.6 32.8 720.9	271.7 216.2 194.3 29.7 712.0 10.8	264.4 210.3 211.4 33.9 720.1 17.5	275.5 210.1 258.6 41.0 785.1	287.8 213.1 226.9 43.0 770.9	302.0 220.5 235.5 23.8 781.7	304.2 224.6 261.5 22.8 813.1	327.7 232.4 271.8 28.0 859.9	323.7 245.3 244.4 27.2 840.6

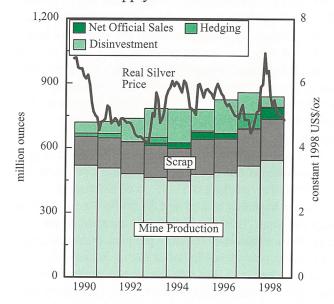
from "stale" longs to new investors including, notably, Berkshire Hathaway, between August 1997 and February 1998, and our impression is that these new investors still own a substantial proportion of their original purchases. GFMS estimates that several of these investors could between them be holding in the region of 200 Moz (6,220 t). More importantly, it seems likely that many of these investors are hanging onto their silver quite tightly. Mr Buffett, for example, has a reputation for being a "value investor" and so it seems that, for the time being, he may be happy to sit with his silver position, especially given his widely reported opinion that many stockmarkets are seriously overvalued.

Clearly at the right price this silver would be sold. But unless and until a higher price level is reached these stocks appear to be firmly held. Meanwhile, there continues to be a structural "deficit" in the silver market that is eating away at above-ground bullion stocks. Last year, for instance, this "deficit" amounted to 104.7 Moz (3,260 t) in spite of higher supply from scrap and mine production and lower fabrication demand. The erosion of available bullion stocks that has resulted is evident from the strong shift upwards in silver leasing rates, in spite of a sharp fall in borrowing demand. Three-month rates have moved up from close to 0.5% a couple of years ago to at least 3.0% currently. One implication of the relative lack of liquidity and the associated running down of bullion stocks is that, in future, higher prices may be required to tease out the same volume of metal as was seen in early 1998.

Nevertheless, we do not believe that too rosy a picture of silver's price prospects should be painted. Apart from the cautionary message from last year's price-elastic increase in supply and collapse of demand, there are some changes that could limit the upside for the price over the foreseeable future. Firstly, a lot of non-speculative borrowers are now out of the market. One reason why silver moved up so rapidly in early 1998 is that many industrial users were forced by the leap in borrowing costs into replacing loans with purchased metal. After last year's rapid price and lease rate spikes, borrowers have reduced their vulnerability by cutting back on their loans and overall inventory levels. Any future rally is therefore not likely to be boosted to the same extent by purchases from this quarter.

Secondly, although producer hedging added very little to supply last year, some mining companies may feel that they missed an opportunity by not selling

Figure 1
World Silver Supply



forward more aggressively into the rally. Things could be different next time.

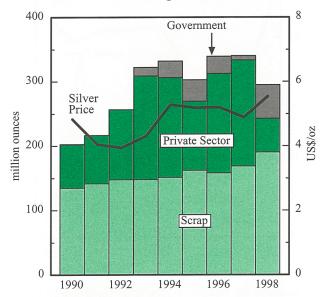
What nevertheless became apparent last year is that silver, does have abundant above-ground stocks that can come into play under the right circumstances. Indeed, as we have seen, one of the reasons why some investors may have somewhat misread the market last year is that they underestimated the size and price-elasticity of, particularly, the unidentified stocks of bullion.

Supply

- Mine production increased 5%, reaching its highest level this decade of 545.5 Moz (16,970 t).
- Producer hedging made a very modest contribution to supply due to increased options activity.
- Scrap supply surged 13% due partly to large-scale dishoarding in a number of countries in response to higher prices.
- Official sector sales increased more than seven-fold to 52.5 Moz (1,630 t), the highest level recorded since the 1970s.
- Net disinvestment generated 47.2 Moz (1,470 t).

Total supply of silver to the market declined by a modest 2% in 1998, despite an additional 93 Moz (2,890 t) finding its way to the market via increases in three of the main sources of supply, namely mine production, scrap and official sector sales. This was

Figure 2
Mobilization of Above-ground Stocks



offset by a very large drop in producer hedging and lower disinvestment than in 1997 (see Figure 1).

Silver mine production continued on the strong expansionary trend which started in 1997, with a number of very large-scale new mines commencing production. Primary silver production increased its share of the total to around 26%.

Despite the poor conditions prevailing in the lead, zinc and copper industries, mining of these metals still generated 5% more silver than the previous year, as capacity cutbacks have not yet been implemented with any noticeable effect. On the other hand, reduced output levels and closure or suspension of a number of silver-bearing gold mines resulted in the share of this source metal in total output shrinking to 13%, from 16% in 1997.

But, as is so often the case, supply from mine production, although it contributed 65% to the total, was not really the most important price-determining factor on the supply side. Rather, it was developments in the mobilization of the vast stocks of above-ground silver which continued to have an impact on the price (see Figure 2).

Supply to the market from above-ground stocks fell 13% last year to 295.1 Moz (9,180 t). Figure 2 shows how flows from private sector stocks of bullion and coins were much reduced at 52.3 Moz (1,630 t), compared to 1997 when both disinvestment and producer hedging were at much higher levels.

Producer hedging generated only 5.1 Moz (160 t) of accelerated supply to the market last year, in stark contrast to 1997 when this number had reached an all-

time high of 66.7 Moz (2,070 t). 1998 witnessed a number of large buybacks and restructuring of hedge books, as producers unlocked some of the value tied up in their positions. There was still a large degree of options activity (particularly on the call options side), and with the delta on some of these being quite high, enough silver was generated in financing the transactions to cancel out the effect of a decline in outstanding forward positions.

Scrap responded to higher silver prices last year, posting a 13% increase to 190.4 Moz (5,920 t). Some of this was generated in the troubled countries of East Asia. However, the relative shortage in this region of "near-market" stocks of silver - i.e. fabricated products which could easily be mobilized in a hurry - meant that silver scrap flows never even remotely approached the levels seen in the gold market. But the real increases were seen in India, where the 14% rise in local silver prices led to large volumes of old ornaments and silverware being remelted last year.

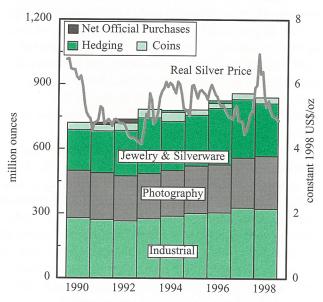
In a sharp deviation from past patterns, net government sales soared to 52.5 Moz (1,630 t) in 1998. This appears to have been the highest level of sales out of government stocks since the 1970s, and disposals came primarily from China, Russia and the United States. Different motivations appear to have been at work in each case. In the United States, the Defense Logistics Agency continued its program of reducing stockpiles for coin fabrication. In China, large-scale disposals were probably motivated by high prices; and in Russia, silver sales may have been an emergency measure implemented by a cash-strapped government.

The silver market saw huge two-way business from speculators and investors, especially in the first quarter. The net disinvestment figure of 47 Moz (1,460 t) totally understates the scale of activity. Much of the reduction in this total from 1997's levels of close to 100 Moz (3,100 t) was due to buying at the start of the year, not all of it entirely "voluntary".

Demand

- After three years of growth, world silver fabrication fell to 840.6 Moz (26,150 t) in 1998.
- The fall was primarily the result of the sharp decline in Indian and East Asian fabrication demand.
- Industrial uses of silver declined by a modest 1.2% to 323.7 Moz (10,070 t).
- Photographic fabrication surged by 5.6%, to 245.3 Moz (7,630 t), almost entirely on the back of

Figure 3
World Silver Demand



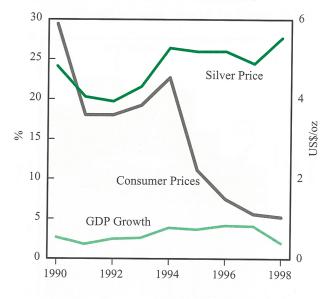
growth in the United States.

- Jewelry and silverware fabrication fell sharply in 1998 to 244.4 Moz (7,600t). Virtually all of this was attributable to the collapse in Indian and East Asian demand.
- Coins and medals demand fell by around 3%.

Table 1 shows that silver is unequivocally an industrial metal - close to 70% of the metal is consumed in industrial applications and photography. To the extent that there remains a hint of silver's past monetary role, this is to be found in coins, which in 1998 accounted for only around 3% of total demand. Jewelry and silverware accounted for the balance of offtake (see Figure 3). The last net official sector purchase recorded was in 1992, and then for a very modest amount of 17.5 Moz (540 t), and there have only been two occasions in the last nine years when hedging has appeared on the demand side.

One of the most revealing things about the demand numbers last year was how each segment responded to the sharp rise in the dollar (and local currency) price. It is particularly noticeable that neither industrial applications nor photography responded particularly markedly to both high prices and lease rates; indeed, silver usage in photography *increased* year-on-year. Most of the response to the high price was seen in jewelry and silverware, which fell by over 10% (price elasticity is discussed more fully in Chapter 2). Of course, this has important implications for the silver market as a whole: if only a relatively small percentage of the market is very price elastic, the capacity of the

Figure 4
Silver Price and Economic Indicators



price to move up sharply is less constrained (and here the differences between the gold and silver markets is very apparent - 76% of gold demand is for jewelry).

The largest single end-use for silver is industrial applications, a quite broad category that encompasses a very wide range of applications ranging from medical uses through to plating salts for use in electronics. Silver has unique properties that have secured it a place in a very wide range of industrial applications. Although fabricators are constantly looking to economize on their silver use, there are limits, and this has been seen in steadily rising demand over the past decade. Silver's industrial credentials are reflected in the fact that Europe, North America and Japan dominate world offtake in this category.

Based on the 5.6% growth posted in 1998, it would seem as if the digital revolution has, thus far at least, largely passed conventional photography by. Currently, the two technologies appear to be developing alongside one another without dramatically affecting each other's market share. To the extent that digital has affected silver halide demand, this has been seen primarily in niche areas of the amateur market and in graphic arts. However, digital imaging will grow as a threat to silver halide in the future.

Turning to jewelry and silverware, it was interesting to see how demand in different geographical areas responded to higher prices. The impact in price-inelastic markets such as Europe and North America was barely noticeable. By contrast, Turkish demand fell by close to 5%, while Indian fabrication declined by 17% - clear confirmation that India is today the big swing market on the jewelry side.

2. Silver Prices

- The average 1998 silver price of \$5.5442 rose 13.2% year-on-year to an 11-year high in nominal terms.
- The trading range of \$3.1200 (56%) and volatility (37%) were the highest in over a decade.
- Lease rates surged ahead of US interest rates in the first half, putting the market in backwardation (basis 3-month silver), effectively from the beginning of January until early April.

1998 was an eventful year in the silver market, a fact clearly reflected in the movements in the price of the metal (see Figure 5). The average price of \$5.5442 was the highest nominal average in 11 years; the 56% trading range and the volatility of 37% also represented eleven-year highs.

Following on two years of declining prices, silver staged an impressive recovery starting around mid-1997. A strong rally was kicked off in August which saw the price rise 29% to end the year at \$5.9950.

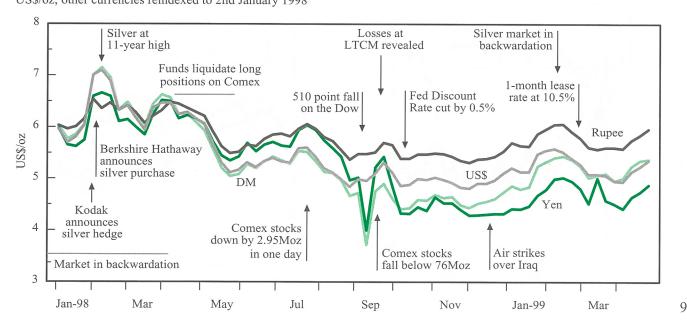
1978	1988	1998
5.4218	6.5324	5.5442
6.2640	7.8215	7.8100
4.8180	6.0500	4.6900
26.7%	27.1%	56.3%
	5.4218 6.2640 4.8180	5.4218 6.5324 6.2640 7.8215 4.8180 6.0500

1998 thus got off to a very good start, with silver breaching the elusive \$6-level only six days into the year. The rally gathered pace towards the end of January, and in February the price rose by over 22% or \$1.43 in just three days to reach its high for the year - and an 11-year record - of \$7.8100, on 6th February.

This marked the culmination of a tumultuous period in the silver market during which lease rates increased sharply. The market moved into steep backwardation, having briefly returned to a contango situation at the beginning of the year. The surge in lease rates was impressive - the 3-month rate shot up to 32.7% on 5th February, while one-month rates briefly touched 90% - and gave a strong signal that some large players were active in the market (see Figure 6).

Warren Buffett's announcement on 3rd February that he had acquired 129.7 Moz (4,030 t) of silver for his Berkshire Hathaway investment fund, confirmed the presence of a large buyer. The intensity of the squeeze suggested that he was not the only one in the market, though. In the wake of the announcement, a further

Figure 5
London Silver Market: Spot Price, Weekly Averages
US\$/oz; other currencies reindexed to 2nd January 1998



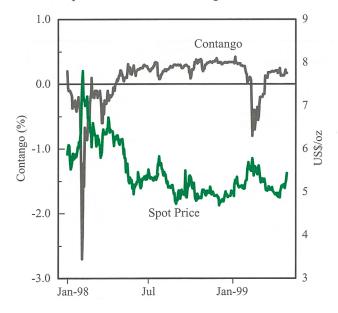
wave of buying hit the already tight market as soaring lease rates left silver buyers scrambling to get hold of the metal, pushing prices up in the process. In what had become a serious liquidity crisis - albeit brief - 3-month forward prices were as much as 0.49 cents below spot.

There can be no doubt that the issue of liquidity and, by implication, mobilization of silver stocks, was the single most influential factor determining price behavior last year. Comex stock movements were a useful guide to what was happening in the market more broadly. They had been falling consistently from mid-1997 (see Chapter 5) and by 12th February 1998 had reached a historic low of 92.8 Moz (2,890 t), prompting speculation that there was a serious "deficit" in the silver market.

The growing tightness in the silver market had a particular geographical dimension, reflected in the growing price differential between London and New York. On 6th February the London premium peaked at 77 cents. It is surely no coincidence that over 66 Moz (2,070 t) of silver was imported into the United Kingdom in February alone (see Chapter 6 for more on this). A substantial percentage of this bullion was most probably originally from Comex warehouses.

These huge flows into London were a leading indicator that the price would soon come under pressure. Much of the silver pouring in was earmarked for borrowing, as bullion players clamored to make silver available against very high lease rates.

Figure 6
London Spot and 3-month Contango



Coinciding with this, a further wave of mobilization was seen in the form of outright sales by the official sector - China, for example, sold large volumes of silver (see Chapter 5).

Of course, with silver lease rates so far above dollar interest rates, demand for borrowed silver had already fallen sharply, and the effect was intensified by a number of large-scale buy-backs of producer hedging positions (see Chapter 4). At the same time, physical demand responded fiercely to high prices: Indian jewelry demand virtually disappeared, for example, while imports into Italy halved. As the liquidity squeeze eased, prices dropped in the first days of March, helped on their way down by long liquidation.

Silver trended downwards for the rest of the year. Only on three occasions did it manage brief rallies. The price rose to \$6.73 towards end-March on the back of fund buying on Comex. In late July the price recovered from recent lows (reached in sympathy with gold) to \$5.8325, as funds once again bought the metal and new borrowing created a sudden tightness in the market. Finally, towards end-September the silver price rose briefly above \$5.38 on the back of falling Comex stocks and the rally in the gold price.

On each occasion, though, the high-point was below that of the previous rally. Silver trended downwards steadily, along with the rest of the commodities complex (see Figure 7), reflecting its role as an industrial metal. The decline continued for the balance of the year with the lowest fix in 1998 of \$4.6900

Figure 7
London Silver and Gold Price, and CRB Index
Gold & CRB Index reindexed to 2 January 1998

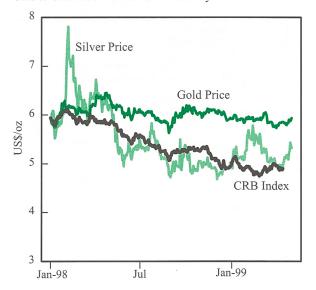
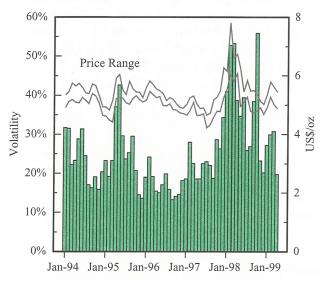


Figure 8

Daily Silver Price Volatility

Based on London fixings (30-day rolling average)



recorded on 3rd December.

During the first weeks of this year, silver trended strongly upward, buoyed by investment buying in New York and further boosted by the mini-rally in the gold price. February saw a further squeeze on silver liquidity which again resulted in the market moving into backwardation, and in March 1-month rates were back up above 10% (albeit briefly). In May, the silver price remained well above \$5 in spite of the UK Treasury announcement of future sales that had sent gold into a tailspin.

The 13% rise in 1998's US\$ price was mirrored in increases in the Indian, German and Italian prices. In Mexico, the price rose by 30% to an all-time high of Peso 50.65/oz in nominal terms.

In East Asia, in the wake of the widespread economic and currency crisis, price increases were even more dramatic. The Thai silver price rose over 49% to a fifteen-year high of baht 229.30/oz. Similarly, the two-thirds increase in the South Korean price to won 2,498/10g represented the highest annual average since 1983.

The Price in Different Currencies									
	US\$/oz	DM/oz	Rupee/kg	Yen/10g					
Annual Average	5.5442	314	8,016	233.0					
Maximum	7.8100	450	9,350	310.0					
Minimum	4.6900	252	7,160	177.5					
Range:Average	56.3%	63.3%	27.3%	56.8%					

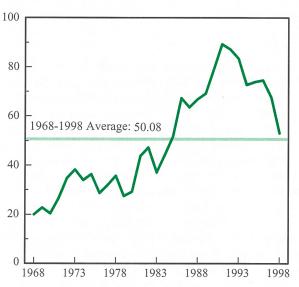
Price Volatility and Trading Ranges

The 37% volatility recorded last year was the highest annual average since 1987 (41%) whilst the 56% trading range of \$3.1200 also represented an eleven-year high. In the intervening period, daily volatility had averaged just 21%.

On a monthly basis, the average in October 1998 at 56% represented the highest level since June 1987. However, the picture during the rest of the year was mixed. After a volatile first quarter, average daily volatility declined for the next six months, falling to 26% in July (see Figure 8). After peaking in October, price volatility fell back towards the end of the year to below 30%. However, to put this into perspective, during the preceding three years average monthly volatility rose to above 30% on just three occasions.

1994	1995	1996	1997	1998
23.4%	25.2%	17.1%	23.5%	37.4%
Q1-98	O2-98	O3-98	Q4-98	Q1-99

Figure 9
The Gold/Silver Price Ratio



Gold/Silver Price Ratio

On an annual average basis, the gold/silver ratio fell to just 53.04 last year, compared with 67.90 in 1997 (see Figure 9). The ratio was last below the 60 mark in 1985 when it averaged 51.75. To put this into context, the average for the 1990s to-date has been 75.71 compared with just 52.06 for the 1980s. Before the

1980s one has to go back to 1945 to find a time when the annual average was last above 50 (the average that year being 67.40). More recently, throughout 1998 and 1999 to date, the monthly average gold/silver ratio has so far consistently remained below 60 and in February 1998 it fell to just 43.55.

Silver Price Elasticity

The response of silver supply and demand to the price spike at the end of 1997 and beginning of 1998 highlighted once again the rather vexed question of the price elasticity of the silver market as a whole. This focus box examines some of the main factors determining how the silver market responds to changes in prices.

The table below shows how certain components of the supply and demand equation have responded to changes in real prices and incomes over the past three years – not enough to draw any firm conclusions but suggestive of some of the factors that are probably important nonetheless.

of the factors that are producty.	important i	TOHOUTOIL	Job.
	1996	1997	1998
Real price (1998 US\$/oz)	5.405	4.956	5.544
Price change y-o-y	-2.8%	-8.3%	11.8%
Income change y-o-y	4.2%	4.1%	2.0%
Supply and Demand Variables			
Industrial demand	0.7%	7.7%	-1.2%
Photographic demand	1.8%	3.4%	5.5%
Jewelry demand	11.1%	3.9%	-10.1%
Scrap supply	-2.7%	6.9%	12.9%
Disinvestment	54.1%	-36.6%	-51.7%
Official sector sales	-19 9%	-73 8%	647.6%

Demand

Economic intuition suggests that "essential" uses of silver should be relatively unaffected by price changes in the short term. For instance, industrial demand applications would not be expected to fall sharply in response to an increase in prices simply because technically it is often not possible to move rapidly from using a material like silver to another. In the case of photography, the degree of responsiveness would be expected to be even less – there are no really viable alternatives to using silver. By contrast, jewelry and silverware would be expected to be more sensitive – they tend to be items of discretionary spending, and so purchases can be postponed in the face of higher prices. India is a case in point. Around 70% of demand is for jewelry and silverware, and this fell sharply last year in the face of higher prices. More generally, the data in the table is not inconsistent with this view regarding price sensitivity.

Naturally, income growth is an important determinant of demand; although it is impossible to separate out entirely price and income effects. Having said this, income growth appears have a greater influence in the medium term, and shocks to the price are arguably more important short-term determinants of demand.

Supply

The impact of rising prices is not only seen on the demand side, and changes on the supply side can be equally important, if not more so, to how much the price can move. Mine supply, although not entirely unresponsive to price changes, is constrained by how quickly new projects can be developed and brought on stream. Elsewhere on the supply side though, there are components that can, and do, respond quickly to changes in the price. Importantly, the capacity of the market to generate substantial amounts of scrap in response to a price rise is limited by the amount of "near market stocks" of fabricated silver products available, a theme that is developed elsewhere in this Survey.

Most fabricated silver is probably held in a form that is not near the market, for example, a layer of silver on a printed circuit board inside a computer. Photographic scrap recovery is already extremely efficient, and it seems unlikely that there could be a substantial increase in scrap from this source in the face of a rising silver price, leaving jewelry and silverware as the biggest potential source of readily available scrap. Considering that only around 30% of silver is used in this form, it seems reasonable to assume that scrap will not be as big a swing factor as it is in gold (where GFMS estimates that close to 50% of the total above ground stock consists of jewelry, much of this in near-market form).

Disinvestment appears to be dictated by myriad different forces of which price is only one, but it will undoubtedly remain an important factor in determining the medium to longer-term trend in the price. Near market forms of bullion and coin held in private hands can be and have been influential in determining the price. As for the official sector, the table suggests that sales and purchases could be an important swing factor in short term movements in the price.

3. Investment

• Net disinvestment fell sharply to 47.2 Moz (1,470 t) in 1998. This low net figure hides the fact that there were massive gross sales and purchases of silver last year, especially in the first quarter.

Overview

In spite of substantial buying interest, the silver market continued to see net private sector disinvestment in 1998. At 47.2 Moz (1,470 t), however, its scale was much reduced compared to the previous year when close to 98.2 Moz (3,050 t) was disinvested. The 51 Moz (1,590 t) reduction in the total helps to explain the higher average silver price in 1998. Unlike most other commodities, silver managed to shake off the downward bias to prices given by slower world GDP growth and declining inflation (see table below). Although fabrication demand was impacted by these developments, the effect on the price was dwarfed by the massive stock flows and sales and purchases of bullion that were set in motion by Berkshire Hathaway in the second half of 1997.

As for the lower "residual" disinvestment of just over 47 Moz last year, we would single out two main reasons why net sales out of private investment stocks declined in 1998. The first was the greater buying interest seen from funds and private investors. The second was the decline over recent years in near market inventories, which meant that there was, initially at least, less loosely-held silver in the way of an upside move in the price. Nevertheless, as the rally developed the volumes transacted in the silver market became ever larger. The huge mobilization of stocks in 1998 is totally understated by the low figure for net disinvestment. The driving forces behind the greater trading activity in the market last year are reviewed below and in the individual sections of this Chapter.

On the "buy" side there were a number of factors present in 1998. Firstly, although most of the 129.7 Moz (4,034 t) hoard amassed by Warren Buffett was

	1997	1998	Change
	Average	Average	у-о-у
Silver Price	4.897	5.544	13%
Contango (3-mth annualized)	4.02%	0.64%	n/a
US\$ Libor (3-mth annualized)	5.74%	5.56%	n/a
S&P 500 Index	853	1060	24%
CRB Index	236	208	-12%
XAU Index	98	73	-26%
World Inflation	5.6%	5.2%	n/a
World GDP	4.1%	2.0%	n/a

purchased between July and December 1997, a small part may have been acquired in January 1998 on price dips. However, with an average cost of acquisition thought to be around \$4.80-\$4.90 it is clear that most of Mr Buffett's silver was purchased in calendar 1997.

Secondly, the knowledge that Mr Buffett's company Berkshire Hathaway was acquiring large amounts of silver generated a huge "coat-tails" effect. Much of this buying, though by no means all of it, had already taken place in 1997. Some of those who got into the market on the long side in 1997 and early 1998 were also quick to get out of their positions on the price spike. Nevertheless, overall, we would not be surprised if, in addition to Mr Buffett, another 50 to 80 Moz (1,560 to 2,490 t) was being firmly held at the end of 1998, some of this silver having been purchased earlier on in the year.

Thirdly, the rising price and spike in lease rates during the first quarter forced all manner of "shorts" in the market to cover their positions. Indeed, it is probable that the bulk of this short-covering would have come from industrial and other borrowers (rather than true short-sellers) who, faced with skyrocketing short-term leasing rates, were forced into replacing leased metal with silver purchased in the spot market. Although the scale of this buying was mitigated by those concerned reducing their overall inventory requirements (and in some cases selling owned stocks into the market for a profit), these "forced" purchases could still have reached a net 30 Moz (930 t).

In the light of so much activity on the purchase side (whether voluntary or not) it could be asked, why was there not in fact net <u>investment</u> rather than <u>disinvestment</u> last year? The answer is that there was an even greater amount of countervailing sales from private stocks and other sources.

Firstly, there was a major increase in retail disinvestment of coins and bars. In the United States in the first quarter of 1998 a large quantity of 100 oz bars and coin bags were sold to dealers by private investors. Part of this was reversed from the third quarter onwards when retail investment encouraged by "Y2K" fears emerged as a factor. Overall though, there was net disinvestment of bars and coins last year by private investors, probably exceeding 10 Moz (310 t) in the United States.

Secondly, holders of "paper silver" in the form of metal accounts were significant net sellers last year as prices headed towards the \$7 level. Many of these individuals could be described as "stale longs" who saw the chance to get out of long held positions. Several million ounces would have come out of these metal accounts in 1998.

Thirdly, long positions held by investors on the Comex declined sharply in 1998. At the end of 1997 the net long positions held by funds on the exchange (the level of non-commercial open interest is taken as a proxy for this - see Figure 10) amounted to 42,127 contracts, equivalent to a nominal 210 Moz (6,530 t). By the end of 1998 this had shrunk by two-thirds to 14,250 contracts, implying long liquidation of nearly 28,000 contracts or 140 Moz (4,350 t).

So far in 1999, funds have maintained a net long stance on the Comex. Indeed to some extent such positions have tended to grow since the beginning of the year, although it is felt that funds' trading strategy is to target smaller moves in the price than they were in 1998. On the other hand, further liquidation of investor positions held off the exchange is likely to have occurred, particularly at the time of the price rallies during February and late April. It is possible though that, conversely, some new long positions were added which triggered this price rise in the first place (evidence that European stocks rose in the first quarter may support this thesis). What is a lot clearer is the strength of retail investor interest in the United States, particularly when silver has traded close to or below the \$5 level. In January, for instance, there were periods when the premium on coin bags exceeded \$1,000, i.e. equivalent to over \$1.50/oz. Once again, "Y2K" fears have been behind many purchases.

Comex

Futures volume on Comex fell by 16% last year compared to 1997. Similarly there was a parallel 8% drop in average futures open interest. When it comes to the options side, turnover fell by a smaller 3% last year. More data on turnover and open interest can be found in the appendices to this Survey.

As noted above, from the end of 1997 to the end of 1998 there was a 27,877 contract decline in the net long positions held by funds on Comex. The disaggregated data show that most of this fall was the result of long liquidation (the bulk of it completed by the end of the third week in March) rather than new short positions being put on. The close relationship this had with the trend in the silver price is also clear from Figure 11. If instead of looking at what happened

between two points (i.e. the year-ends), the average fund positions during 1998 and the previous two years are analyzed then a different pattern emerges. In 1998, according to the non-commercial net open interest data, funds in aggregate and on average were over 25,500 contracts long. This was more than double the level in 1997 which itself was higher than the average net long position in 1996. Even though the 1998 average was skewed by events in the first quarter, these numbers may indicate a more positive view on silver from the investor community.

This conclusion certainly applies if silver is compared to gold. The bias on Comex to the short side in gold and to the long side in silver is evident from Figure 12. At the right price level it is clear that most speculators are more comfortable being long silver and short gold. From September to mid-December last year this conventional wisdom was for a while turned on its head as the gold market saw a wave of short covering and the temporary build up of long positions. Since then a more "normal" pattern has been restored.

Comex silver stocks fell by 34 Moz (1,060 t) in 1998, ending the year at 76 Moz (2,360 t). A fuller treatment of this issue is to be found in Chapter 5.

LME Silver Contract

On 10th May 1999, the London Metal Exchange (LME) launched its Futures and Options contracts. These are for 999 silver in 5000 oz lot sizes, deliverable in either bar or granule form to warehouses in five locations around the world. As with the launch of any new futures and options contract, its success

Figure 10
Comex: Non-commercial Net Open Interest
Weekly Net Positions and Settlement Price

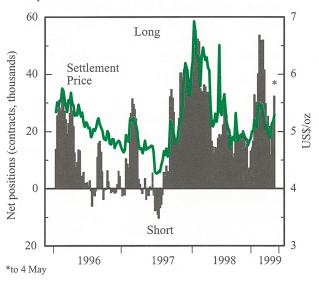
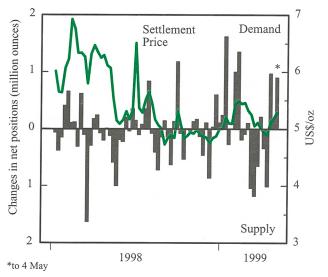


Figure 11
Comex: Non-commercial Net Open Interest
Changes in Weekly Net Positions



will depend on generating sufficient liquidity in the market to encourage both suppliers and consumers of silver to use the LME for hedging and speculation.

OTC Market

It is not impossible that there was net investment last year via the Over-The-Counter (OTC) market. This is particularly likely given the substantial net disinvestment referred to above on the Comex and, below in terms of the retail or small investor market.

One reason why it is difficult to be certain about trends in the OTC market is that the volumes transacted in 1998 were so huge and came from so many quarters. For instance, we refer later in this Survey to the massive flow of bullion back into the market as a result of the first quarter spike in leasing rates and the smaller, though still considerable replacement of these borrowings by purchased metal. The latter phenomenon would necessarily be captured within our theoretical OTC "investment" number.

More importantly there is the difficult question of just how much silver Mr Buffett and his peers acquired in the OTC market last year and, equally, how much they sold back on higher prices. Regarding Berkshire Hathaway's purchases, it is generally felt that most of the 129.7 Moz (4,030 t) referred to in their press release of 3rd February was bought between 25th July 1997 and the end of that year. In the same press release Berkshire Hathaway claimed to have taken delivery of 87.5 Moz (2,720 t) by the end of 1997. The balance of 42.2 Moz (1,310 t) was contracted for delivery by 6th March. It is probable that part of this

second tranche was purchased in early 1998.

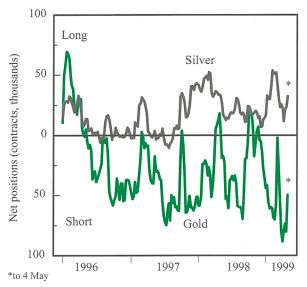
Even before the news was broken to the world that Mr Buffett had amassed a huge amount of silver there was a growing realization that a very powerful buyer was in the market. This fact prompted others into entering the silver market on the buy-side. The willingness of these investors to go long was undoubtedly supported by the strong case that could be made on the basis of silver's supply/demand fundamentals that its downside was relatively limited at prices much under \$5/oz. This second wave of buying could quite possibly account for another 50 Moz to 80 Moz (1,560 to 2,490 t) of core long positions, probably mostly acquired through the OTC market, held physically and (largely at least) not lent to the market. It is probable that the bulk of this silver would have been bought in 1997 but some of it is likely to have been picked up early last year. Assuming that Berkshire Hathaway's position is itself still intact, this implies that there was still around 200 Moz (6,220 t) of silver that was being firmly held and (mostly) not lent to the market at the end of 1998. At its peak the total would have been a lot higher than 200 Moz (possibly closer to 300 Moz). Much of this buying was of a shorter-term speculative nature, often technically-driven and liquidated in the bout of profit taking that helped force silver down from its highs reached in February. Although there is a view that Mr Buffett could have formed part of this wave of liquidation (and also, some suspect, in January 1999), letting go up to 30 Moz (930 t) of his position due to higher prices, this is not certain. Similarly, there are differences of opinion as to how much silver, if any, Berkshire Hathaway are lending to the market. The prevailing level of leasing rates suggests that the quantity cannot be that large. This seems to be confirmed by the increase in European Dealers' vault stocks last year (see Chapter 5).

After its strong performance from September to December 1997, turnover on the London Silver Market remained high in January and February before dropping back sharply from March onwards. For 1998 as a whole, turnover in London, as measured by the number of ounces transferred, was down 16% year-on-year, exactly the same percentage fall as on Comex.

Physical Investment

Apart from the dishoarding of silver coins, principally the Maria Theresia Taler in the Middle East and some metal account activity in Western Europe, physical investment or, perhaps better put, retail activity, is dominated by the United States. This is

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



because, with few exceptions, in Europe and the Middle East small investors have historically put their money into gold, not silver. In contrast, physical gold investment was actually prohibited in the United States from 1933-75. But even before this period silver had a keen following among the American populace.

As regards the situation in 1998, the market saw a tremendous swing in US retail investment activity during the course of the year. In the first quarter, there was a major increase in retail disinvestment of coins and bars. At this time a large quantity of 100 oz bars was sold to dealers by private investors. This additional supply forced the discount on these bars down from the usual 2-3 cents/oz (typical with silver under \$5/oz) to 12-18 cents/oz. In addition, a sizeable quantity of 1,000 oz bars came into the market from a variety of sources. It was a similar story when it came to coin bags. A massive quantity of 90% (and to a lesser extent 40%) bags were sold back when silver surged above the \$6 level in late 1997 and the first few months of 1998. The fine weight of the 90% bags of former US circulating coins is typically 712-715 oz.

However, from the third quarter onwards the selling earlier in 1998 was partially reversed by a surge in US retail buying. Investor interest in silver was stirred by the lower price and growing "Y2K" fears. This was clear from a dramatic increase in coin sales, both newly minted ones like the US Eagle and in purchases of 90% coin bags. Nevertheless, on balance, this new demand was not nearly sufficient to outweigh the tremendous supply of old coins and bars that came into the market during the first half. Thus, for 1998 as a

whole, we estimate that, excluding the minting of new bullion coins, over 10 Moz (310 t) of coins and bars were disinvested on a net basis (mostly but not exclusively from retail stocks in the United States). It should be noted that this number also excludes some coins where our information is precise enough for the supply to be allocated to scrap (see Chapter 5).

Besides the direct (net) dishoarding of coins and bars, holders of "paper silver" in Europe and North America, in the form of metal accounts, sold several million ounces last year, mostly in the first quarter.

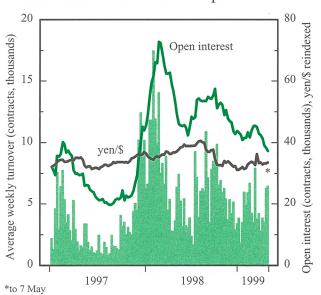
Tocom

On Tocom silver trading held its own with the active platinum group metals complex for much of 1998.

It was not surprising that activity on the silver contract rose in February and March when the dollar silver price was moving up to 11 year highs. Total monthly turnover peaked at 253,627 contracts in February, up a phenomenal 708% from the low of 31,360 recorded in August 1997. Open interest also reached its zenith in February, recording 66,081 contracts, up an almost equally impressive 230% on the August figure.

In tandem with other markets, the Tocom enjoyed a mini-boom in activity in September and October. In this case the burst of trading activity was triggered as much by the move in the yen exchange rate against the dollar as by the change in the dollar silver price. From its low of 80,521 contracts in June 1998, turnover surged 116% to 174,037. By contrast though, open interest actually fell over this interval, signalling that the rally in local prices was not expected to continue.

Figure 13
Tocom Futures Turnover and Open Interest



4. Mine Supply

- World mine production of silver increased by 5% in 1998, to reach a new record level of 545.5 Moz (16,970 t). Primary silver's share of total production grew to 26%, generating 142.5 Moz (4,430 t).
- Weighted average production costs for primary producers were \$3.03, up 10% from 1997.
- Producer hedging contributed only 5.1 Moz (160 t) to supply, mainly through options. Forward sales declined.

Top 2	20 Silver	Producing Count	tries in 1998	
Rankii	ng		Outp	out (Moz)
1998	1997		1997	1998
1	1	Mexico	86.8	92.5
2	2	Peru	66.8	65.1
3	3	United States	63.2	62.8
4	7	Australia	35.6	47.2
5	8	Chile	35.1	43.2
6	4	CIS	41.9	41.9
7	6	China	38.0	38.2
8	5	Canada	39.0	36.2
9	9	Poland	33.8	36.0
10	10	Bolivia	12.4	13.1
11	12	Indonesia	8.4	10.0
12	13	Morocco	8.4	9.8
13	11	Sweden	8.5	8.4
14	14	Spain	6.2	5.6
15	. 15	South Africa	5.2	5.1
16	17	Japan	2.8	3.0
17	16	Turkey	2.9	2.8
18	27	Argentina	1.1	2.2
19	24	Greece	1.2	2.1
20	19	PNG	1.6	1.9

Top 20 Silver Producing Companies in 1998								
Ran	king		0	utput (Moz)			
98	97	Company Name	Country	1997	1998			
1	1	Industrias Peñoles	Mexico	35.0	36.4			
2	2	KGHM Polska Miedz	Poland	33.1	35.3			
3	30	BHP Minerals	Australia	3.5	18.1			
4	3	Rio Tinto plc	UK	16.4	16.2			
5	4	Grupo Mexico	Mexico	14.6	16.1			
6	12	Cominco Ltd.	Canada	10.6	13.3			
7	5	MIM Holdings Ltd.	Australia	13.0	12.5			
8	8	Homestake Mining	USA	11.8	11.7			
9	6	Noranda Inc.	Canada	12.8	11.2			
10	13	Cia. de Minas Buenaventura	Peru	10.0	10.8			
11	10	Coeur d'Alene Mines Corp	USA	11.0	10.7			
12	22	Placer Dome Inc.	Canada	5.7	10.5			
13	24	TVX Gold Inc.	Canada	5.1	9.9			
14	11	Echo Bay Mines Ltd.	USA	11.0	9.4			
15	17	Boliden AB	Sweden	7.0	8.0			
16	14	Corporativos Frisco	Mexico	7.5	7.9			
17	16	ONA Pôle Mines	Morocco	7.3	7.7			
18	18	Asarco Inc.	USA	6.9	7.5			
19	7	Centromin	Peru	12.5	7.3			
20	15	Codelco	Chile	7.3	7.3			

Silver Mine Production

- Mexico was once again the biggest producing country, generating close to 17% of global silver output.
- Very strong growth was also recorded in Australia and Chile, where large new silver-producing mines reached full capacity.

World mine production of silver increased for the fourth consecutive year, rising 5% to a new record level of 545.5 Moz (16,970 t) in 1998. This robust performance comes on the heels of even stronger growth in 1997, bringing the total expansion over the last two years to over 12% and adding close to 60 Moz (1,860 t) of silver to world supply since 1996. The growth occurred at a time of renewed interest in silver mining associated with what was perceived to be the promising outlook for the silver market.

During 1998 there was a significant reshuffling among the world's top producing companies, as the table above shows. Heading the list, as in 1997, were Mexico's Industrias Peñoles and Polish copper

producer KGHM Polska Miedz. In terms of the sheer size of their silver output, these producers are clearly in a league of their own; their combined output contributed over 13% of the world total.

New in third position was BHP Minerals, whose production soared to over 18 Moz (560 t) as the giant new Cannington silver-lead-zinc mine in Australia reached commercial production levels. Another superleague silver project, the Chimberos deposit at the La Coipa mine in Chile, reached full capacity production and secured for Placer Dome and TVX, its joint owners through Cia. Minera Mantos de Oro, places among the top producers. Increased output at Cominco and Buenaventura moved these producers higher up on the Top Twenty list, while asset sales as part of the privatization of Centromin resulted in this Peruvian producer slipping 12 notches.

Primary silver mines increased their share of total output to 26%, from around 23% in 1997. This significant shift is likely to be a temporary phenomenon only, as a very large quantity of primary silver was produced at the Chimberos deposit in Chile, which will be mined out within one year. Our byproduct analysis is set out in pages 24-25.

World Silver Mine Production									
Million ounces	1990	1991	1992	1993	1994	1995	1996	1997	1998
Europe									
Poland	26.7	28.9	25.7	29.4	27.6	31.6	30.6	33.8	36.0
Sweden	7.2	8.2	9.1	8.9	8.1	8.0	7.7	8.5	8.4
Spain	7.4	7.5	7.5	5.9	5.7	5.6	5.8	6.2	5.6
Greece	2.0	2.3	2.0	1.9	1.4	1.4	0.5	1.2	2.1
Serbia	3.4	3.0	2.6	0.8	0.9	1.0	1.1	1.3	1.3
Romania	1.9	1.6	1.5	1.5	1.4	1.4	1.4	1.4	1.2
Portugal Finland	1.4 0.9	1.4 1.0	1.2 0.9	1.2 0.9	1.0 0.8	1.2 0.9	1.1 1.1	1.1	1.0
Bulgaria	3.4	1.0	2.7	3.1	1.8	1.4	1.1	1.0 1.0	1.0 0.8
Ireland	0.3	0.4	0.4	0.4	0.5	0.5	0.5	0.4	0.8
Czech & Slovak Republics	0.8	0.9	0.6	0.5	0.3	0.3	0.2	0.4	0.3
Italy	0.5	0.5	0.4	0.3	0.5	0.5	0.2	0.3	0.3
Norway	0.3	0.3	0.4	0.2	0.2	0.2	0.1	0.1	0.1
France	0.7	0.9	0.4	0.4	0.1	0.1	0.1	0.1	0.0
Other	0.7	0.3	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Total Europe	57.6	58.8	55.4	55.3	50.5	54.2	51.7	56.4	58.3
North America									00.0
Mexico	78.9	73.4	67.4	71.2	71.2	72.6	81.3	86.9	92.5
United States	68.3	59.4	58.0	52.9	47.6	49.8	50.0	63.2	62.8
Canada	44.4	40.6	37.6	28.3	23.8	40.0	39.9	39.0	36.2
Total North America	191.6	173.4	163.0	152.3	142.6	162.4	171.3	189.1	191.5
Central & South America									
Peru	62.0	67.1	53.6	53.7	56.0	61.4	63.3	66.8	65.1
Chile	21.1	21.8	33.0	31.2	31.6	33.5	36.8	35.1	43.2
Bolivia	11.5	12.1	10.2	10.7	11.3	13.8	12.3	12.4	13.1
Argentina	2.7	2.3	1.5	1.4	1.2	1.3	1.0	1.1	2.2
Honduras	1.0	1.4	1.1	0.8	0.9	1.0	1.2	1.5	1.5
Brazil	1.1	1.0	0.7	0.7	0.6	0.5	0.4	0.3	0.3
Dominican Republic	0.7	0.7	0.4	0.5	0.3	0.7	0.5	0.4	0.2
Other	0.3	0.4	0.5	0.5	1.3	0.3	0.3	0.3	0.3
Total Central & South America	100.3	106.6	100.9	99.4	103.2	112.3	115.9	117.8	125.8
Asia Indonesia	2.1	2.5	3.2	2.9	3.1	77	77	0.5	10.0
Japan	4.8	5.5	5.5	4.4	4.3	7.7 3.2	7.7 2.9	8.5 2.8	10.0
Turkey	0.9	1.3	2.5	2.3	2.1	2.1	2.9	2.8	2.8
Papua New Guinea	3.4	4.0	3.1	3.1	2.5	2.1	1.9	1.6	1.9
India	1.1	1.1	0.8	1.6	1.6	1.2	1.1	1.6	1.7
Philippines	1.4	1.1	0.9	1.1	1.0	1.1	0.8	0.6	0.5
Saudi Arabia	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4
Malaysia	0.4	0.4	0.5	0.5	0.4	0.4	0.3	0.3	0.2
Thailand	0.5	0.5	0.2	0.1	0.1	0.2	0.2	0.1	0.1
Other	2.2	2.0	2.4	2.0	2.5	2.6	2.5	2.6	2.8
Total Asia	17.4	18.9	19.6	18.4	18.3	21.1	20.9	21.5	23.5
Africa									
Morocco	5.9	6.6	4.9	7.6	8.3	6.6	6.4	8.4	9.8
South Africa	5.1	5.5	5.9	6.3	6.2	5.7	5.5	5.2	5.1
Namibia	3.0	3.0	2.9	2.3	2.0	2.1	1.4	1.2	0.4
Zambia	0.6	0.5	0.6	0.6	0.4	0.3	0.3	0.2	0.2
Zimbabwe	0.7	0.6	0.5	0.4	0.4	0.4	0.3	0.3	0.2
Other	3.0	2.3	1.4	0.7	0.3	0.3	0.4	0.3	0.3
Total Africa	18.3	18.4	16.0	17.9	17.5	15.4	14.2	15.7	16.1
Oceania Australia	37.7	37.0	20.2	27.0	22.6	216	22.0	25.6	47.0
New Zealand	0.3	37.9 0.4	39.2	37.0	33.6	31.6	32.8	35.6	47.2
Fiji	0.3	0.4	0.7	0.8	0.8	1.0	1.0	1.0	0.8
			0.0	0.0	0.0	0.1	0.1	0.1	0.1
Total Oceania	38.0	38.3	39.9	37.9	34.4	32.6	33.9	36.7	48.1
Vestern World Total	423.3	414.4	394.9	381.3	366.4	398.1	407.9	437.1	463.4

Table 2 World Silver Mine Production Million ounces									
	1990	1991	1992	1993	1994	1995	1996	1997	1998
Other Countries									
Soviet Union/CIS	69.9	64.7	58.9	54.3	49.3	47.6	43.6	41.9	41.8
China	22.7	24.6	24.7	24.9	29.7	30.6	32.2	38.0	38.2
Mongolia	0.9	0.7	0.7	0.8	0.9	0.9	0.9	1.0	1.1
North Korea	1.6	1.6	1.7	1.8	1.7	1.7	1.3	1.2	1.0
Total Other Countries	95.1	91.6	86.0	81.9	81.6	80.9	78.0	82.0	82.2
World Total	518.3	506.0	480.8	463.2	448.0	478.9	485.9	519.2	545.5

North America

Mexican silver output grew by more than 6% last year to 92.5 Moz (2,880 t). Over half of this was produced from primary mines, which also generated most of the growth. On the by-product side, lead-zinc mines were responsible for 28 Moz (870 t), almost one-third of Mexican silver; gold mines accounted for just over 11 Moz (340 t), and copper mining for 2 Moz (60 t). Output at the largest world producer, Industrias Peñoles, increased by 4% to 36.4 Moz (1,130 t), contributing 40% to Mexico's total. Peñoles together with its three fellow major producers, Grupo Mexico, Frisco and Luismin, accounted for three-quarters of Mexican silver.

The only new Mexican source to start up in 1998 was the Peñoles/Newmont La Herradura gold mine, with an anticipated output of 150,000 oz (5 t) of byproduct silver annually. Low gold prices had forced the mine plan to be adjusted, resulting in lower output than initially planned. There is plenty of potential for increased silver from Mexico in the future though, with a number of large projects in the pipeline. Two of the most significant projects are being developed by Peñoles: the Rey de Plata zinc mine is planned to commence operations in 2000 and produce around 2 Moz (60 t) of silver per year, while the Francisco I. Madero zinc mine could be contributing a similar amount in 2001.

In addition, Pan American Silver is redeveloping the La Colorada silver mine with production potential of 4.5 Moz (140 t) annually from 2000, and Cambior and Metallica are assessing the feasibility of the Cerro San Pedro gold-silver project where annual production of 2.8 Moz (90 t) of silver is possible. Although a large number of copper projects are scheduled to open in the near future, the minor amount of silver derived from copper mining in Mexico demonstrates that the increase in silver from these new mines will be small.

The **United States** saw silver output fall slightly in 1998, from just over 63 Moz (1,960 t) to just under

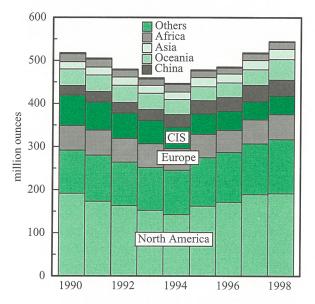
that figure. Primary mines contributed over half of the total and output from this source increased by 6%. Though substantial, this increase was considerably less than the almost one-third jump of the previous year, when the Coeur-Galena and Greens Creek operations reached capacity. Hecla's major expansion at the Lucky Friday mine approached full production during the year, realizing over 4 Moz (120 t) and the expansion at Sunshine's mine of the same name resulted in a leap of over one-third to 5.8 Moz (180 t). The largest contribution, though, came from Coeur d'Alene's Rochester mine where production reached 7.2 Moz (220 t). On the other hand, output was lower at the DeLamar and Candelaria mines as both these mature primary operations wind down.

Silver from US gold mines fell by 16% to below 13 Moz (400 t), at least in part because gold prices weakened causing producers to cut output or suspend operations at a number of silver-bearing gold mines. In 1997 around one-fifth of US silver was produced from Echo Bay's McCoy/Cove gold-silver mine, but output there dropped by 15% in 1998 through a combination of lower silver grades and the scaling back of operations due to high costs. At other gold mines, reductions were recorded at Kinross's Denton-Rawhide operation due to lower silver grades as the pit deepened; Real del Monte placed the Aurora mine on care and maintenance; and Vista Gold suspended the Hycroft gold mine in December due to low prices.

US copper operations contributed about 5% less silver than in 1997, at just over 10 Moz (310 t) but byproduct silver from lead-zinc mines was up by almost 14% to 5 Moz (160 t), mainly due to expansion at the Red Dog mine in Alaska, which has associated silver. Persistent low copper prices could force high cost US copper capacity to close, with a consequent reduction in silver from that source.

Canada does not have any primary silver mines but produced 36 Moz (1,120 t) of silver as by-product last year. Of this, gold mining provided just over one-

Figure 14
World Silver Mine Production



third, copper mining just under one-third and zinc/lead mining 10 Moz (310 t). Lower zinc and gold mine output contributed to the 3 Moz (90 t) decline in silver from this source. The largest Canadian silver producer is the Eskay Creek gold mine (now wholly-owned by Homestake Mining after the acquisition of Prime Resources mid-year) where output fell slightly but still exceed 11.7 Moz (360 t). Lower output was also reported at Noranda's Brunswick zinc operation, as a result of changes to the mine plan due to ground stability issues.

In contrast, by-product from copper operations rose; for example, the Kidd Creek copper mine contributed 3.9 Moz (120 t), up from 3.3 Moz (100 t) the year before. There are a number of projects in Canada with significant associated silver and future increases in Canadian silver output will depend on an improvement in the prices of the source metals, enabling at least some of those projects to go ahead.

Central and South America

Central and South American production surged 7% to reach 125.8 Moz (3,910 t). These regions produce close to one-quarter of the world's silver, (see Figure 14) with over 40% coming out of lead-zinc mines. In 1998 there was a substantial shift from gold by-product to primary silver mining, largely brought about by the temporary suspension of gold mining at **Chile**'s La Coipa mine and its substitution with high-grade silver material from the neighboring Chimberos deposit. These operations produced more than 19 Moz (590

tonnes) of silver in 1998. Mining of the silver-rich material from Chimberos will continue until September this year, after which gold mining will recommence at La Coipa.

Several of the other gold mines in Chile reported lower silver by-product output, including El Indio, El Bronce, Fachinal and San Cristobal. Nevertheless, Chimberos contributed to a 23% increase in the country's overall silver output to 43.2 Moz (1,340 t) in 1998.

Peru remained the biggest silver producer in South America. More than half of Peru's silver is generated at lead-zinc mines, many of which used to be owned by the state-run Centromin. Centromin reported a large drop in silver output in 1998, but this should not be interpreted as indicating actual loss of production. Rather, ongoing privatization at Centromin has seen five of its silver-producing mines change ownership in 1998, including Yauliyacu, Andaychagua, Mahr Tunnel and San Cristobal. These mines continued to perform strongly last year in the hands of their new owners, in many cases exceeding earlier production levels. The biggest of the Centromin silver-producing mines, Cerro de Pasco (now known as Paragsha) was to be sold by public auction in May this year.

Around one-third of Peru's silver is produced at primary silver mines. The leading producer in Peru, Buenaventura, operates several primary silver mines. At Uchucchacua, the largest of these (and soon to be the largest silver mine in the country), expansions continued during the year, resulting in a 17% increase in output. Increased output was also reported at another of the country's large primary silver mines, the Quiruvilca mine, operated by Vancouver-based Pan American Silver.

In Bolivia, silver production expanded by around 5% to just over 13 Moz (410 t). With the exception of some silver produced as by-product of gold mining at Kori Kollo (where silver output increased almost 10% last year), all of Bolivia's silver is associated with lead-zinc deposits. Comsur, the country's largest miner, produces silver at four underground lead-zinc mines as well as at a tailings retreatment facility which processes the wastes generated by Bolivia's very large informal mining sector, around the Cerro Rico mountain in particular. The country's silver production is expected to skyrocket should Apex Silver's San Cristobal project be developed. This project is currently still the subject of a feasibility study but, should it go ahead, its owners expect it to be the biggest open-pit silver mine in the world.

The fourth biggest producer in South America,

Argentina, witnessed very robust growth in silver output to over 2.2 Moz (70 t) as a result of two new mines commencing production. The Bajo de la Alumbrera copper-gold mine achieved commercial production during 1998 and generated close to 0.7 Moz (20 t) of silver, a level which the owners (MIM, Rio Algom and North) expect to maintain for at least 20 years. Also, Minorco's new Cerro Vanguardia goldsilver mine was expected to reach full production in January this year, and to produce at least 1.4 Moz (40 t) of silver in 1999. At this stage, the largest silver producer in the country is still the El Aguilar zinc mine. However, should Sunshine's Pirquitas project go ahead, this will be by far the largest silver mine in the country, with output planned at 9 Moz (280 t) per year. A final feasibility study for this project was expected in May.

Europe

After a very strong performance in 1997, production in Europe increased once again last year, by around 3% to reach 58.3 Moz (1,810 t). Almost three-quarters of the continent's silver is produced as by-product of copper mining, with **Polish** miner KGHM Polska Miedz leading with 1998 output of over 35 Moz (1,100 t). Silver grades and recoveries continue to exceed planned levels at the company's three copper mines and its new precious metals smelter near Glogow, and output levels in 1999 could be even higher. Plans are under way for the state to sell off a further stake in the company during 1999.

Outside of Poland, there are few significant silver producers in Europe. Output in **Sweden** declined moderately due to lower production at Boliden's lead-zinc and copper operations, which cancelled out higher output from North's Zinkgruvan mine. In **Spain**, lower lead-zinc and copper output was equally mirrored in declining silver output. On the other hand, **Greece** recorded much higher production due to a marked recovery in the lead-zinc and copper mining industries. Silver by-product output could be further boosted should development of the underground deposit at the Olympias mine go ahead. Owners TVX are currently in the process of arranging financing for this and other Greek projects.

CIS

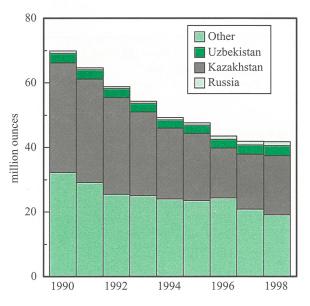
The countries constituting the Commonwealth of Independent States (CIS) collectively had very similar silver output in 1998 to the previous year. But there were some interesting developments in the individual countries, with declining production in some being

offset by growth in others (see Figure 15)

In Russia, silver output dropped below the 20 Moz (620 t) level for the first time this decade as the mining industry was hit by the impact of the economic crisis which gripped the country in the second half of the year. This resulted in lower production of all the source metals of silver, including lead-zinc (which generates over two-thirds of the country's silver), copper and gold. As much as 20% of Russian silver used to be produced at primary silver mines, but with the suspension of production at the Dukat mine, this has dwindled to negligible levels. Pan American Silver plans to reopen this mine, located in what is claimed to be the world's third biggest silver deposit (containing in excess of 250 Moz (7,780 t) of silver), and to produce 16 Moz (500 t) of silver per year from 2000 onwards. The International Finance Corporation recently agreed to participate in the financing of this promising project. Pan American have decided against building a new mine and processing plant, and opted instead for using the existing facilities to produce concentrates for export. A shadow has been cast over development of this project with the Russian government's recent and unexpected announcement to impose a 5% tax on gold and silver exports from the country.

In **Kazakhstan**, formerly the biggest silver producer in the region, production had been declining for a number of years until 1996. Reports in 1998 of lower silver exports and higher premiums on Kazakh silver bars seemed to suggest that output had fallen once again, leading to a supply squeeze in the country, but

Figure 15
CIS Mine Production



our impression is now that this related more to stock movements than to declining mine production. Indeed, indications are that strong performances in the copper and lead-zinc industries last year resulted in higher silver output, which recovered back up to the 18.4 Moz (570 t) level. All of Kazakhstan's silver is produced as by-product of base metals mining.

The actual level of silver production in **Uzbekistan** is still a tightly-guarded state secret, but indications are that production increased last year to over 3.1 Moz (100 t). Most of the country's silver is a by-product of copper mining, although traces of silver are also found in the large gold deposits. Marginal quantities of silver are also produced in **Armenia** and **Tajikistan**.

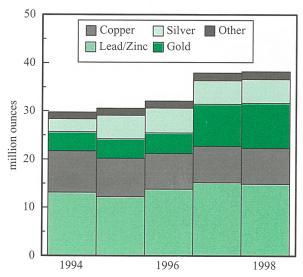
China

Silver production in **China** was up only marginally in 1998, reaching 38.2 Moz (1,190 t). Much of this enormous volume of silver is consumed domestically, mainly for the manufacturing of industrial and decorative products.

Most of China's silver derives from lead-zinc mining (which contributed almost 40% to the total in 1998), but significant quantities are also produced as by-product to copper and gold mining (see Figure 16). Not surprisingly, the significant increase in gold mine production last year spilled over into higher silver production from this source. In addition, China has a number of primary silver mines, which generate around 13% of all silver. Output at these mines was virtually unchanged last year at around 5 Moz (160 t).

Figure 16
Chinese Mine Production

By source metal



Asia

The countries of Asia increased their collective silver output last year, achieving growth of 9% to 23.5 Moz (730 t). The region's silver is generated mainly from gold and copper mines, which produce around one-third each of the total, with a smaller contribution from lead-zinc mines. A further 9% of silver is mined at primary silver mines (exclusively in Turkey).

The leading producer in the region is **Indonesia**, where silver production has been growing consistently for the last five years, due mainly to increased capacity and production at the Grasberg copper-gold mine. In 1998, a fourth concentrator was commissioned at this mine, which contributed to a surge in copper, gold and silver output: published figures suggest that recoverable silver in concentrates grew 57% to reach over 4 Moz (130 t). Plans for further expansion of capacity were recently approved by the Indonesian Mines and Energy Ministry, and 1999 could see production levels expand even more.

Indonesian silver production received a further boost from the new Rawas gold mine, where full production levels were achieved after a difficult 1997 start-up. These increase were more than sufficient to cancel out production lost through the closure of the Prima Lerang mine, and marginally lower production at two other gold mines, Gunung Pongkor and Mount Muro.

There was very little change in production levels at **Japan's** large base metals mines, yet silver by-product generated at mines such as Toyoha and Kamioka increased by over 8%, to reach 3 Moz (90 t). Silver output levels have not yet recovered to those seen before 1995, though.

In **Turkey**, production at the large 100th Anniversary Mine – the country's only primary silver producer – dropped around 3%. Further declines in by-product output were reported by silver-bearing copper and lead-zinc mines, leaving the country's overall silver output down 4% at 2.8 Moz (90 t). The **Philippines** also experienced declining silver production in 1998. In this case, however, the declines related to the closure of a number of gold and copper mines during the year, including Lepanto's Enargite copper operation, and Benguet's two mines Antamok (gold) and Dizon (copper). Lower output was also achieved at Bulawan and Padcal, and small amounts of by-product silver from Lepanto's Victoria gold mine was not nearly enough to cancel out the effect of this.

Lower gold production resulted in falling silver byproduct output in **Saudi Arabia**, while in **Malaysia** the contraction in the copper mining industry contributed to a 25% reduction in silver supply from that country.

On the other hand, silver production in **Papua New Guinea** recovered back to 1.9 Moz (60 t), an 18% increase on 1997's very low levels. PNG derives its silver from gold and copper mining in close to equal measure. The large-scale new gold mine, Lihir, reported higher silver by-product while production levels at Ok Tedi copper mine also recovered after a disastrous year in 1997.

Oceania

Australia achieved soaring silver production in 1998, as BHP's Cannington silver-lead-zinc mine increased throughput as it approached commercial production levels. Cannington produced 18.1 Moz (560 t) of silver in 1998, making it the third largest silver producing operation in the world (after Peñoles' Fresnillo in Mexico and Placer Dome/TVX's La Coipa/Chimberos in Chile). However, this mine has the potential to become the biggest silver mine in the world once optimum output levels of 24 Moz (750 t) per year are attained.

Virtually all of Australia's silver is generated in the process of mining lead and/or zinc. Apart from Cannington, several of the other lead-zinc mines in the country recorded lower silver by-product output last year. Pasminco's large lead-zinc operation, the Broken Hill mine, reported lower silver output, as did the Rosebery mine. At the Mount Isa copper operation, silver is extracted from a lead-zinc orebody which is expected to be exhausted within three years, and 1998 already witnessed a 10% reduction in silver from this source. On the other hand, MIM's new McArthur River zinc mine achieved substantially higher silver production, exceeding 1.2 Moz (40 t) during the calendar year.

Elsewhere in the region, **New Zealand**'s silver output was much reduced with the suspension and subsequent premature closure of the Golden Cross gold mine due to structural problems. Higher silver output from the Martha Hill mine was not sufficient to offset this, with the result that silver production in the country declined over 21% to 0.8 Moz (30 t) in 1998. Despite this large drop, overall production from Oceania was still as much as 31% higher in 1998, thanks to the production boost from Cannington.

Africa

Over 60% of African silver is produced in **Morocco**, where output soared for a second consecutive year in 1998 to reach 9.8 Moz (300 t). Most of the increase

was generated at the Imiter primary silver mine near Ouarzazate. Owners ONA Pôle Mines continue to report higher grades – which averaged over 1,000 g/t in 1997 – and improved recovery rates, and production is forecast to grow even more this year. 1998 also saw marked increases in the production of by-product silver produced at lead-zinc and cobalt operations in the country.

The only other country in Africa which produces significant quantities of silver is **South Africa**, where all silver is a by-product of gold and base metals mining. Significantly lower gold output, combined with a slight decline in lead-zinc output resulted in a modest decline in output of silver, to reach 5.1 Moz (160 t).

A small amount of silver is produced as by-product of copper mining in **Zambia**. ZCCM, the state-owned operator of these copper mines, reported an 8% increase in silver by-product during 1998, bringing total production in the country up to 250,000 oz (8 t).

Outlook

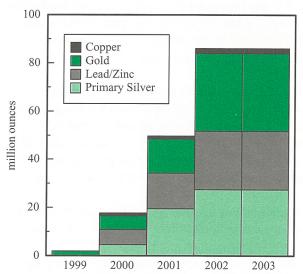
In last year's World Silver Survey, we suggested that close to 100 Moz (3,110 t) of new silver capacity was due to come on stream within the next five years. This analysis indicated that only around 35% of the new capacity would be in the form of primary silver mines. Our estimates were based on projects already under development at the time, as well as projects which appeared very likely to get the go-ahead from owners and financiers.

This year, we have repeated that analysis, which is not intended as a production forecast, as no account was taken of fluctuations in production levels at existing mines, be they closures, cutbacks or expansions. The results are shown in Figure 17.

The most significant change from last year is that several of those projects have been brought into production, including Cannington, Chimberos, La Herradura, Pierina and Cerro Vanguardia, and they were therefore excluded from this year's list of future projects.

Based on information available at the time of writing, our estimate of cumulative new silver capacity being brought into production over the next five years is 86.1 Moz (2,680 t), translating into an average annual growth rate of just over 3%. It should be noted that two very large projects, San Cristobal (14 Moz/440 t per year) and Pascua (20 Moz/620 t per year), have been included in these calculations although a

Figure 17
Cumulative Future Silver Mine Production (by source metal)



final development decision has not yet been announced for either.

As for the source metal of future capacity, roughly 37% is planned to derive from gold projects, and whether or not this capacity does eventually come onstream depends to a great extent on the outlook for the gold market, rather than silver. Similarly, around 30% of the projects included are actually base metals or poly-metallic projects. Only around one-third of future capacity relates to primary silver mines, a slight decline from the position in 1997.

By-product analysis

- By-product silver production accounted for just under three-quarters (400 Moz (12,430 t)) of total output last year.
- Lead-zinc mining generated 37% of all silver, copper 22% and gold 13%.

Economic primary silver deposits are relatively rare and the metal is more likely to be found in association with lead, zinc, copper and gold ores. A minimal amount (less than 1%) is derived from the production of other metals, such as nickel, cobalt and platinum. In the analysis which follows, individual mines have been classified as primary or by-product (co-product) depending on the metal generating the largest share of revenue; thus, classification can vary from one year to the next according to changes in output and metal prices.

	1994	1995	1996	1997	1998	Change
Lead	2707	2749	3001	3033	3094	2%
Zinc	6806	6981	7295	7335	7428	1%
Copper	9414	10087	1103	11487	12308	7%
Gold (t)	2279	2274	2357	2480	2555	3%

Mine production of all the main source metals continued on a rising trend in 1998 (see Figure 18). Not surprisingly, by-product silver output increased also, though by only 1% due to a rise in silver production from base metal operations being tempered by a drop in silver output from gold mines.

By-product Silver Output by Source Metal Million ounces								
	1997	1998	Change					
Lead-zinc	190.0	202.9	7%					
Copper	118.9	121.2	2%					
Gold	83.5	72.0	-14%					
Other	3.6	3.5	-3%					
Total	396.0	399.6	1%					

Because of the high proportion of silver derived as a by-product or co-product of other metal mining, the demand for and prices of these metals exert a strong influence over the trend in silver output.

The largest source of by-product silver is **lead-zinc** mining, accounting for 51% of by-product silver in 1998 and 37% of total silver output. Lead-zinc ores are typically found in association and often have a high silver content. The main regions producing silver from lead-zinc operations are Australia, the Latin American countries of Peru, Mexico and Bolivia, plus North America.

After a significant rise in 1997, the average zinc price fell back to its 1996 level last year. However, the zinc market is forecast to be only just in surplus this year and to move in to deficit in 2000, and therefore prices are likely to increase. The prospects for lead are less positive, with rising stocks and poor demand depressing the price. Exports from the former Eastern Bloc countries and the well-developed international recycling network are over-supplying the Western World market and limiting the demand for primary lead. Poor prices have forced several mines to close:

Anvil Range closed the Faro mine in the Yukon in January 1998; Breakwater Resources suspended their Caribou mine in New Brunswick in August; and the future of the El Toqui mine in Chile is in doubt. Nevertheless, new mine production and an increase in primary smelter capacity are still expected in the short-term as the lead times for such projects can be several years.

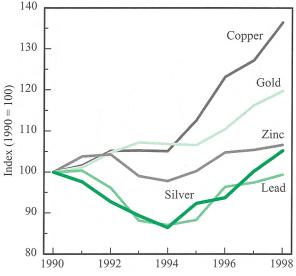
Silver from Australian lead-zinc operations rose by over one-third last year to 47 Moz (1,460 t), almost entirely due to the start-up of BHP's Cannington mine in Queensland during October, which should produce 24 Moz (750 t) of silver annually at full capacity. In 1998 Cannington mined 18.1 Moz (560 t) and without this contribution, world by-product silver output would have fallen. Higher zinc recovery in Mexico resulted in 4 Moz (120 t) more by-product silver; while Peru and Canada both produced less silver from this source due to a drop in zinc output, and, in the case of Peru, also in lead production.

money of the day									
	1994	1995	1996	1997	1998 (Change			
Lead (\$/t)	549	631	774	624	528	-15%			
Zinc (\$/t)	998	1031	1025	1313	1023	-22%			
Copper (\$/t)	2313	2937	2290	2276	1653	-27%			
Gold (\$/oz)	384	384	388	331	294	-11%			

Copper mining provided 30% of by-product silver in 1998, and 22% of total silver. Poland was the dominant producer with over 35 Moz (1,090 t) of silver from its copper mines, followed by Chile at half that amount. Much of the 57% increase in Indonesia's silver output related to higher production at Freeport McMoRan's giant copper mine, Grasberg.

The copper price has been declining since 1995 and fell dramatically in 1998 (see Figure 19). This was at least partly due to excess capacity following a number of highly profitable years for copper producers and the subsequent investment in new capacity; copper production itself has leapt 31% in the last 5 years. It was also influenced by the economic crisis in Asia which caused a drastic fall in demand in the region. In the longer term, production cuts are inevitable at high-cost mines, but this may be countered by new low cost capacity coming on stream; in addition, some producers are increasing through- and output in an effort to reduce unit costs. The effect on silver output

Figure 18
Mine Production of Source Metals



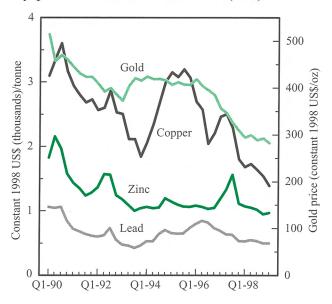
Sources: GFMS / ILZSG / WBMS

will be smaller than might be expected as the increasingly popular, low-cost solvent extraction and electrowinning (SX-EW) treatment method for copper ores does not recover significant amounts of silver.

Gold deposits vary as to their silver content, from those in silver-rich regions such as North America, Chile and Indonesia to ones with negligible associated silver such as in South Africa. Despite higher world gold output, less silver was recovered from gold operations in 1998 at 72 Moz (2,240 t). The biggest fall was in Chile, due mainly to the suspension of operations at the La Coipa gold-silver mine, to allow mining of the neighbouring Chimberos silver deposit. This deposit should be depleted in the third quarter, after which mining at La Coipa will resume. In the United States, silver output from this source dropped to 12.9 Moz (400 t), resulting from closures and cutbacks at gold mines due to weak prices, and lower silver grades. Echo Bay's McCoy/Cove mine suffered from both and produced 9.4 Moz (290 t) of silver as opposed to 11 Moz (340 t) the previous year.

In the gold market, production increased for the third consecutive year in 1998 despite historically low prices. Successful cost-cutting strategies mean that a large proportion of production is still profitable and with more low-cost capacity in the pipeline, gold output is likely to continue rising, at least in the short term. However, as last year's figures show, higher gold production does not necessarily result in higher associated silver output.

Figure 19
By-product Source Metal Prices (real)



Production costs

- Weighted average cash costs were \$3.03/oz, up 10% year-on-year. The lowest costs were reported at the largest primary mine, Fresnillo in Mexico.
- None of the primary silver producers recorded cash production costs which were higher than the average silver price in 1998.

As was pointed out in last year's World Silver Survey, very little information is available on the subject of silver production costs, on which an analysis of trends can be based. The first and obvious reason for this is that such a large proportion of silver is produced as by-product of gold and base metals mining. Such operations would express their production costs in terms of the main metal, and either account for the silver ounces produced as a by-product credit or convert it to equivalent ounces of the main metal. Secondly, a number of silver producers report their costs on a "per tonne milled" basis rather than on a "dollars per ounce produced" basis. This lack of consistency further complicates comparative research.

The production costs analysis work done by GFMS over the past few years has been focused on that handful of primary silver producers who report silver production costs on a consistent basis. The database in this study has increased significantly since last year's Survey, although the sample group remains relatively small.

Silver Mine Production Costs							
	1997	1998					
Cash costs: highest	\$5.47	\$5.34					
lowest	\$1.77	\$1.90					
weighted average	\$2.76	\$3.03					
Average spot price	\$4.897	\$5.544					
% output with costs > avg spot price	8.3%	0%					
Sample size (million ounces)	69.4	81.3					

Weighted average production costs increased 10% last year. With only three exceptions, every producer sampled reported higher costs in 1998. Lower costs were reported at the Galena, Rochester and Sunshine mines, all of which benefited from higher output which brought down unit costs.

Remarkably, not a single silver producer which reports production costs appears to have had costs higher than the average silver price for the year of \$5.54/oz. This suggests that, even though prices declined for the greater part of the year, producers maintained, on average, a cash-positive position.

Peñoles' Fresnillo operation in Mexico once again reported the lowest production costs among primary producers. This mine benefited from increased capacity, very high grades and competitive labour costs. In addition, a 22% devaluation in the Mexican currency in 1998 helped to lower US dollar-denominated costs.

Producer hedging

- Net outstanding producer silver hedging positions increased by a very modest 5.1 Moz (160 t) yearon-year.
- Outstanding forward sales positions declined, but delta-hedged options positions expanded. A number of large-scale buy-backs were made in the first half.

1998 saw a significant reversal in producer hedging behavior, with net outstanding positions increasing only marginally during the year, having expanded by close to 67 Moz (2,080 t) in 1997. As is always the case, producers tended last year to apply widely divergent strategies in running their silver hedge books. The main factor determining willingness to hedge, volume and terms of hedging is the nature of the producer in question's principal operations. The largest hedgers of silver tend to be gold producers,

who either operate silver projects or produce substantial volumes of silver as a by-product of gold mining. These producers are often comfortable with hedging, and do not have any strong motivation to present themselves to boards of directors and shareholders as being particularly exposed to movements in the silver price, as silver is not their main product.

By contrast, primary silver producers are very much aware of having to secure maximum profits on their silver production. This they can do by controlling costs on one hand, and by maximizing revenue on the other, also through hedging. However, primary producers tend to prefer being fully leveraged to the silver price, as this is often the motivating factor behind investment in such companies, particularly for institutional investors.

Turning to the last and largest group, base metals producers, they, also, do not tend to hedge much silver. For some, silver is so small in volume and/or value in the overall production portfolio that silver hedging is not a priority. For those familiar with sudden market swings into backwardation, quite common in for example the copper market, silver hedging would only be done on a shorter-term basis and primarily to meet delivery obligations. The end result is that hedging forms a much smaller element of the overall silver market than, for example, for gold.

After an enormous surge in silver hedging activity in 1997, last year saw only a very modest net increase of 5.1 Moz (160 t) in outstanding positions. This increase was generated entirely through the delta hedging of producer options positions; in fact, as Fig 20 shows, outstanding forward sales ended the year lower, and was, as a result, a source of demand rather than supply to the market.

The large increase in both forward sales and options positions in 1997 was a result of large projects being developed, combined with the strong uptrend in the silver price after several years of depressed prices. Some of the producers who had large projects about to enter production, seized the opportunity to lock in high prices for their future output - thus Barrick, Placer Dome and TVX all did large transactions probably relating to silver production from Pierina and Chimberos, respectively.

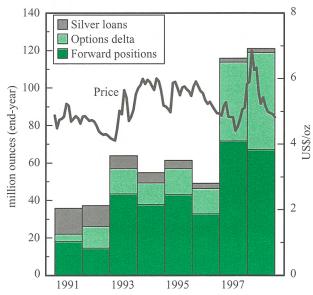
In the first months of 1998 the price strengthened even more, creating an apparent opportunity for significantly increased hedging. But the situation was complicated by the fact that silver lease rates had also soared - one-month lease rates peaked at 90% on 5th February - plunging the market into backwardation for

several weeks. This discouraged some producers from adding to their books, fearing lease rate exposure. And those producers who were going to hedge their future production, arguably had already done so in the latter part of 1997.

The price started declining in March, and over the next few weeks a number of large-scale buy-backs and restructurings of books were effected, including Kinross' buyback of 1.1 Moz (30 t) and TVX's restructuring, both done in combination with a restructuring of gold hedge books. Aurora, similarly, closed out most of the forward sales position for the Mount Muro mine in Indonesia; while Pegasus' position was closed out following that company's bankruptcy. For some, financial pressure forced them to cash in on hedged revenues by closing out positions prematurely. In addition, several producers allowed their positions to run down naturally without replacing deliveries. Even Echo Bay's very large new hedge position, put on around mid-year, was not enough to offset all these declines, and the end result was that forward positions were down 4.6 Moz (140 t).

Although the high volatility in lease rates as well as prices rendered options quite expensive at times, a number of producers made use of the sliding prices to sell call options, generating revenue with which to enhance realizable prices. Some of these positions carried very high deltas (being very close to the money); thus, although the size of outstanding options positions may well have declined during the year, the silver which needed to be sold to hedge the delta on those positions, increased by close to 10 Moz (310 t).

Figure 20 Silver Producer Hedging: Outstanding Positions



5. Supply from Above-ground Stocks

- Supply to the market from above-ground stocks fell by around 14% last year to 295.1 Moz (9,180 t).
- Flows from private sector stocks of bullion and coins were much reduced at 52.3 Moz (1,630 t), compared to 1997 when both disinvestment and producer hedging were at much higher levels.
- Net government sales soared to 52.5 Moz (1,630 t) due to Chinese and Russian disposals.
- Scrap responded to higher silver prices last year, posting a 13% increase to 190.4 Moz (5,920 t).

Stocks

By the end of 1998 cumulative historical mine production reached 38,500 Moz (1.20 million tonnes). This sets the outer limit for the size of the aboveground stock of silver. In practice, of course, a sizeable chunk would have been "lost" over the ages. For example, through constant handling, coins and jewelry suffer from abrasion. Also, until comparatively recently, a lot of photographic silver was lost due to spent fixer solutions simply being discarded. In other cases, landfill has claimed an older generation of products that incorporated silver materials such as contacts and brazing alloys. Needless to say, it is very difficult to establish how much silver has been returned to the Earth over the millennia.

It is clear, however, that today the largest single part of the above-ground silver stock is in the form of fabricated products. These products can and do reenter the silver market as scrap supply. A certain percentage of fabricated stocks is regularly recycled, as products containing silver are used and/or come to the end of their useful lives. Photography, in particular, is a rich source of scrap due to the rapid "turnover" of photographic products. As the stock of fabricated products gets larger so does (all things being equal) the regular or normal supply of scrap. Of course, under the right circumstances the rate of recycling can increase or decrease depending upon economic trends and the change in, and/or the level of, the silver price. Last year, for example, the increase in the price resulted in a higher, "above-trend" level of scrap supply. Another way of looking at this is to assess the amount of fabrication that was supplied by "new" silver (i.e. mine production). In 1998 the demand for "new" silver fell by 6% due to the rise in scrap supply.

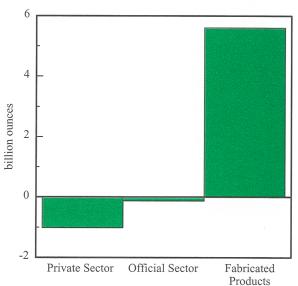
A smaller, albeit still large, part of the above-ground silver stock consists of coins and bars held by the private sector. The majority of these private stocks are very widely dissipated and so hard to quantify but some are more concentrated and therefore identifiable.

Nearly 15% of the total supply to the market since 1990 has come via private sector disinvestment from all these sources.

Finally, even though they are far smaller than the bullion and coin stocks held by the private sector, government holdings of silver are still fairly important. Indeed, last year the market experienced the highest level of net official sector sales since the 1970s.

Figure 21 shows the net changes in the 1990s of the three components of the above-ground stocks discussed above: fabricated products, private sector stocks and government or official sector holdings. From 1990-98 the stock of fabricated products increased by nearly 5.6 billion ounces (174,200 t). This effectively absorbed the more than 4.4 billion ounces (136,900 t) of new mine production over the same period. Private sector stocks meanwhile declined by a little over 1 billion ounces (31,100 t). This includes silver supplied to the market to fund producer hedging. Between 1990-98 government holdings dropped by around 130 Moz (4,040 t).

Figure 21 Changes in Above-ground Stocks, 1990-98



Identifiable Bullion Stocks

The absolute size of the above-ground stock of bullion cannot be determined with great certainty. This is not only due to its very nature, i.e. much of it being held privately outside the financial system but also because of the lack of good historical data on silver supply and demand, especially scrap, prior to 1990. Nevertheless, part of the above-ground bullion stock can be identified with a reasonable degree of accuracy and it is this part which is arguably nearest to the market. "Identifiable" stocks consist of inventories held on behalf of the world's futures exchanges (principally the Comex division of Nymex), physical stocks in European bullion dealers' vaults, government stocks and, finally, Japanese trade stocks (which are officially compiled). Figure 22 shows the level of identifiable bullion stocks at year-end for the period 1990-98. At the end of 1998 these amounted to 619 Moz (19,250 t). The fall of only 16 Moz (500 t) in 1998 compares to a 156 Moz (4,850 t) decline in identifiable stocks in 1997. The more modest drop in identifiable stocks in 1998 fits well with our lower overall disinvestment number of just over 47 Moz (1,470 t) last year. It also implies that the balance, i.e. around 30 Moz, of net disinvestment would have come from non-identifiable bullion stocks.

European Dealers' Stocks

From 1990-94 there was a steady fall in the level of stocks held in European Dealers' vaults (Figure 23).

Figure 22
Identifiable Bullion Stocks

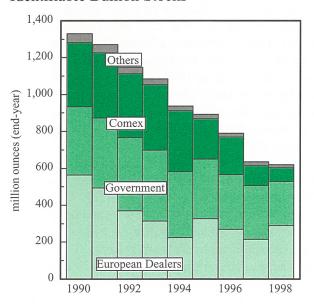
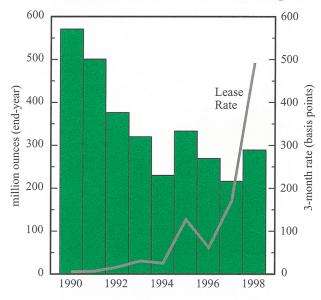


Figure 23
Bullion Stocks in Dealers' Vaults in Europe



Since then, they have been on something of a roller-coaster chiefly because of two years, 1995 and 1998, when there were large transfers of bullion to Europe, mostly from the United States. Much of this inflow consisted of inventories formerly held in Comex warehouses, particularly in 1995 but also in 1998 even though the bullion in many cases left the Exchange's depositories the previous year. The influx of new metal from the United States and elsewhere has partially obscured a continued run-down in the underlying level of bullion stocks in Europe.

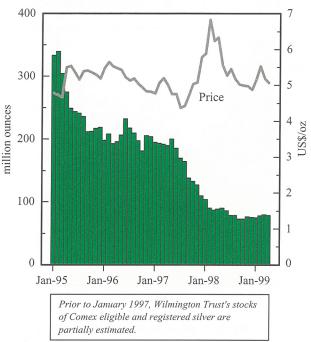
Comex Stocks

After a 94 Moz (2,920 t) fall in 1997, Comex stocks managed no more than a 34 Moz (1,060 t) decline last year. This was not surprising given that most of Berkshire Hathaway's silver hoard was acquired between July and December 1997.

Most of the reduction in stocks last year occurred in two phases, a drop of 23 Moz (720 t) in the first quarter and one of over 13 Moz (400 t) from June to September (see Figure 24). In the intervening period (April and May) and again from September through most of December stocks actually increased. There has been a tendency for Comex inventories to increase during periods of stable or weaker prices and to decline when the price is moving upwards.

The fall in Comex stocks during the first few months of 1998 was at a time of high silver prices and leasing rates. As already mentioned in this Survey, the effect

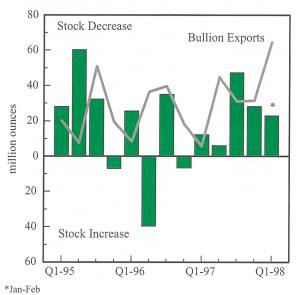
Figure 24
Comex Warehouse Stocks



of these premia was to attract silver to London from many parts of the world, including the United States.

Figure 25 shows that there has, however, not been a perfect correlation between changes in Comex stocks and the level of US bullion exports. Between 1995 and 1998 there were frequently lags between the decline in inventories and the associated increases in US bullion exports. Furthermore, not all the periodic increases in

Figure 25
Comex Stock Change and US Bullion Exports



Comex Silve	er Stocks (end	period)		
Million Ounces	S			
	Q1	Q2	Q3	Q4
1990	252	252	260	265
1991	258	266	270	271
1992	270	268	279	275
1993	272	274	277	263
1994	239	236	255	259
1995	235	185	157	159
1996	140	168	142	146
1997	192	186	138	110
1998	87	86	73	76
1999	80			

US bullion exports can be attributed to changes in Comex stock levels: other non-recorded inventories have also been reduced. For instance, in the first quarter of 1998 bullion exports at nearly 50 Moz (1,560 t) were more than double the decline in Comex inventories over the same period. What Figure 25 indirectly confirms is that for large amounts of metal to be shipped over and above the "regular" quantities, there needs to be a market incentive in terms of prices and leasing rates to justify the cost of transport. In the first quarter of 1998 and, especially in February last year, the massive premium in London over New York and the associated increase in silver leasing rates encouraged such arbitrage.

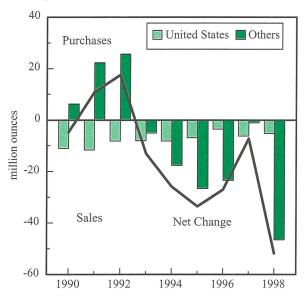
Government Stocks

Sales out of government stocks have generally not been much of an issue in the silver market. For example, from 1990-97 net official sector sales accounted for only 1.3% of total silver supply compared to 8.3% in the case of gold. Things were different, however, in 1998. Last year's 52.5 Moz (1,610 t) of net government sales may have been the highest recorded since the 1970s. At 6.2% of total supply, official sales in 1998 represented something more akin to the kind of levels regularly seen in the gold market. The bulk of the government silver sales last year came from three sources: China, Russia and the United States.

US sales totalled 5.3 Moz (160 t), mostly coming from a further reduction in the Defense Logistics Agency's stockpile. Also, there was a tiny fall in US Treasury stocks. At the end of 1998, combined inventories of both bodies totalled 56.3 Moz (1,750 t) having been reduced by 50% since 1990.

Net Chinese sales exceeded 21 Moz (650 t) last year. This represented something of a departure from

Figure 26 Changes in Government Stocks



normal practice: GFMS data shows the official sector in China as a net buyer each year from 1990-97 (mostly via the absorption of local mine production). It seems that the spike in the price last year was too good an opportunity to miss.

To a limited extent, the same considerations apply to Russian government sales, which we estimate to have topped 30 Moz (930 t) in 1998. This is because most of this silver was shipped to Europe and sold in the third quarter at a time when the authorities in Moscow were strapped for cash.

Our government stock numbers have been revised upwards in the light of new information. GFMS now estimate that, at a minimum, official stocks would have totalled 238 Moz (7,400 t) at the end of 1998.

Other Stocks

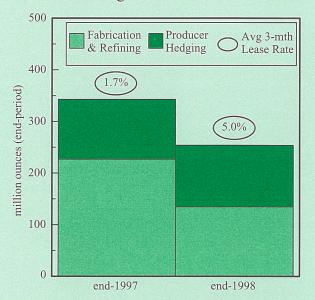
Other identifiable stocks not covered above, consist of those registered on the Tokyo Commodities Exchange (Tocom), the Chicago Board of Trade

Silver Borrowing

The first quarter of 1998 saw a spectacular increase in silver borrowing costs. For instance, 3-month silver leasing rates peaked at 33% in February while shorter term rates reached into the triple digits. And, even though rates dropped sufficiently in May to restore a contango on 3-month silver, they remained at historically high levels throughout the rest of 1998 and into this year. This begs the question as to why leasing rates have moved up to a new higher level (last year they averaged 5.0% compared to 1.7% in 1997).

The reason appears to be related more to the supply than the demand side for borrowed silver. Even prior to market stocks being drained off in 1995 and, more impressively in the second half of 1997 and early 1998, there were indications of a growing tightness in silver liquidity. The super-abundant supply of metal that had characterized the market and which had led to rates typically around the 50 basis points area looked to be coming to an end. Nevertheless, the very high rates that occurred in 1995 and again last year were the result of available silver bullion stocks being taken out of the market by investors, principally through Berkshire Hathaway's intervention. The massive increase in leasing rates forced many industrial borrowers and refiners to dramatically reduce their silver leases in order to avoid crippling finance charges. Most of their inventory requirements had been financed through short-term silver leases. This was very cost effective when rates were low but perilous when they had risen to several multiples of dollar interest rates. The reduction in borrowing that inevitably followed eventually brought down

Figure 27
Silver Borrowing



the level of leasing rates and some new lending took place in the second half. For the year as a whole, however, we estimate that silver borrowing (including for producer hedging, which by contrast was up slightly) fell by close to 26%. As Figure 27 shows, this resulted in nearly 90 Moz (2,800 t) coming back into the lending market. That this unwinding of silver leases was not sufficient to move rates down further is testimony to the amount of metal being tightly held (and not lent) by investors and speculators.

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Euwana									
Europe Germany	16.1	16.1	16.1	15.8	15.4	14.8	15.4	16.1	16.4
UK & Ireland	7.2	7.2	7.2	7.3	7.9	7.4	7.6	8.4	10.4
Italy	2.7	2.7	2.7	2.7	2.8	3.2	3.5	3.4	4.7
France	3.1	3.8	5.3	4.0	4.2	4.7	4.5	4.3	4.1
Austria	1.9	1.9	1.9	1.9	1.9	2.0	1.8	1.8	1.8
Netherlands	1.1	1.1	1.2	1.1	1.3	1.1	1.3	1.3	1.3
Sweden	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Norway	0.8	0.8	0.8	0.8	0.8	0.8	1.0	1.0	0.8
Czech & Slovak Republics	0.6	0.8	1.0	0.8	0.7	0.7	0.9	0.8	0.7
Belgium	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Denmark	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Portugal	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.5	0.5
Spain	0.4	0.4	0.3	0.3	0.3	0.4	0.5	0.5	0.4
Switzerland	0.5	0.5	0.5	1.4	0.5	1.5	1.5	0.6	0.3
Romania	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other	1.4	1.4	1.5	1.5	1.5	1.5	1.5	1.6	1.5
Total Europe	38.8	39.7	41.4	40.5	40.2	41.0	42.3	42.6	45.8
North America	30.0	37.1	71.7	40.5	40.2	71.0	72.3	72.0	73.0
	44.0	40.7	40.0	42.0	45.0	160	40.4	51.0	55.5
United States	44.8	42.7	42.3	43.2	45.2	46.0	48.4	51.8	55.7
Mexico	2.3	2.3	2.3	2.3	2.3	4.8	2.4	4.3	10.6
Canada	1.3	1.3	1.3	1.3	1.3	1.7	1.8	1.6	1.9
Total North America	48.3	46.3	45.9	46.7	48.7	52.5	52.6	57.7	68.3
Central & South America									
Brazil	1.9	1.9	1.9	1.9	1.9	1.9	1.9	1.6	1.6
Argentina	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Chile	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Other	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.9
Total Central & South America	3.9	3.9	3.9	3.8	3.8	3.8	3.8	3.4	3.7
Middle East									
Saudi Arabia & Yemen	0.1	0.1	0.6	0.8	1.9	3.0	1.3	3.2	2.1
Turkey	1.8	1.9	1.9	2.0	2.3	2.3	1.9	1.6	1.7
Egypt	1.1	1.0	0.6	1.0	0.9	0.8	0.7	0.3	0.2
Other	0.2	0.2	0.2	0.3	0.3	0.3	0.7	0.3	0.4
Total Middle East	3.1	3.1	3.4	4.2	5.4	6.5	4.3	5.5	4.3
Indian Sub-Continent									
India	4.0	9.6	7.2	4.5	4.5	9.6	6.4	9.6	11.9
Other	0.1	0.1	0.2	0.2	0.2	0.3	0.2	0.3	0.5
Total Indian Sub-Continent	4.1	9.8	7.4	4.7	4.7	9.9	6.6	10.0	12.4
East Asia									
Japan	15.7	18.9	24.2	26.2	26.9	27.3	27.1	27.8	29.2
South Korea	1.9	2.2	2.3	2.4	2.6	2.9	3.0	3.2	5.1
Thailand	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.8	1.0
Taiwan	1.0	1.0	0.8	0.7	0.6	0.6	0.6	0.7	0.8
Hong Kong	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.5
Philippines	0.1	0.1	0.2	0.2	0.2	0.3	0.4	0.4	0.4
Vietnam	0.3	0.3	0.3	0.2	0.3	0.4	0.4	0.4	0.4
Indonesia	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4
Singapore	0.3	0.3	0.3	0.3	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
Total East Asia	20.0	23.6	28.8	30.9	31.9	32.9	32.9	34.4	38.3
	20.0	23.0	20.0	30.3	31.3	34.7	34.7	34.4	30.3
Africa	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	
South Africa	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Other	0.9	0.9	1.0	0.9	0.9	1.0	1.0	0.9	1.0
Total Africa	1.0	1.0	1.1	1.1	1.0	1.2	1.1	1.1	1.1

Table 3									
Supply of Silver from the Recyc	cling of Old	Scrap							
Million ounces									
	1990	1991	1992	1993	1994	1995	1996	1997	1998
Oceania									
Australia	2.3	2.3	2.3	2.4	2.5	2.5	2.3	2.3	2.4
Total Oceania	2.3	2.3	2.3	2.4	2.5	2.5	2.3	2.3	2.4
Western World Total	121.5	129.6	134.1	134.4	138.1	150.3	145.9	157.0	176.2
Other Countries									
Other	13.3	11.9	13.6	13.4	13.1	12.0	11.9	11.7	14.6
Total Other Countries	13.3	11.9	13.6	13.4	13.1	12.0	11.9	11.7	14.6
World Total	134.8	141.5	147.8	147.9	151.3	162.3	157.8	168.7	190.4

(CBOT) and Japanese trade stocks, the levels of which are regularly reported to the Ministry of International Trade and Industry (MITI). In aggregate, these stocks fell last year by 3.3 Moz (100 t). Nearly 70% of this decline was accounted for by a drop in the level of Japanese trade stocks reported to MITI.

Manufacturers' inventories not covered by the official data, however, fell by a considerably larger margin.

Scrap

Our series for scrap supply in the **United States** has been revised upwards to account for better information on the production and scrapping of catalysts. Although the net impact of these changes on the supply/demand balance has been minimal, the numbers have been increased for both the manufacture and scrapping of, principally, ethylene oxide catalysts. Catalysts are the second largest source of silver scrap in the United States after photography. Overall, the level of US silver scrap supply was boosted by 7.5% last year due to growth in imports (not counted by us in the country of origin) and the effect of higher prices in the first quarter.

In the Middle East, the rise in silver prices in the first quarter of 1998 saw moderately higher levels of scrapping of silverware in some countries, though this subsided quickly as the price fell back later in the year. Modest quantities of silver were recovered from old jewelry, X-ray film and fixer solutions.

But the main item of interest was, as in recent years, the outflow of old Maria Theresia talers from **Yemen**. This still abundant but price-sensitive source of silver has been a regular part of supply in the past five years. However, given the lack of a large nearby market for silver and the need for this material to be refined, only a small portion of the total has been refined and reabsorbed in the Middle East itself. As in the past, the

bulk of it was exported to European refiners, either directly or via Saudi Arabia, where the coins first had to be melted to circumvent a ban on the export of "antiquities". Exports continued during the first four months of the year: an estimated total 1.9 Moz (60 t) was exported to European refiners in this period, a figure which might have been higher if more refinery capacity had been available. When the price dipped below \$5.50 in May, the outflow abruptly ceased and has not since reappeared.

With the exception of areas such as southern Egypt and neighboring Sudan, silver jewelry in the Middle East is not markedly dependent on price trends. This is because the bulk of jewelry is not bought primarily as a form of investment or savings. In the absence of real economic distress, lightweight gift items, often with a manufacturing charge in the same order as the metal price, are not likely to be scrapped in large quantities on a moderate increase in the price of silver. In addition, much of the jewelry sold in the Middle East is bought by Western tourists and is thus unavailable for local recycling.

Even in **Egypt**, where the south of the country has a tradition of heavyweight investment jewelry, the quantities of scrap recycled, even at the height of last year's price spike, were quite small. In fact, the major part of Egypt's scrap use last year consisted of imports including Yemeni coins, jewelry from the Sudan and silver from X-ray film originating in Saudi Arabia.

In **Turkey**, the bulk of scrap supply last year took the form of heavyweight silverware. Many younger Turkish couples are abandoning the tradition of using such items as domestic utensils. This plus higher prices and the weak economy resulted in a substantial increase in scrap.

The picture in the Indian sub-continent was very different because of the importance of investment

jewelry in the northern tribal belt of India and in the Sindh province in South East Pakistan. Given the extreme price-sensitivity of the Indian scrap market, it was not surprising that the 14% year-on-year rise in the average silver price led to large volumes of old ornaments and silverware being remelted last year. Women have relatively little sentimental attachment to their silver jewelry, particularly when it is old and tarnished (which does not take too long in India's polluted atmosphere). In this situation, it only needs a modest price increase to produce a surge in recycling. Furthermore, the coincidence of a difficult period for the Indian agricultural sector - caused by excessive rains affecting the winter crop in the first months of 1998 - boosted the scrapping of silver. Farmers were forced to sell the metal to pay for inputs such as seeds and fertilizers.

Economic difficulties in **Pakistan** were worse than those faced by India, especially after the exchange of nuclear bomb tests with India in May. The subsequent devaluation helped to keep the local price of silver at high levels in the summer months and thus boost recycling of silver.

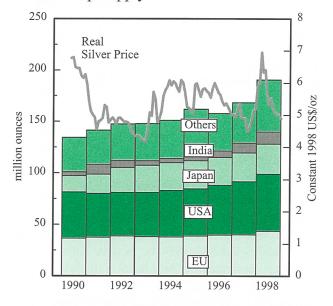
East Asia

The increase in East Asian silver scrap in 1998 of over 11% was extremely modest when compared to gold scrap, which increased by over 200%. Total scrap rose to 29.2 Moz (910 t). Japanese silver scrap accounts for a huge 76% of the East Asian total, and the only other country to record substantial volumes of scrap is Korea, which accounted for around 13% of the total. As yet, GFMS has not compiled a reliable and sufficiently long time series of scrap in China. Consequently, Chinese fabrication demand is based only on new supplies of silver.

The fact that silver scrap did not increase to the extent of gold is, of course, not entirely surprising given the inherent differences between the two markets. As GFMS has consistently pointed out in relation to both gold and silver, of crucial importance to the market dynamics is the amount of "near market" stocks of metal held in both official and private hands. Put somewhat more crudely, the issue is "how quickly can above-ground stocks of the metal be mobilized?", especially in response to a price rally.

1998 demonstrated just how different the two markets are in East Asia. Silver scrap levels only responded modestly to huge rises in local silver prices (as a result of the collapse of many Asian currencies

Figure 28
World Scrap Supply



and the rise in the dollar silver price at the beginning of the year).

The reasons are quite simple, and revolve around firstly, the total stock of silver held in fabricated products in the region, and secondly, the type of products in which the silver is contained. The reality of the silver markets in East Asia is that, with the exception of Japan, Korea and possibly China, there is very little silver available that can easily be scrapped and sold back. In fact, Korea is one of the few countries in the East where there are substantial holdings of jewelry and silverware stocks; the forms of silver, after bullion, which are nearest to the market.

Korean scrap levels did respond well to the local price increase. In fact, they rose by around 60%, drawing on the large stocks of jewelry and silverware held by most Korean households. However, this needs to be put in to context by comparing what happened to gold scrap over the same period when well over 8 Moz (250 t) of gold was collected.

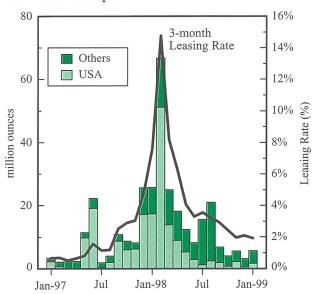
6. Silver Bullion Trade

- 1998 witnessed substantial silver bullion flows associated with movements in the price. In particular, Europe imported very large quantities of silver last year.
- UK bullion imports soared to 21.2 Moz (6,590 t) in 1998, more than double the previous year's level, with much of this silver coming from the United States.
- The collapse in Dubai's imports last year was mainly thanks to the start of direct silver bullion imports into India under Open General Licence (OGL) in October, 1997.
- Japanese bullion imports fell sharply in 1998, by over 40%, but this was partly offset by rises in other supplies.
- 1998 saw the continuation of the downward trend in imports into Singapore.

Europe

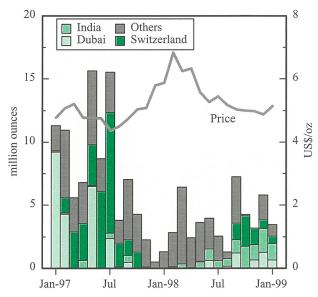
Europe was a massive importer of bullion last year. There were three principal reasons for the size of the inflow of silver into the region. The first was that local supply in the form of domestic mine production and scrap at 104.1 Moz (3,230 t) was comfortably exceeded by European fabrication demand at 247.3 Moz (7,690 t). The balance had to be met by imports or local stocks. The second reason was that London and Zurich are two of the world's most important entrepôts for physical silver. Bullion is imported into these major trading centers and re-exported (frequently after some degree of transformation) to markets throughout the world. The third reason why so much metal has flowed into Europe is the relocation of private bullion stocks from the United States, particularly to the United Kingdom.

Figure 29
UK Bullion Imports



In 1998 UK bullion imports soared to 21.2 Moz (6,590 t), more than double the previous year's level. As Figure 29 shows, the inflow was at its peak in the first quarter. For instance, in the month of February alone, imports reached nearly 67 Moz (2,080 t). The bulk of these supplies came from the United States. Silver was attracted by the premium that emerged in London over the price available in the New York market. This in turn had resulted from the shortage of liquidity in the London market that drove up silver borrowing costs dramatically (at their peak 3-month rates exceeded 30%). For several weeks the "squeeze" in London resulted in a sufficiently high premium to encourage a huge inflow of metal from the United States. The increase in the price and in leasing rates during the first quarter also sucked in silver from other

Figure 30
UK Bullion Exports



countries, most notably Germany and Switzerland. Imports picked up again in July and August when there was a substantial inflow of silver from Russia.

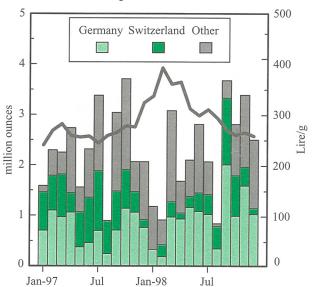
The very factors that led to such a strong increase in UK imports of silver depressed the level of bullion exports last year. Figure 30 shows how exports have declined since the silver price strengthened in the latter part of 1997. Shipments to Switzerland and Dubai have been worst affected, the latter, in particular, due to the weakness of demand in the Indian sub-continent. Increased direct exports to India were insufficient to cancel out the collapse in UK exports. In addition, deliveries of bullion to Italy fell very sharply in 1998.

Due to the lack of local supply from scrap and mine production **Italy** is a large importer of bullion for its important jewelry and silverware industry. Official bullion imports were slightly weaker in 1998; notably so in the first quarter when the higher price led to their nearly halving year-on-year (see Figure 31). By contrast, imports picked up in the fourth quarter on lower lire prices. The source of Italy's official imports of bullion has changed with less material entering the country from Switzerland and the United Kingdom and more coming in from Germany. A new development last year was a substantial inflow of refined metal from Kazakhstan.

North America

Although there is a large silver "surplus" in North America (including Mexico) - mine production plus scrap exceeded fabrication by 45 Moz (1,400 t) in

Figure 31 Italian Bullion Imports



1998 - the region is also a large importer of bullion. The United States, for example, imported nearly 106 Moz (3,300 t) last year, over three-quarters of this trade accounted for by bullion imports from Mexico and Canada.

Imports of bullion by the **United States** in 1998 exceeded exports, which at a little over 83 Moz (2,580 t) were down 26% year-on-year. According to the US trade data pictured in Figure 32, exports to the United Kingdom were unchanged (something contradicted by the UK data covered earlier in this Chapter!) but fell to other destinations. The biggest declines last year were in shipments to Switzerland, Dubai and Japan.

Middle East and Indian Sub-Continent

The Middle East and the Indian sub-continent are treated together in this section for two reasons. First, an overwhelming proportion of the Middle East's bullion imports during the past decade has consisted of supplies passing through Dubai on the way to the subcontinent. The imports of the region's only sizeable silver fabricating countries - Turkey and Egypt - are small by comparison. In addition, and in contrast to the situation in the gold trade, Dubai's silver bullion exports to neighboring countries in the Gulf are trivial in comparison to its business with the sub-continent. This is explained by the lack of significant levels of industrial, or even jewelry fabrication, in the Gulf region. Secondly, from the perspective of a precious metals dealer in India or Pakistan, the Middle East (in the shape of the free-trading entrepôt of Dubai) has

Figure 32
US Bullion Exports

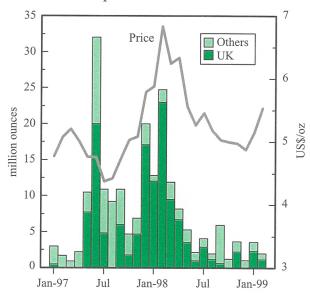
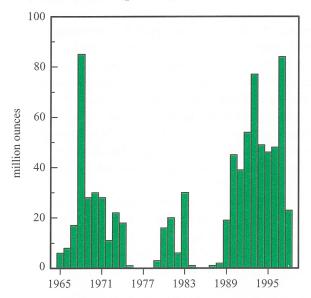


Figure 33
Dubai Bullion Imports



been the essential trading partner for a generation, regardless of whether he had a need to import or export silver. For more than thirty years, Dubai has played this key rôle, at various times importing large quantities for, or from, the Indian sub-continent, as can be deduced from Figures 33 and 34.

Dubai's silver trade has been at a maximum when India's import/export regime has been restricted. When silver could be freely exported from India in the late 1970s, Dubai saw almost none of the resulting outflow. At other times in the 1960s, Dubai's imports were simply a mirror-image of Indian exports. In the 1990s, the gradual liberalization of India's bullion regime resulted in a mix of mainly official, plus some smuggled supplies. The latter continued because the sum of the import duty (of 500 rupees per kilogram or around 7%) and other costs exceeded the landed cost of unofficial imports.

Apart from such regulatory issues, Dubai's silver trade has been boosted both when India was poor and the silver price was perceived as being high - and vice versa. The former situation gave rise to the huge outflows of silver from India in the late 1960s and mid-1970s. Just the opposite has been seen in the 1990s, when a falling real price and rising prosperity resulted in a massive influx of the metal. During this period, however, Singapore traders succeeded in supplying an increasing share of the Indian silver market, thus eroding Dubai's former near monopoly.

The five years from 1993 to 1997 saw a renewed phase of liberalization in the Indian market, with imports being permitted first via returning Non-

Resident Indians (the NRI scheme) and then, from 1994, by the use of Special Import Licences (SIL). Neither of these schemes resulted in a substantial shift in bullion flows (in particular in favor of direct shipments to India from Europe and other supplying countries). Dubai's imports reached an impressive total of 304 Moz (9,460 t) for this five-year period, with more than 95% of this being destined for reexport to the sub-continent.

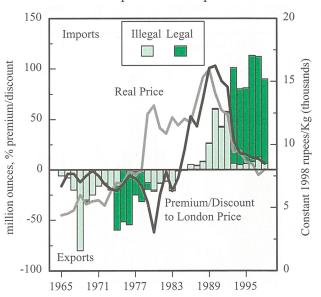
In 1997, Dubai's imports amounted to 84 Moz (2,620 t) just a fraction below the 1968 record level. The big difference between the markets in these years was, of course, that while the 1997 figure was the result of strong demand from India, the 1968 figure represented Dubai taking in silver which India was dishoarding.

The pattern of bullion flows changed dramatically in 1998. Dubai's imports declined sharply, to less than a third of the 1997 level.

	i - Bullion n ounces	1 Imports			
1993	1994	1995	1996	1997	1998(E)
76.8	48.9	45.5	48.1	84.2	23.3

The collapse in Dubai's imports last year was mainly thanks to the start of silver bullion imports under Open General Licence (OGL) in October, 1997. This allowed a selected group of banks and dealers freely to import silver on payment of the same duty of 500

Figure 34
Indian Bullion Imports and Exports



rupees per kilogram that applied to the pre-existing NRI and SIL schemes. As can be seen in the table below, almost all of India's silver requirements have since been imported under the OGL scheme. These have included direct shipments to India primarily from Switzerland, the United Kingdom and the United States, though Dubai has managed to retain a share of around 25% of the supply to the Indian market.

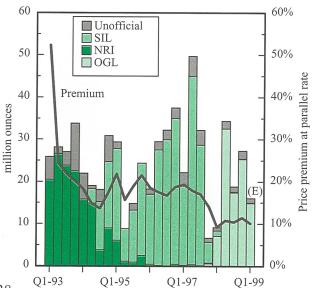
Dubai's traders still have the advantage of being able to break bulk seaborne cargoes and then to distribute the metal quickly by a variety of air routes to the various importing centers in the sub-continent. But this advantage depends on leasing rates being low. When they are high, the additional carrying cost of the time spent at sea can easily negate the cheaper cost of sea freight.

Not surprisingly, then, Dubai's trade was severely disrupted by the price and leasing rate spike in the first months of 1998. The sharp rise in the price caused Indian demand to collapse, leaving Dubai temporarily overstocked with bullion. Worse still, the associated jump in leasing rates led to carrying costs rising by an order of magnitude. The consequence was that much of this surplus silver had to be shipped back, quickly and expensively, to Europe and the United States.

Although in recent years supplies to Dubai have been dominated by the United Kingdom and the United States, in 1998 imports from Switzerland recovered. This also reflected Dubai's main advantage - the availability of good air-freight links to India.

Dubai's bullion exports to the sub-continent in 1998

Figure 35
Estimated Indian Bullion Imports by Scheme

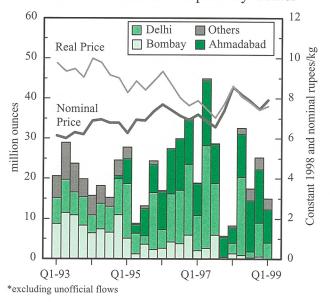


were almost exclusively destined for India and Pakistan. This was in contrast to the situation in the previous year, when large quantities of silver were shipped in the first place to Nepal, before being reshipped unofficially to India across Nepal's long and porous border. The introduction of OGL imports led to the local silver premium in India falling rapidly (as can be seen in Figure 35) in fact, to below 10% over the London price in the first months of 1998. This eliminated much of the profit margin from smuggling silver into India via Nepal, though this channel continued to be used for some unofficial flows in the remainder of the year.

Looking at the sub-continent itself, in spite of falling in absolute terms, India's imports actually increased as a share of the region's total imports. This was because of the steeper falls in Pakistani imports (on account of the country's economic problems).

Indian Bullion In	nports				
Million ounces					
	1994	1995	1996	1997	1998
OGL	-	-	-	0.6	81.8
NRI	43.6	10.7	1.1	0.8	0.1
SIL	30.4	63.6	102.5	96.9	1.4
Replenishment	1.1	0.9	1.8	1.5	0.3
Sub-total official	75.2	75.2	105.5	99.8	83.6
Smuggling	5.0	5.9	8.0	12.5	6.4
Total	80.1	81.1	113.5	112.4	90.0
Local Premium*	28	27	23	23	9
* percent above Lond	on price at	the offic	cial exch	ange rate	

Figure 36
Estimated Indian Bullion Imports by Center*



Within **India**, the dominance of OGL imports was virtually complete last year, with the NRI scheme almost totally unutilized and SILs being used only occasionally for the import of special products that cannot be imported under OGL.

The ascendancy of the OGL route is thanks to its greater efficiency compared with either of the earlier schemes in that OGL imports avoid the costs, either of a license (as in the case of the SIL scheme) or of a courier (on which the NRI scheme depended).

Even more interesting than the split between the various import routes last year has been the changing pattern of imports over the past two years, and especially in relation to the silver price. Figure 36 indicates how the fall in real prices from 1996 to mid-1997 helped to boost imports, which peaked in the second quarter of 1997. The rise in the price in the second half of 1997 brought about a dramatic collapse in import demand. Finally, during the course of 1998, the fall in the price led to a revival of imports in the second quarter, though this recovery faded as the year progressed.

The regional pattern of bullion imports is also shown in Figure 36. It can be seen that the bulk of imports are concentrated in the north of the country. This provides an indication of the distribution of demand in the country (since, unlike gold, the high cost of moving silver means that each of the main importing centers serves a limited geographical area). Ahmadabad, in the state of Gujerat, has benefited from its proximity to the main silver consuming areas in the tribal belt of Rajasthan and Madhya Pradesh. The decline of Bombay as a physical importer of silver from its position of pre-eminence five years ago is a reflection of the less business-friendly environment in Maharashtra and, above all, the continued application of an octroi (a local import tax) to commodities arriving in Bombay.

In 1997, 90% of India's official bullion imports stemmed from just four countries: Switzerland, Dubai, the United States and the United Kingdom. The other 10% was obtained mainly from producing countries such as Canada, Kazakhstan and Russia. In 1998, the main change, apart from the decline in Dubai's share noted above, was the appearance of a substantial inflow of non-good delivery silver from China in the second half of the year.

East Asia

The last decade has witnessed a precipitous decline in silver imports into **Singapore**. 1997 and 1998 saw

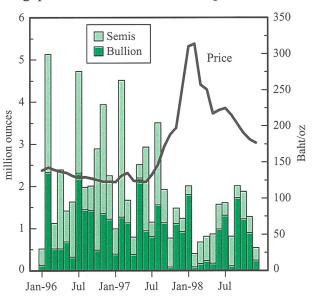
the continuation of this trend, and as Figure 37 shows, imports fell sharply in both years. As we have stressed in previous Surveys, to calculate the net inflow of new silver into Singapore, one has to look at both the bullion and the semi-manufatured goods import categories - semis imports into Singapore are primarily silver grain. As Figure 37 shows quite clearly, at times, semis are larger than bullion imports. Many jewelry fabricators in the region prefer to take grain over bar.

Singapore continues to play an important, if declining, role in silver flows into the region. The major destination for silver imported into Singapore is **Thailand**.

Supplies of silver to the Thai market are now finely balanced between official and unofficial supplies, and between supplies from Singapore and other sources. In the past, Singapore has dominated both official and unofficial imports into Thailand, but this has changed perceptibly over the past two or three years. The move to other sources of silver supply is most closely tied to the trend amongst many of the bigger fabricators to take most of their production "official". All the indications are that in relative terms, official supplies have been replacing unofficial supplies of silver into the Thai market.

Tracking the flows into Thailand is difficult because as circumstances change, so do the incentives amongst the fabricators to take either official or unofficial silver. For instance, the sharp devaluation of the baht

Figure 37
Singapore Bullion and Semis Imports



in July 1997 caused many of the smaller fabricators to move to more unofficial supplies. The reasons were mainly related to the financing costs of using officially imported silver, and as in the past, much of this centered around the VAT system currently in place. It is difficult to find a fabricator using official silver who does not complain bitterly about the length of time it takes to receive VAT refunds. Higher baht silver prices as a result of the collapse of the currency against the dollar translated directly into greater VAT payments on imported silver, compounding the cash flow problems of fabricators. As a consequence of this, many fabricators shifted some of their production back into unofficial silver.

The biggest changes to regional bullion flows in 1998 were recorded in **Hong Kong** and **China**. GFMS estimates that there were substantial flows out of China in 1998, destined for Hong Kong and other countries. Our data stands in stark contrast to some other commentators on the silver market who still record China as a major importer of silver, allegedly because of the deficit in new mine supplies of silver (see also our discussion of Chinese mine production on page 22). The silver flowing out of China was a mixture of both unofficial and official silver, and the latter is discussed further in Chapter 5. It is no coincidence that imports of silver into Hong Kong fell by over 30% in 1998. In addition to this, it needs to be recognized that imports would have fallen further if the quality of

Figure 38
Korean Bullion Imports and Exports

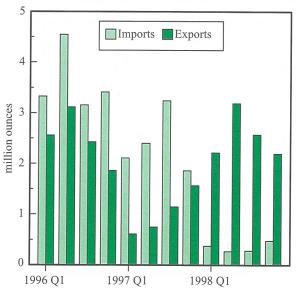
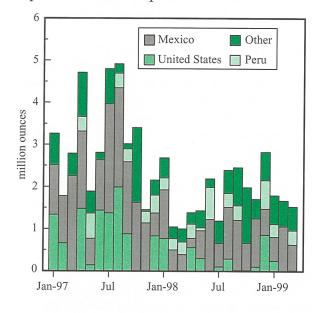


Figure 39
Japanese Bullion Imports



the silver coming out of China had been sufficiently high to be used directly in production processes. Much of it was not, and consequently was shipped out to be re-refined in other locations.

Bullion imports into **Korea** collapsed in 1998, by over 80%. Although falling local demand contibuted to this fall, the main explanatory factor was the sharp rise in local silver production from imported concentrates. GFMS estimates that these rose by well over 70% in 1998.

After a surge in 1997, **Japanese** bullion imports fell sharply in 1998, by over 40% (see Figure 39). Although demand did fall year-on-year, the decline was substantially less than the fall in bullion imports. GFMS estimates that production of silver from other sources rose by around 8% in 1998, offsetting some of the decline in imports. For example, domestic mine production rose by over 8% to 3 Moz (90 t).

Mexico, Peru and the United States continue to dominate imports into Japan accounting for around 70% of the total. However, this was down on the 80% that they accounted for in 1997. The biggest recorded rise in imports was from South Korea, with imports up by over 1,600%. Unlike in the case of gold, where much of South Korea's trade is motivated by financing incentives not directly related to the trade itself, most of the silver trade is "genuine". The biggest fall in imports was from Poland, which were down by over 70% year-on-year.

7. Fabrication Demand

- After three years of growth, world silver fabrication fell by 2.2% in 1998, to 841 Moz (26,140 t).
- The fall in the world total was primarily the result of the sharp decline in Indian and East Asian fabrication demand, which fell by 16% and 13% respectively, a combined amount of 46 Moz (1,430 t).
- Industrial Uses of silver declined by a modest 1.2% to 323.7 Moz (10,070 t). Interestingly, the two largest components of this category, Electrical and Electronics actually grew year-on-year and Brazing Alloys and Solder only fell by only 0.3 Moz (10 t).
- Photographic fabrication surged by 5.6%, to over 245 Moz (7,630 t), almost entirely on the back of growth in the United States. Japanese photographic fabrication demand fell marginally year-on-year to 58.2 Moz (1,810 t).
- Jewelry and Silverware fabrication fell sharply in 1998, by 10%, to 244.4 Moz (7,600 t). Virtually all of this was attributable to the collapse in Indian and East Asian demand (which fell by 17% and 21% respectively).
- Coins and Medals demand fell by around 3% to 27.2 Moz (850 t).

Silver is predominantly an industrial metal, having shed its monetary aspirations many years ago. As the supply and demand table at the start of this Survey shows quite clearly, demand is almost exclusively made up of three components, Industrial, Photography and Jewelry and Silverware. Only twice has hedging appeared on the demand side in the past nine years.

As Figure 40 shows, the largest single use category is Industrial Applications, a catch-all term that

encompasses a very wide range of applications ranging from medical uses through to plating salts for use in electronics (Figure 42 overleaf shows the breakdown of Industrial applications demand into its various major sub-components).

Four regions dominate silver demand, as shown in Figure 41. The largest consuming region is the European Union, with Italy being the largest consumer within that group.

Figure 40
World Silver Fabrication

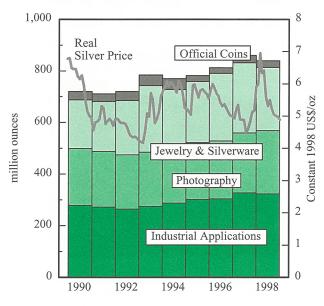


Figure 41
World Silver Fabrication

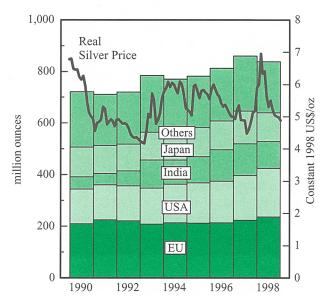
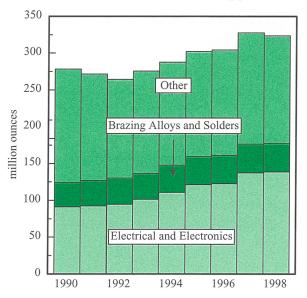


Figure 42
Main Components of Industrial Applications



Industrial Applications

- European industrial demand increased by nearly 3% last year to a record level of 74.5 Moz (2,320 t), due in large part to a surge in UK & Ireland demand, which grew by 30% to 16.3 Moz (510 t).
- Silver use in the European Union has picked up in the last two years in line with stronger industrial production growth in the region (see Figure 43).
- North American demand rose by a robust 7.6% to 84.8 Moz (2,640 t), partly on the back of higher electrical and electronics demand.
- Indian industrial demand fell sharply, by 10%, to 32.4 Moz (1,110 t), due in part to rising prices.
- Japanese industrial offtake fell sharply, by 11%, to 52.8 Moz (1,640 t).
- Electrical and Electronics uses of silver rose by a modest 1% to 138.5 Moz (4,310 t) while Brazing Alloys and Solders demand fell marginally, from 38.9 Moz to 38.6 Moz (1,210 to 1,200 t).

Europe

German industrial demand recorded a modest increase of 0.6 Moz to 18.4 Moz (570 t). Demand was seasonally stronger in the first half, especially in the automotive industry, but thereafter offtake was affected by uncertainty ahead of the September general elections.

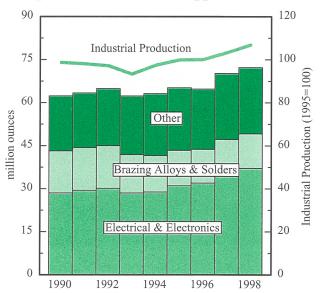
There was a 22% or 3.0 Moz (90 t) fall in French

demand last year due to lower offtake in electronics, electrical uses and brazing alloys. Both the electronics and electrical sectors were hit by the weakness of several key export markets and, in the local market for contacts, by strong competition from imports. The same adverse trade factors drove down silver use in brazing alloys. In addition, industrial consumers are, generally, moving away from the use of brazing alloys towards greater use of other joining techniques or monobloc parts. Furthermore, there is a tendency for the average silver content of brazing alloys to decline.

Swiss industrial demand surged by over 15% to reach 10.0 Moz (310 t) in 1998. Since 1990 the amount of silver used in industrial applications has nearly doubled. The electrical and electronics sectors have been responsible for the majority of this growth. Most of the silver consumed is in the form of wires, contact bands and powders used in the manufacture of contacts.

The use of silver for industrial applications in **Italy** fell 6% to 11.2 Moz (350 t). This was largely due to lower demand for Italian products from export markets in Asia. The main sub-category of industrial demand, electrical and electronics, used 10% less silver in contact materials as exports of domestic appliances and electrical equipment to East Asia fell strongly. There was also a fall in the amount of silver used in brazing alloys as domestic demand for refrigeration and air-conditioning units was affected by the sluggish local economy. Production of anodes and salts for

Figure 43
European Union Industrial Applications



decorative electroplating fell due to reduced plating of fashion accessories.

Industrial demand in the **United Kingdom** rose by almost one third to 16.3 Moz (510 t) as a result of growth across all sectors. Despite the currency appreciation during 1998, exports accounted for higher demand in the brazing alloy and solder markets. Elsewhere, growth in the automotive and mobile phone industries, both at home and abroad led to a rise in electrical and electronics demand which rose 33% to 6.8 Moz (210 t). Finally robust growth, again notably in export markets, accounted for a marked rise in other industrial and decorative fabrication.

North America

Demand in the **United States** rose by 7.6% last year to a record level of 81 Moz (2,520 t). Since 1990 the use of silver across a variety of industrial applications has grown by no less than 32 Moz (1,000 t). As Figure 44 shows, demand has risen in line with but much faster than the general level of US industrial production. The Figure also shows that most of the growth in silver demand has come from electronics.

Last year was no exception, with the electronics sector absorbing just under 31 Moz (960 t) in spite of the slowdown in the world economy and, initially at least, consumers reducing raw material inventories they had built up during 1997. Towards the end of that year the electronics market weakened and this moderated silver demand over much of 1998. Offtake was especially soft in the third quarter at a time when the outlook for the world economy seemed particularly poor. As confidence returned, however, orders picked up very strongly in the fourth quarter. Thus, for the full year, US silver demand for electronics was up nearly 6% above the level recorded in 1997.

The increase in offtake last year was particularly impressive in the light of the very strong performance from the sector in 1997. Silver electronics demand has benefited from growing use of the metal in various forms in existing and new applications such as multilayer ceramic capacitors, shielding, keypad contacts and adhesives.

Nevertheless, it was significant that in 1998 the increase in the quantity of silver consumed was at only half the level of growth in the underlying electronics market (reported at 10-15% year-on-year). The reason why there was a smaller rise in raw material demand than that for finished products was due to substitution of silver by other metals, economization and inventory

reduction.

As regards substitution, the situation here has been considerably exacerbated by the tremendous increase in the palladium price. Possibly the largest single use of silver in the electronics field is in silver-palladium powders that go in to multilayer capacitors. This enduse is under threat from base metal substitutes. For example, copper-nickel is being substituted for silver-palladium. A further twist has come from the fact that it is Asian component manufacturers, which have tended to rely more on base metal technology and they have been winning market share from US producers.

When it comes to economization, the first quarter spike in the price and, especially, in the level of silver leasing rates led to manufacturers looking harder for ways to economize on inventories and raw material use. An example of the latter would be the replacement of solid switches by silver-coated ones in computer keyboards.

Finally and, in addition, although raw material orders increased in the second half of 1998 and into the early part of this year, growth has been held back by manufacturers running down the level of their inventories. This process probably will have run its course by the middle of 1999. On the other hand, it is probable that the other two trends, in the shorter term, economization and, particularly, the longer run effect of substitution, still have further to go and that their impact will inevitably be to moderate any growth in electronics demand this year.

Figure 44
US Industrial Applications

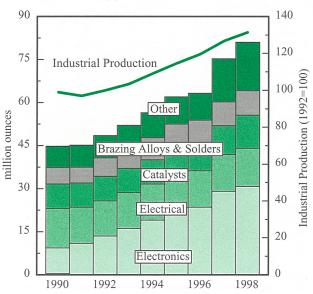


Table 4									
World Silver Fabrication									
(including the use of scrap)									
Million ounces									
	1990	1991	1992	1993	1994	1995	1996	1997	1998
Europe	51.4	56.0	(1.0	57.0	50.6	50.5	50.0	55.0	
Italy Germany	51.4 54.3	56.8 57.9	61.0 54.8	57.2 48.4	52.6 52.8	50.7 46.0	52.8 45.6	57.0 46.0	57.0 48.5
UK & Ireland	25.0	25.4	26.8	28.4	31.2	32.3	34.4	35.5	40.7
Belgium	19.9	20.2	20.2	20.7	21.1	23.4	25.3	26.1	32.5
France	26.5	28.6	30.9	30.2	28.2	31.1	27.2	28.7	27.8
Switzerland	5.7	7.6	6.7	6.2	7.1	7.3	7.8	9.6	10.7
Spain	15.2	17.4	6.6	6.1	10.7	9.9	9.3	8.7	8.8
Greece Poland	3.2 5.1	3.4 3.9	3.5 2.1	3.7 2.3	3.9 2.6	3.8 3.1	4.2 3.0	4.5 3.4	4.1 3.6
Portugal	2.5	2.3	2.5	2.5	2.0	2.4	2.8	2.9	3.1
Netherlands	2.8	2.2	2.1	2.1	2.6	3.2	2.2	2.1	2.1
Norway	1.0	2.0	2.5	1.9	1.6	1.6	1.4	1.5	1.5
Sweden	1.5	1.9	1.6	1.6	1.5	1.4	1.5	1.7	1.4
Austria Denmark	1.6 1.1	1.7 1.0	1.6 1.1	1.5	1.5	1.6	1.5	1.3	1.4
Czech & Slovak Republics	1.1	1.0	1.1	1.0 0.7	1.0 0.6	1.0 0.8	1.0 0.7	1.1 0.8	1.0 0.9
Finland	1.4	1.5	1.3	0.7	1.0	0.8	1.0	0.8	0.9
Romania	0.7	0.6	0.5	0.5	0.4	0.3	0.4	0.4	0.5
Cyprus & Malta	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Other	1.0	0.9	1.0	1.1	0.9	0.9	0.9	0.7	0.8
Total Europe	221.8	237.0	228.2	217.1	223.5	222.1	223.4	233.2	247.3
North America									
United States	135.9	135.3	136.0	140.2	149.1	156.8	161.6	172.8	188.8
Mexico Canada	14.1 6.5	15.1 4.7	22.9 2.3	32.0 2.8	27.6 3.1	17.5	20.8	23.7	22.2
Total North America	156.5	155.0	161.2			2.7	2.7	2.8	3.4
	130.3	133.0	101.2	175.0	179.9	176.9	185.0	199.3	214.4
Central & South America Brazil	6.8	6.7	6.6	6.9	8.3	9.4	8.4	8.4	8.1
Argentina	4.1	4.1	4.1	4.1	4.1	3.9	3.8	3.8	3.1
Peru	1.5	1.2	0.9	0.8	0.9	1.0	1.1	1.1	1.1
Colombia	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Ecuador	0.4	0.4	0.4	0.5	0.7	0.7	0.7	0.7	0.7
Chile Other	0.5 0.6	0.5 0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	14.9		0.6	0.6	0.5	0.6	0.9	1.3	1.6
Total Central & South America	14.9	14.4	14.1	14.5	15.9	17.1	16.4	16.8	16.2
Middle East Turkey	4.9	4.7	5.5	5.9	5.2	6.1	6.4	6.5	6.2
Israel	2.1	2.3	2.6	2.8	3.1	3.4	3.7	4.0	3.9
Egypt	1.6	1.7	2.3	1.9	2.5	2.2	2.3	2.1	2.1
Saudi Arabia	0.2	0.3	0.4	0.4	0.3	0.4	0.4	0.6	0.5
Other	1.6	1.9	2.7	2.0	2.4	2.5	2.6	2.6	2.5
Total Middle East	10.4	10.9	13.4	13.2	13.5	14.5	15.4	15.8	15.1
Indian Sub-Continent	150								
India Bangladesh & Nepal	46.8 1.8	44.8 2.0	58.1 2.6	108.8	93.9	101.3	122.2	122.9	104.3
Other	1.7	2.3	2.8	3.4	4.5 2.8	5.1 3.8	5.8 2.7	6.4 4.1	5.1 2.8
Total Indian Sub-Continent	50.2	49.1	63.5	116.0	101.2	110.2	130.7	133.5	112.3
- Total matan 500-Comment	30.2	77.1	05.5	110.0	101.2	110.2	130.7	155.5	112.3
East Asia									
Japan	115.8	108.8	104.9	107.9	108.4	112.7	112.1	127.2	112.8
Thailand	24.1	20.1	31.6	38.7	29.1	27.7	27.6	27.1	24.2
South Korea	6.8	9.3	9.0	15.6	16.4	18.6	18.5	18.6	13.8
Taiwan Hong Kong	4.5	3.6	4.3	4.8	5.3	5.7	6.4	6.9	7.1
Hong Kong Indonesia	2.4 1.4	2.1 1.7	2.3 1.9	2.6 1.8	3.4 2.7	3.4 3.1	3.7 3.4	4.4 4.1	3.6 2.7
Myanmar, Laos & Cambodia	1.0	1.7	1.0	1.0	1.0	1.1	1.1	1.0	0.8
,	0	1.0	1.0	1.0	1.0	•••	1.1	1.0	0.0

Table 4 World Silver Fabrication									
(including the use of scrap) Million ounces									
	1990	1991	1992	1993	1994	1995	1996	1997	1998
Vietnam	0.3	0.3	0.3	0.4	0.5	0.6	0.7	0.7	0.6
Malaysia Other	0.3 0.5	0.4 0.4	0.4 1.1	0.5 0.4	0.4 0.4	0.4 0.4	0.4 0.4	0.4 0.3	0.3 0.4
Total East Asia	157.1	147.6	156.9	173.7	167.5	173.7	174.2	190.6	166.1
Africa									
Morocco	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6
Tunisia	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3
South Africa	0.5	0.3	0.3	0.6	0.4	0.5	0.3	0.3	0.3
Algeria	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.2	0.2
Other	0.6	0.6	0.5	0.5	0.5	0.5	0.4	0.4	0.4
Total Africa	2.1	1.9	1.8	2.0	1.9	2.0	1.8	1.8	1.7
Oceania									
Australia	5.2	5.2	6.9	7.0	6.3	5.3	5.2	5.2	5.6
Total Oceania	5.2	5.2	6.9	7.0	6.3	5.3	5.2	5.2	5.6
Western World Total	618.3	621.2	646.0	718.4	709.7	722.0	752.1	796.2	778.7
Other Countries									
China	22.0	23.5	23.9	25.6	29.5	30.6	32.6	35.9	36.1
Soviet Union/CIS	80.6	67.2	50.2	40.9	31.7	29.0	28.4	27.8	25.8
North Korea	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
Total Other Countries	102.6	90.7	74.1	66.7	61.2	59.6	61.0	63.6	61.9
World Total	720.9	712.0	720.1	785.1	770.9	781.7	813.1	859.8	840.6

Besides a positive contribution from the electronics sector, silver demand in industrial applications was higher last year due to increased offtake in electrical end-uses, especially contact materials. The driving force in this area was housing where silver contacts are used in light switches and, especially, circuit breakers. This was hardly a surprise given that the nominal value of US private sector residential construction grew by nearly 12% in 1998. There was also a less pronounced increase in silver use by the automotive sector.

By contrast, general industrial demand for contacts was less strong. This was due to manufacturers looking very hard at their inventory levels in the light of the jump in silver borrowing costs and the potential economic fallout from the Asian crisis. Another factor was that imports from Europe were very competitive given the strength of the dollar for much of the year. The heavier industrial side of the power control market was worst affected by these adverse developments. Overall, the combination of these different trends within the electrical category resulted in a 4% rise in silver demand to 13.3 Moz (410 t).

Looking ahead, it is probable that growth in electrical demand will be constrained by two forces. The first is the tendency for contact manufacturers to

seek ways of reducing their raw material requirements through designing less silver-intensive contacts. This continues to be an "engineering goal" at almost any silver price due to raw material being such a large part of the cost of each electrical contact (and the contact in turn accounting for a major element of the price of each switch). Thus manufacturers strive to reduce their silver use through smaller size contacts and even the replacement of silver where possible by other materials and/or plating.

The second threat is to the low voltage applications where traditional electrical contacts are vulnerable to replacement by electronic, solid-state systems or hybrid variants. This has already progressed quite far in the automotive sector. For instance, one large component manufacturer, which put in a line to make electronic switches three years ago now has three such production lines in operation.

Taken together, electronics and electrical uses accounted for 54% (over 44 Moz or 1,370 t) of US industrial demand for silver. The balance of 46% or just under 37 Moz (1,150 t) was accounted for by a myriad of other uses, chief among which were catalysts, brazing alloys and solders.

Silver is widely used as a catalyst in chemical

reactions. The most important end-use is in ethylene oxide catalysts with formaldehyde catalysts another important source of demand. Very little of the silver used in these catalysts is lost so that when catalysts are recycled and replaced the net impact in terms of silver demand is limited. Only when new catalysts are introduced therefore is there any net increase in silver demand. Such was the case last year in the United States with an additional 1.4 Moz (40 t) in new offtake over and above an estimated 10 Moz (310 t) of "replacement" demand (our numbers on such annual "replacement" demand and the associated silver scrap have been revised upwards).

Brazing alloys and solders was the fourth largest end-use in 1998 (after electronics, electrical and catalysts), manufacturers' requiring 8.6 Moz (270 t) of silver for their processes.

All the other industrial uses of silver together absorbed some 16.9 Moz (530 t) of silver in 1998. Silver use in batteries accounted for a good part of this sub-total. Even though rechargeable batteries have not enjoyed commercial success in the United States, overall market demand was sufficiently strong for the battery sector to enjoy steady growth in 1998. Higher offtake is also expected in 1999 due to increased demand from a variety of military applications. Silver use in water purification systems is growing but from a small base. The amount of silver used in mirror manufacture was up strongly in 1998. Silver's reflective properties are also leading to higher offtake in uses such as highway reflectors. Demand for silver, as an anti-microbial agent is small but growing rapidly. There is great potential for using silver rich products to safeguard hygiene in, for example, public facilities. Medicine too is benefiting from silver's anti-bacterial properties. A new application is to coat a thin film on to gauzes that are used to treat wounds and burns. Another new use for silver in medicine is in diabetes testers.

India

India is the largest industrial fabricator of silver in the developing world and is third to only the United States and Japan in the world ranking. It owes its preeminence in this area partly to the Ghandian tradition of swadeshi (or economic self-reliance) which has been an important strand in Indian political and economic thinking since independence. Domestic industries have been encouraged to set up facilities for the manufacture of various manufactured products by

means of generous tariff protection. Indian industrial fabrication has grown steadily, if less excitingly than jewelry and silverware, during the past decade, as can be seen in Figure 45. Despite a decline in absolute terms last year, due to a combination of the slowdown in the economy and the sharp rise in prices, industrial fabrication slightly increased its share of total Indian fabrication to just over 30%.

Another reason for the size of the Indian industrial sector is that there are a number of uses for silver which are virtually unique to the sub-continent and are classed as industrial in this Survey though being of a very different character from the high-tech products described above.

Figure 46 shows the breakdown of industrial fabrication in India in 1998 (including the tiny residual use of silver for the local manufacture of X-ray film). This graph excludes the approximately 10% of uses classed as miscellaneous. The largest sector, "Plating", covers a wide spectrum of applications, both of an industrial and a decorative nature. It suffered a fair share of the general decline last year. The next largest sectors, foil and jari (a gilded silver thread used in embroidery), are very much Indian specialities. The use of foil for embellishing food suffered a decline last year because of the generally depressed state of the economy and the rise in the cost of food. However, the incorporation of silver foil into chewing tobacco, which is responsible for the major part of foil demand, has continued despite the possibility of a ban on

Figure 45
Indian Fabrication

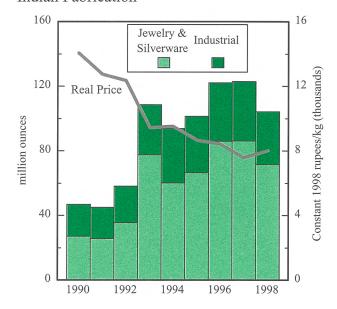
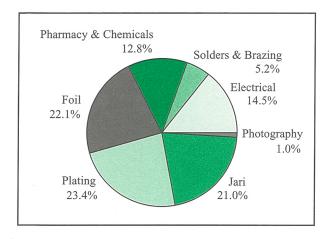


Figure 46 Indian Industrial Fabrication, 1998



ghutka (a mixture of chewing tobacco, aromatic nuts and spices). Fabrication of jari fell by around 15% partly because of serious mid-year flooding in the town of Surat where almost all of the country's production is concentrated. Within the "Pharmacy and Chemicals" grouping, there is another uniquely Indian application the use of silver in the manufacture of ayurvedic medicines.

Turning to the truly industrial uses, the electrical sector was the only area not to show a decline last year - though the flat year-on-year offtake was in contrast to the past five years of rapid growth. The problems lay in the disappointing performance of the power generating industry where the installation of new capacity fell well below the planned amounts.

East Asia

After a surprisingly strong year of offtake in 1997, total industrial demand in Japan fell by 11% in 1998 to 52.8 Moz (1,640 t). Two primary forces were at work in explaining this fall. Firstly, the health (or lack thereof) of the Japanese economy started, somewhat belatedly, to feed through into the silver market, although as the following table shows, industrial production had actually been increasing in the preceding three years.

Japanese Index	Industri	al Producti	on	
	1995	1996	1997	1998
	96.0	98.3	101.7	95.2
Source: OEC		70.5	101.7	75.2

Secondly, and perhaps more importantly, the collapse of many of the Asian economies had a double whammy effect on the demand for Japanese products – total demand fell in the region and competition from the likes of the Korea increased at the same time.

The substantial rise in the ven silver price at the beginning of the year, precipitated by both the rise in the dollar price and the weak yen, did not seem to influence production to a great degree. In fact, most of the adjustments in the short term were seen in silver inventory levels. It is revealing that across the Asian region as a whole, industrial demand does not appear to have been greatly influenced by price factors, something that cannot be said, for example, of the silver jewelry industry in Thailand.

Electronics uses of silver continue to be the dominant force in determining the direction of total offtake, and various sub-sectors of the market fared quite differently through the year.

Japanese Non-Photographic Nitrate and Contact Production

Million ounces

	1995	1996	1997	1998
non-photo nitrates	10.6	9.6	10.5	10.5
contacts	9.3	8.7	9.5	9.1

Nitrate demand for use in capacitors now probably accounts for close to 60% of non-photographic nitrate use. Mobile telephone use of the ubiquitous multilaver ceramic capacitor (MLCC) increased year-on-year, whilst other uses of capacitors saw steady or slightly falling demand for uses in computers and computer games (amongst other uses). Overall, the use of silver nitrate in capacitors increased in 1998, according to some estimates by as much as 4%.

This was offset by a sharp fall in other uses of nitrate, in particular its use in mirrors. Indications are that demand for use in mirrors fell by as much as 20% in 1998, caused by the sharp fall in construction and the more general fall in consumer expenditure. After 3 or 4 years of tremendous growth, demand for nitrate in anti-bacterial applications stabilized year-on-year, suggesting that in times of real economic difficulties, marginal health issues take a back seat. Having said this, it is difficult to find disposable pens in Japan that do not have a special "anti-bacterial" pad on them to

Table 5 Silver Fabrication: Industrial App	lications								
(including the use of scrap) Million ounces	nications								
	1990	1991	1992	1993	1994	1995	1996	1997	1998
Europe	22.2	21.1	20.0	10.6	10.0	10.5	15.0	17.0	
Germany UK & Ireland	22.3 10.5	21.1 10.8	20.0 11.1	18.6 11.4	18.0 11.7	18.5 11.9	17.2 12.2	17.8 12.5	18.4 16.3
Italy	9.5	9.9	10.1	10.6	10.7	11.2	11.8	11.9	11.2
France	10.1	11.1	12.8	11.3	11.6	12.0	11.7	13.4	10.4
Switzerland Spain	5.1 1.9	5.7 1.9	6.0 1.8	5.6 1.8	6.5 1.7	6.6 1.8	6.9 2.0	8.6 2.9	10.0 3.1
Netherlands	1.9	1.9	1.8	1.8	1.7	1.8	1.7	1.7	1.7
Poland	0.6	0.5	0.5	0.6	0.8	0.8	0.8	0.7	0.7
Austria	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.5
Czech & Slovak Republics Sweden	0.8 0.3	0.7 0.3	0.5 0.3	0.5 0.3	0.4 0.3	0.5 0.3	0.5 0.3	0.4 0.3	0.4 0.3
Belgium	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Other	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.1
Total Europe	65.0	65.7	67.0	64.6	65.5	67.6	67.2	72.4	74.5
North America	40.0	40.3	50 T	563	<i>(</i> 0 <i>(</i>	65.0	60.5	77.	01.6
United States Mexico	49.0 2.6	49.3 2.6	52.7 2.6	56.3 2.6	60.6 2.8	65.9 2.5	68.2 2.6	75.3 2.9	81.0
Canada	0.7	0.7	0.7	0.7	0.6	0.7	0.6	0.6	3.2 0.5
Total North America	52.2	52.6	55.9	59.6	64.0	69.2	71.4	78.8	84.8
Central & South America									
Brazil	2.4	2.4	2.4	2.5	3.2	3.5	3.3	3.4	3.5
Argentina	1.3	1.3	1.3	1.3	1.3	1.2	1.2	1.2	1.2
Colombia Other	0.3 0.5	0.3 0.5	0.3 0.5	0.3 0.5	0.3 0.5	0.3 0.5	0.3 0.5	0.3 0.5	0.3 0.5
Total Central & South America	4.4	4.4	4.4	4.5	5.2	5.4	5.2	5.3	5.4
Middle East				1.0	3.2		5.2	9.9	3.1
Israel	0.4	0.6	0.7	0.8	0.9	1.0	1.0	1.0	1.0
Turkey	0.8	0.7	0.9	0.9	0.8	0.9	0.9	1.0	0.9
Egypt Other	0.1 0.0	0.1 0.0	0.1 0.3	0.1 0.0	0.1 0.0	0.1 0.0	0.1 0.0	0.1 0.0	0.1 0.0
Total Middle East	1.3	1.4	2.0	1.9	1.8	2.0	2.1	2.1	2.0
Indian Sub-Continent	1.5	1.1	2.0	1.5	1.0	2.0	2.1	2.1	2.0
India	14.1	16.6	20.0	29.0	32.1	34.1	35.5	36.0	32.4
Other	1.4	0.4	0.5	0.6	0.5	0.6	0.5	0.7	0.5
Total Indian Sub-Continent	15.5	17.0	20.4	29.5	32.6	34.8	36.0	36.7	32.9
East Asia	16.6	47.5	44.1	45.0	£1.1	52.6	50.1	50.4	50.0
Japan South Korea	46.6 2.3	47.5 4.0	44.1 4.0	45.8 8.4	51.1 10.0	53.6 11.9	52.1 11.9	59.4 12.3	52.8 11.2
Taiwan	3.0	3.1	3.7	4.2	4.7	5.2	5.8	6.3	6.2
Hong Kong	1.5	1.1	1.3	1.6	2.4	2.5	2.8	3.4	3.0
Indonesia	0.4	0.6	0.7	0.4	0.4	0.4	0.4	0.5	0.5
Total East Asia Africa	53.8	56.3	53.8	60.4	68.6	73.6	73.1	81.9	74.1
Morocco	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2
South Africa	0.5	0.3	0.2	0.5	0.3	0.3	0.2	0.2	0.2
Other	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total Africa	0.8	0.6	0.5	0.8	0.6	0.7	0.6	0.6	0.6
Oceania Australia	2.0	1.9	2.0	2.0	2.2	2.4	2.3	2.1	2.3
Total Oceania	2.0	1.9	2.0	2.0	2.2	2.4	2.3	2.1	2.3
Western World Total	195.0	199.9	206.1	223.5	240.7	255.8	257.8	280.0	276.5

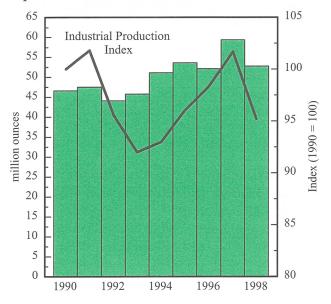
Table 5 Silver Fabrication: Industrial A (including the use of scrap) Million ounces	pplications								
	1990	1991	1992	1993	1994	1995	1996	1997	1998
Other Countries									
China	17.3	17.7	18.8	20.1	23.2	24.3	25.4	27.0	27.6
Soviet Union/CIS	66.0	54.1	39.5	31.9	24.0	21.9	21.1	20.6	19.6
Total Other Countries	83.3	71.8	58.4	52.0	47.2	46.2	46.5	47.7	47.2
World Total	278.3	271.7	264.4	275.5	287.8	302.0	304.2	327.7	323.7

ward off the transfer of bugs from one person to another, indicating just how pervasive the use of silver is in this type of application. Catalyst demand fell in line with the overall decline in industrial production.

Japanese Motor V	ehicle Pro	duction	
Year-on year percent	change		
1995	1996	1997	1998
-3.4	1.5	6.1	-8.4
Source: JAMA			

Contact production fell by around 4% in 1998, having recorded strong growth of over 9% in 1997. Contact demand is influenced heavily by the cycle in motor vehicle production and electronics demand. The sharp fall in vehicle production combined with the

Figure 47
Japanese Industrial Fabrication



weakness in electronics demand overall saw contact production fall. As noted above, 1998 witnessed ongoing weakness in the construction sector, and contact production for use in switches and other electrical applications also fell. There were, however, countervailing forces at work, and good demand in certain specialist areas like robots helped moderate the size of the fall.

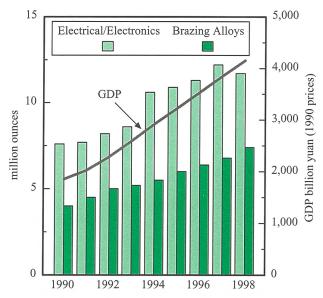
In light of the fall in overall electronics fabrication it was not surprising that electroplating solution demand fell by around 10% to just over 3.2 Moz (100 t). The overall weakness in the Japanese electronics (reflected for example in the 19% fall in billings reported by the SIA) has been the result of a number of factors, the most important of which include:

- the fall in absolute levels of demand in Japan for many electronic items as well as the collapse in East Asian demand in the aftermath of the currency crisis. It is no coincidence that only one of the big five electronics fabricators in Japan made a profit last year;
- the substitution of cheaper (especially Korean) electronics semi-products and finished goods for Japanese products;
- the ongoing process of relocating fabrication facilities outside of Japan.

Fabrication of brazing alloys and solders fell sharply year-on-year. Following on from the decline recorded in 1997, production fell by 16% in 1998 to around 4.2 Moz (130 t). Again, the fall in construction activity accounted for much of this decline, but it was not only the decline in Japanese construction that was to blame, and weakness in the Asian construction market as a whole saw demand for items like air-conditioners falling, reducing offtake of brazing alloys.

Dental alloy offtake fell by around 6% year-on-year.

Figure 48
Chinese Industrial Uses of Silver



Most of this was accounted for by the fall in demand for Kinpara 12, the most popular alloy used in Japan, accounting for up to 70% of overall demand. Kinpara 12 consists of 12% gold, 20% palladium and 55% silver with smaller amounts of other materials. The sky-rocketing of the palladium price recently has pushed the price of Kinpara 12 above the health insurance limit, hence curtailing demand.

As in last year's Survey, we have not yet been able to separate out jewelry and silverware uses from industrial demand in **China**, and as a consequence they are all lumped together under industrial uses.

Total industrial demand in China rose marginally in 1998, by around 2% to 27.6 Moz (860 t). This was the slowest rise in industrial demand this decade, and signals some of the underlying problems within the Chinese industrial complex as well as the impact of the Asian economic crisis.

On the question of China's economic growth recently, there is an emerging consensus that official data is consistently overstating the "true" state of affairs. This has been officially acknowledged through channels like the China Daily who have reported that "China's State statisticians are to reduce their dependence on calculations of local governments to prevent cooked local figures from skewing national statistics". As economic growth has slowed in the face of, for example, the restructuring of the state sector, so has the need to "cook" production statistics. The long and the short of this is that the official data showing GDP growth of around 7.8% probably overstates (by

up to 3% by some estimates) the actual growth rate in China in 1998. But rather than reducing silver offtake, this has mainly affected the growth in demand, and one has to look elsewhere for why the picture in 1998 was flat.

The main reason for this appears to have been the substitution by imported silver materials for local Chinese silver. As we noted in last year's Survey, improved production techniques in China have resulted in a substitution of locally produced silver products by imported products like contacts, pushing up the local fabrication numbers. Last year saw a reversal of this trend on the back of weaker Asian currencies. For example, the collapse of the Korean won reduced the price of semis from that country to a level that was often irresistible. This had a notable impact on products like contacts and plating salts, which fell by around 3% year-on-year according to GFMS estimates.

By contrast, the impact of solders and brazing alloys was nowhere nearly as marked, although there was some substitution away from local products, and total fabrication is estimated to have increased by around 10% year-on-year. This was driven by rapidly rising production of air-conditioners (which according to official statistics increased by over 30% year-on-year) and rising vehicle production (which rose by around 4% according to official statistics) amongst others. Although there is undoubtedly a degree of exaggeration in these numbers, the trend increase in the use of brazing alloys and solders in these applications appears to be incontrovertible.

If it were not for the growth in exports of silver using products and semis, especially in the first half of the year, **Korean** industrial demand would have fallen further than it did.

Korean Industria Index, 1990 = 100	al Production	on		
97Q1	97Q2	98Q1	98Q2	
165	175	152	155	
Source: OECD				

1998 was very much a year of two halves in Korea. Industrial production fell sharply in the first half of 1998 before recovering towards the end of the year. Brazing alloys and solders were especially hard hit, falling by over 28%, especially as they did not enjoy the benefits of a mini-export boom experienced by electronics products.

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 multilayer ceramic capacitors, in the manufacture of membrane switches, silvered film in electrically heated automobile windshields, and in conductive adhesives.

The ease of electrodeposition 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 coatings for glass, 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 catalysts are important in the production of formaldehyde which is used in the manufacture of housings for television sets, computers and electrical switch boxes.

Silver is employed as a bactericide and algaecide in an ever increasing number of 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 hi-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 the 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.

Table 5a									
Silver Fabrication: Electrical	l and Electronic	22							
(including the use of scrap)	i diid Eiconome	,6							
Million ounces									
Willion dunces									
	1990	1991	1992	1993	1994	1995	1996	1997	1998
		1,,,1	1992	1775	1994	1773	1770	1991	1990
United States	23.3	23.5	25.8	28.6	31.6	36.0	36.3	41.9	44.1
Japan	22.4	22.4	20.3	20.9	22.5	23.9	22.7	25.8	23.7
Germany	13.5	12.7	12.1	11.3	10.9	11.9	11.6	11.9	12.2
China	7.6	7.7	8.2	8.6	10.6	10.9	11.3	12.2	11.7
Switzerland	1.3	1.9	2.6	2.8	3.5	3.8	4.1	5.5	7.3
United Kingdom	4.2	4.4	4.5	4.5	4.6	4.7	5.0	5.1	6.8
France	4.8	5.3	6.2	5.0	5.4	6.1	6.3	7.7	6.0
South Korea	0.0	0.6	0.5	4.5	5.3	6.4	6.4	6.5	6.0
Taiwan	2.2	2.2	2.7	2.9	3.3	3.6	4.2	4.7	4.8
India	2.4	2.4	2.4	2.4	2.6	3.0	3.2	4.2	4.2
Italy	3.0	3.1	3.1	3.2	2.7	2.7	3.3	3.2	2.9
Hong Kong	1.2	0.8	0.9	1.2	1.8	1.9	2.2	2.7	2.5
Brazil	1.0	1.0	1.0	1.0	1.5	1.6	1.4	1.4	1.4
Mexico	1.2	1.2	1.2	1.2	1.2	1.1	1.1	1.2	1.3
Spain	0.8	0.9	0.9	1.0	0.9	0.9	0.9	0.9	1.0
Turkey	0.8	0.7	0.9	0.9	0.8	0.9	0.9	1.0	0.9
Netherlands	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Australia	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5
Austria	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
Egypt	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Гotal	91.2	92.5	94.6	101.4	110.8	121.0	122.4	137.4	138.5

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

	1990	1991	1992	1993	1994	1995	1996	1997	1998
United States	5.8	5.6	6.5	7.2	7.7	8.0	8.2	8.4	8.6
China	4.0	4.5	5.0	5.2	5.5	6.0	6.4	6.8	7.4
Japan	4.5	4.8	4.2	3.8	4.7	4.8	5.1	5.0	4.2
Germany	5.4	5.1	4.8	4.5	4.0	3.5	2.9	3.1	3.1
United Kingdom	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4
Italy	1.8	1.9	2.1	2.3	2.4	2.7	2.7	2.4	2.3
Switzerland	2.4	2.6	2.4	1.8	1.8	1.8	1.7	1.7	1.6
India	1.3	1.5	1.5	1.5	1.6	1.9	2.1	1.6	1.5
France	1.8	2.1	2.4	1.8	1.4	1.3	1.4	1.4	1.0
Spain	0.6	0.6	0.5	0.4	0.3	0.3	0.6	0.9	1.0
Taiwan	0.5	0.5	0.6	0.7	0.8	1.0	1.1	1.1	1.0
Mexico	0.9	0.9	0.9	0.9	1.0	0.9	0.9	0.9	1.0
South Korea	0.1	0.2	0.3	0.8	1.0	1.2	1.2	1.1	0.8
Brazil	0.5	0.5	0.5	0.6	0.8	0.9	0.9	0.8	0.8
Australia	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.6	0.7
Canada	0.4	0.4	0.4	0.4	0.4	0.5	0.4	0.4	0.3
Netherlands	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Austria	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Israel	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Total	33.3	34.4	35.4	35.2	36.9	38.4	38.9	38.9	38.6

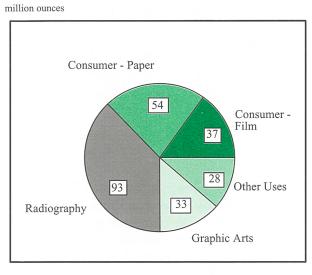
Korean Vehicle Pr	oduction ar	nd Constru	ction	
*Millions of units, ^M	Iillions of squ	are meters		
1995	1996	1997	1998	
2.52*	2.81	2.81	1.95	
9.77^	9.4	9.4	4.2	
Source: Kama, OECD				

Contact production fell sharply on the back of much weaker vehicle production and the collapse in construction, although poor domestic conditions were offset by a rise in exports to countries like China.

Overall electronics uses of silver rose year-on-year, very much in line with what was happening to gold electronics fabrication demand (which according to *Gold Survey 1999* rose by around 20% in 1998), but electrical uses fell sharply, primarily due to the collapse in construction.

Even **Taiwan** was not able to buck the trend seen in many other Asian countries in 1998, with industrial offtake falling by around 2%. Electronics demand did, however increase year-on-year, and part of the explanation for this lies in the structure of the Taiwanese electronics industry. In particular, the OEM (original equipment manufacturing) basis of much of its electronics manufacturing, with its low cost base, economies of scale and world wide penetration has enabled Taiwanese fabricators to maintain and in some instances increase production levels (at the expense of say Japanese fabricators).

Figure 49
Photographic Uses of Silver



However, the slight growth in electronics uses of silver was more than offset by the fall in other industrial uses.

The industrial fabrication series for **Hong Kong** has been revised on the back of new information. The revision concerns the allocation of silver to electronics and other uses. GFMS estimates that electronics consume substantially more silver than we made allowance for in the past.

Total industrial demand is estimated to have fallen by around 13% year-on-year, but electronics is thought to have fallen more modestly, by around 10%, with the biggest fall being recorded in the miscellaneous category (plating salts for non-electronics uses fell sharply, for example).

Photography

- Total photographic demand rose by 5.6% to 245
 Moz (7,620 t). Some of this growth was fuelled by
 stockbuilding as final consumer demand for
 photographic products increased at a lower rate.
- Fabrication in the United States leapt to nearly 89 Moz (2,760 t) in 1998, representing 36% of world demand for silver in photographic products.
- Japan, the world's second largest consumer of silver in photography, saw demand decline very marginally to 58.2 Moz (1,810 t).
- European photographic fabrication rose by over 7% last year.

As might be expected, the relative market shares of the respective components of photographic demand did not change substantially in 1998. It is still the case that around 75% of the silver used in photographic fabrication is accounted for by consumer film and paper and radiography (see Figure 49). There was a slight change, however, in the relative share of the Graphics Arts sector, with demand falling quite sharply in Japan, for instance (as much on the back of the recession there as the substitution towards digital).

Not surprisingly, as in 1997, the United States and Japan continue to dominate total fabrication demand for photographic silver, although the European Union does account for a larger share of demand than Japan. Focusing on the narrower group of the Euro-11 countries, demand does lag behind that of Japan.

On the corporate front, there have been a number of acquisitions, mergers and strategic joint ventures in the

Table 6									
Silver Fabrication: Photographic	c Use								
(including the use of scrap)									
Million ounces									
	1990	1991	1992	1993	1994	1995	1996	1997	1998
Europe									
Belgium	19.0	19.4	19.7	20.1	20.6	22.8	24.8	25.5	31.9
UK & Ireland	12.1	12.3	13.1	13.6	15.9	16.7	18.2	19.0	20.5
France	12.5	13.4	14.3	14.7	13.7	15.9	13.2	12.7	14.5
Germany	16.1	16.6	15.8	15.4	16.1	14.8	13.8	14.5	9.9
Romania	0.5	0.4	0.3	0.3	0.2	0.1	0.2	0.2	0.3
Czech & Slovak Republics	0.6	0.5	0.2	0.0	0.0	0.0	0.0	0.1	0.3
Hungary	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.2	0.2
Bulgaria	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Poland	2.9	2.3	0.5	0.5	0.5	0.5	0.3	0.2	0.0
Spain	1.6	1.4	0.6	0.4	0.2	0.1	0.0	0.0	0.0
Total Europe	65.7	66.6	64.8	65.2	67.4	71.1	70.7	72.4	77.6
North America	67.0								
United States	67.0	65.0	63.5	64.0	67.8	70.3	74.4	78.9	88.7
Mexico	2.3	2.3	2.6	3.2	3.2	3.3	3.4	4.1	3.4
Canada	2.9	1.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total North America	72.1	69.2	66.1	67.2	71.0	73.7	77.8	83.0	92.1
Central & South America									
Brazil	2.6	2.6	2.6	2.6	3.2	4.0	3.4	3.4	3.2
Argentina	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
Total Central & South America	4.4	4.4	4.4	4.4	5.0	5.8	5.2	5.2	5.0
Indian Sub-Continent									
India	5.6	2.6	2.6	2.3	1.6	0.6	0.6	0.6	0.3
Other	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.4
Total Indian Sub-Continent	5.8	2.8	2.8	2.5	1.8	0.9	0.9	1.0	0.7
East Asia									
Japan	56.5	57.8	58.0	57.2	55.1	56.9	57.9	58.6	58.2
Taiwan	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0
Total East Asia	56.6	57.9	58.1	57.3	55.2	56.9	57.9	58.6	58.2
Oceania									
Australia	2.3	2.3	2.3	2.1	1.9	1.6	1.6	1.6	1.6
Total Oceania	2.3	2.3	2.3	2.1	1.9	1.6	1.6	1.6	1.6
Western World Total	206.8	203.0	198.4	198.7	202.3	209.9	214.2	221.8	235.3
Other Countries	200.0	203.0	170.7	170.7	202.3	203.3	214.2	221.0	433.3
China	4.3	4.4	4.7	5.1	5.6	5.6	5.8	6.0	6.1
Soviet Union/CIS	10.0	8.8	7.2	6.3	5.2	5.0	4.7	4.5	3.8
Total Other Countries	14.3	13.2	11.9	11.4	10.8	10.5			
World Total	221.1						10.4	10.5	9.9
voliu Total	221.1	216.2	210.3	210.1	213.1	220.5	224.6	232.4	245.3

past year that will alter the face of the photographic industry. For example, Kodak announced alliances with Adobe and Intel, and Agfa-Gevaert is to be spun off from Bayer AG. Possibly the biggest development recently has been Kodak's entry into China, which is discussed in more detail below. The ruling by the WTO on the United States/Japanese dispute regarding access to the Japanese market in favor of the latter appears to put this matter to rest, as least temporarily.

It is somewhat surprising that silver demand in

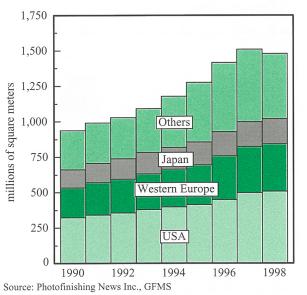
photography has held up so well in spite of a number of countervailing trends. Firstly, digital imaging has been perceived as a major threat to traditional silver halide photography. However, the two appear to be growing symbiotically rather than eating into one another's market share, at least at the present time. In addition to this, digital imaging has only made significant inroads into a few markets (although they are the two largest in the world), namely Japan and the United States.

Secondly, silver loadings on film and paper are being reduced consistently from year to year, lowering the amount of silver per picture and per print. The introduction of the Advanced Photo System (APS) has further contributed to this trend because it requires around one-third less silver than conventional 35mm film. However, this appears to have been offset to some degree by higher usage rates and the built-in tendency of APS to encourage users to take more prints, consequently consuming more paper and silver. Furthermore, whilst these developments have been going on, there has been growth in the absolute consumption of film and paper in all forms which has been greater than the countervailing force of, for example, lower loadings.

This trend did change, however, in 1998, and possibly the most interesting development in the photographic market last year was the divergence between fabrication and consumption growth rates.

As can be seen from the table below, in the three years leading up to 1998, higher consumption of film and paper always accompanied higher fabrication demand. In 1998, however, consumption fell whilst fabrication appears to have increased quite robustly. GFMS believes that part of the explanation for this lies in inventory build-up of both finished products (in factories and at the retail level where restocking appears to have occurred quite extensively in 1998)

Figure 50
World Color Photographic Paper Consumption



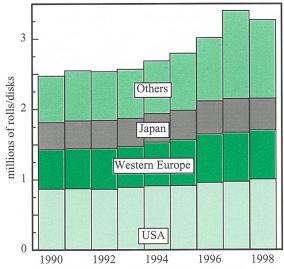
and nitrate. In addition to this, 1998 recorded growth in the consumption of single use cameras (Photofinishing News estimates growth of around 7% year-on-year), which partially offset the decline in film and paper use.

Photographic Fall **Millions of rolls,			. *Moz	
	· · · · · · · · · · · · · · · ·		,	
	1995	1996	1997	1998E
Film**	2,795	3,015	3,404	3,272
Paper^	1,276	1,417	1,509	1,481
Fabrication*	220	224	232	245

Silver use in the **United States** increased by close to 10 Moz (310 t) in 1998. This 12% increase in production over the previous year's level of output requires some explanation.

As a direct consequence of the trade dispute between the United States and Japan over imports and exports of photographic products (see below), Japanese manufacturers have set up local manufacturing facilities in the United States. Output from these plants operated by Fuji and Konica has effectively substituted for (politically sensitive) imports of

Figure 51
World Consumer Film Sales



Source: Photofinishing News Inc., GFMS

Digital Technology in the Photographic Market

Digital photography technology continues to develop incrementally, and there were no notable improvements in 1998 to substantially alter the short-term outlook for traditional silver halide methods of image capture. The consensus amongst the photographic companies, including those with an interest in both technologies, is that there is room for the two to develop side by side in the foreseeable future.

Digital Technology

In film-based photography, light is focused through a lens onto a silver-halide-coated piece of plastic (the film) thereby causing a photo-chemical reaction that creates an image of the original picture. The film is then chemically processed to produce negatives, which can be printed on to silver-halide paper.

Digital technology replaces the film in this process with a charge-coupled device (CCD) which contains hundreds of thousands of resistors that convert incoming light into binary, ie, digital form. As a rule of thumb, the more photocells the better the final picture quality, although there are many other factors that influence the final picture quality.

Once pictures have been captured digitally, they can be manipulated on a standard PC using readily available software or, less easily, be sent directly to a printer. Since the real power of digital technology is the ease with which digital pictures can be adjusted, factors such as the power of these programs and PCs and the available memory are important determinants in the attractiveness of the technology.

There are two separate ways in which pictures can be digitized. Firstly, there are digital cameras, which capture pictures into digital form immediately, eliminating the need for silver in the photographic process. Secondly, standard silver-halide pictures can be scanned into electronic form which necessitates the use of silver in the taking and printing of the picture in the first place (many new products aimed at this segment of the market are being released regularly).

Digital Cameras

The major advantages of using a digital camera are the ease, speed and cost efficiency of capturing digital pictures. On the other hand, digital cameras are expensive and constrained by the physical limitations of how many photocells can be attached to the CCD, and the cost of increasing the pixel density on this device.

However, the price per pixel is declining rapidly (see Figure 52), and it is interesting to note, for example, that only one year ago, the "standard" amateur digital camera contained around 350,000 photocells (producing an image of 640 x 480 pixels), whilst in 1999, it is not uncommon to

find cameras aimed at this section of the market with resolutions of around 800,000 pixels (with the upper end of the amateur market going as high as 1.6 M_pixel, producing an image of 1024x1536 pixels).

To put this into context, however, it is worth noting that silver-halide film produces a picture equivalent to 20 million pixels and also has better color accuracy.

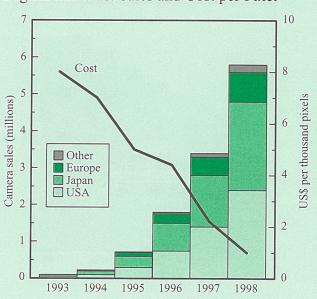
One very real constraint on the growth of digital photography has centered around making prints of images. Standard computer printers cannot, at present, produce affordable prints of sufficient quality for the mass market, and ironically, silver-halide paper is still widely used in the production of finished prints

Digital Technology in Radiography and the Graphics Arts

In medical photography, digital imaging allows for the central storage of images such that all of the patient's records can be easily accessed. Information can also be stored centrally, thereby reducing costs. These systems can be prohibitively expensive, and in addition, physical pictures often still need to be produced as these make analysis better and easier, relative to looking at pictures on computer screens which often do not have adequate graphical capabilities.

In the graphic arts sector, demand for silver has already begun to be negatively affected by digital technology. This is not so much through the use of digital cameras, but rather because of the elimination of wasteful trial runs by using alternative technologies to transfer images to computers where they be easily retouched without the need for more shots to be taken.

Figure 52
Digital Cameras: Sales and Cost per Pixel



photographic paper and film from Japan. In the last two years production from these facilities has increased with an especially strong rise recorded in 1998. This largely explains the increase in US photographic demand for silver last year. In addition, there was some contribution from an underlying growth in the market for amateur photography (although exports were moderated by weaker consumption growth in East Asia and China) and radiography (where the innovative dry-imaging technology pioneered by the US company Imation Corp is beginning to take off). Silver nitrate demand was also lifted by higher production of motion picture film. Output in recent years has more than tripled due to multiple prints being distributed to a larger number of theaters. Graphic arts demand, by contrast, fell back slightly in 1998. The use of silver in amateur film has grown more slowly than the number of units produced by manufacturers due to continued reduction in silver loadings. Silver use in amateur photographic paper on the other hand has increased because of the growing popularity of larger print sizes and multiple copies, e.g., through 2-for-1 offers.

In Europe, fabrication of silver into nitrates for the photographic industry is concentrated in four countries: Belgium, the United Kingdom, France and Germany. Approximately two-thirds of the silver that is converted into silver nitrate for use by the photographic industry is exported, not only to facilities in the above countries but also to plants elsewhere, especially those located in the Netherlands and Italy. GFMS data, however, are based on where the silver is originally transformed into nitrate. They do not therefore necessarily reflect where this silver nitrate is finally consumed. Changes in the level of exports in 1998 largely explain the year-on-year movements in fabrication recorded in Table 6. This was particularly important in the case of the decline in German fabrication and the rise in Belgian output.

GFMS estimates that **Japanese** photographic demand fell very slightly in 1998, by less than 1% to 58.2 Moz (1,810 t). This is somewhat surprising given the collapse in demand across the Asian region, especially in what were good growth markets in Thailand, Indonesia and South Korea. The collapse in Russian demand later in the year did not help matters either. Weakness in these markets was offset to a large extent by demand from China, Africa and the Middle East.

In spite of the clampdown on the smuggling of film

(the clampdown was on all smuggling of course) into China, which is easily the largest source of film supply in that market, demand appears to have increased slightly year-on-year. Good growth was experienced in some African markets and in the Middle East, demand grew in 1998 to partially offset the declines elsewhere. Final demand in Japan was stable in spite of the poor economic conditions prevailing throughout the year.

All of this would appear to suggest that total fabrication demand in Japan should have fallen by more than it did year-on-year, and the reason why it did not can be found in what appears to have been some stock building of final film products and nitrate. It is interesting that much of the adjustment seen in Japan in 1998 was inventory related. For instance, there was a sharp reduction in bullion inventory levels in the first half due to the high local and international silver price, whilst in the second half some fabricators chose to build up stocks of finished products and nitrate. GFMS estimates that Japanese photographic companies hold substantial volumes of both silver bullion and nitrate that enable them to ride out spikes in the price.

In summary, production (but not sales) of amateur film appears to have risen in 1998, as did motion picture production (due to growth in small movie theaters around the country). This was offset by falls in graphic arts (related as much to the recession as to the substitution of digital for silver halide). X-ray demand appears to have been stable year-on-year.

At the retail level, 1998 witnessed a sharp rise in price competition. Both of the large domestic manufacturers engaged in aggressive pricing policies precipitated in part by hard bargaining from large retailers.

Japanese photographic companies have caused something of a stir in the local nitrate market recently by starting to release their own product into the market for *non*-photographic uses. Whilst there has been much discussion about the relative merits of various manufacturers' nitrate (focusing on such important issues as flake size), there is little doubt that the Japanese nitrate market may never be the same again. This implies, of course, that total nitrate production by these companies in Japan *exceeds* its use in photographic applications.

One final comment on the Japanese photographic industry is warranted. On 30th January 1998, the WTO issued a final report rejecting the complaint brought by

Table 7	C1								
Silver Fabrication: Jewelry and S (including the use of scrap)	liverware								
Million ounces									
	1990	1991	1992	1993	1994	1995	1996	1997	1998
Europe									
Italy	41.5	46.3	50.4	46.2	41.4	39.0	40.5	44.8	45.5
Germany	13.2	14.5	13.5	11.6	11.6	10.3	10.0	10.0	10.1
Greece	3.2 11.3	3.4 13.0	3.5 3.7	3.7 3.7	3.9 4.0	3.8 4.1	4.2 4.5	4.5 4.0	4.1 4.1
Spain UK & Ireland	2.0	1.9	2.2	2.7	2.9	3.0	3.3	3.4	3.3
Poland	1.4	1.0	1.0	1.0	1.1	1.6	1.8	2.3	2.7
France	1.8	1.8	1.7	2.0	1.9	2.0	2.0	2.2	2.5
Portugal Norway	2.2 0.6	2.2 1.2	2.2 1.2	2.1 1.2	1.5 1.2	1.7 1.2	1.9 1.1	1.9 1.1	1.9 1.1
Sweden	1.2	1.6	1.3	1.2	1.2	1.0	1.1	1.3	1.0
Denmark	0.9	0.9	0.9	0.9	0.9	0.9	0.9	1.0	0.9
Finland	1.2	1.3	1.0	0.8	0.9	0.7	0.8	0.8	0.6
Austria Cyprus & Malta	0.5 0.2	0.5 0.2	0.5 0.3	0.5 0.3	0.4 0.4	0.4 0.4	0.4 0.4	0.4 0.4	0.5 0.4
Czech & Slovak Republics	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4
Other	1.2	1.2	1.1	1.1	1.0	1.0	0.9	0.9	1.0
Total Europe	82.5	90.9	84.7	79.0	74.3	71.2	74.0	79.2	79.7
North America									
Mexico	8.0	8.7	9.0	9.2	8.7	11.0	14.2	16.3	15.3
United States Canada	9.8 1.0	9.7 1.2	10.9 0.9	11.3 0.9	12.0 1.0	12.5 1.2	12.4 1.3	12.5 1.5	12.6 1.8
Total North America	18.8	19.5	20.8	21.3	21.6	24.8	28.0	30.4	29.7
Central & South America	10.0	19.5	20.8	21.3	21.0	24.0	20.0	30.4	29.1
Brazil	1.8	1.7	1.6	1.8	1.8	1.9	1.8	1.6	1.4
Peru	1.5	1.1	0.7	0.8	0.8	0.9	1.0	1.1	1.0
Colombia	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
Ecuador Argentina	0.3 1.0	0.3 1.0	0.3 1.0	0.5 1.0	0.6 1.0	0.6 0.9	0.6 0.8	0.6 0.8	0.6 0.2
Other	0.7	0.7	0.7	0.7	0.6	0.7	1.0	1.4	1.7
Total Central & South America	6.0	5.6	5.1	5.5	5.7	5.9	6.0	6.3	5.8
Middle East									
Turkey	4.1	3.9	4.6	5.0	4.3	5.1	5.5	5.5	5.2
Israel	1.7	1.7	1.8	2.0	2.1	2.3	2.6	3.0	2.8
Egypt Saudi Arabia	1.5 0.2	1.6 0.3	2.2 0.4	1.8 0.4	1.8 0.3	2.0 0.4	2.1 0.4	2.0 0.6	2.0 0.5
Other	1.6	1.9	2.4	2.0	2.4	2.5	2.6	2.6	2.4
Total Middle East	9.1	9.5	11.4	11.2	11.0	12.4	13.3	13.6	13.0
Indian Sub-Continent									
India	27.1	25.7	35.6	77.5	60.2	66.6	86.0	86.3	71.6
Bangladesh & Nepal	0.6	2.0	2.6	3.9	4.5	5.1	5.8	6.4	5.1
Other	1.2	1.7	2.1	2.5	2.1	2.9	2.0	3.1	1.9
Total Indian Sub-Continent	28.9	29.3	40.3	83.9	66.8	74.6	93.8	95.8	78.7
East Asia Thailand	24.1	20.1	31.6	38.5	28.9	27.4	27.1	26.8	23.9
South Korea	4.5	5.3	5.0	7.2	6.4	6.8	6.6	6.3	23.9
Indonesia	1.1	1.1	1.2	1.4	2.3	2.7	2.9	3.6	2.2
Japan	3.8	3.5	2.8	2.5	2.2	2.2	2.1	1.9	1.8
Myanmar, Laos & Cambodia	1.0 0.9	1.0 1.0	1.0 1.0	1.0 1.0	1.0 1.0	1.1 0.9	1.1 0.9	1.0 1.0	0.8 0.6
Hong Kong Vietnam	0.9	0.3	0.3	0.4	0.5	0.9	0.9	0.7	0.6
Taiwan	0.4	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Malaysia	0.3	0.4	0.4	0.5	0.4	0.4	0.4	0.4	0.3
Other	0.4	0.4	0.3	0.3	0.2	0.3	0.3	0.3	0.3
Total East Asia	36.7	33.3	44.0	53.2	43.4	42.8	42.6	42.5	33.5

Table 7									
Silver Fabrication: Jewelry and	d Silverware								
(including the use of scrap)									
Million ounces									
	1990	1991	1992	1993	1994	1995	1996	1997	1998
Africa									
Morocco	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Tunisia	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
Algeria	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2
Other	0.5	0.5	0.5	0.4	0.5	0.5	0.4	0.4	0.3
Total Africa	1.4	1.4	1.3	1.2	1.3	1.3	1.2	1.2	1.2
Oceania									
Australia	0.5	0.5	0.5	0.6	0.6	0.6	0.5	0.6	0.7
Total Oceania	0.5	0.5	0.5	0.6	0.6	0.6	0.5	0.6	0.7
Western World Total	184.0	190.0	208.0	256.0	224.6	233.5	259.4	269.6	242.2
Other Countries									
Soviet Union/CIS	4.6	4.2	3.4	2.6	2.3	2.0	2.1	2.3	2.2
Total Other Countries	4.6	4.2	3.4	2.6	2.3	2.0	2.1	2.3	2.2
World Total	188.6	194.3	211.4	258.6	226.9	235.5	261.5	271.8	244.4

the US Trade Representative concerning alleged Japanese government restrictions on imports to Japan's consumer film market. Whether or not this is the end of the saga remains to be seen, but on 3rd February 1998, the US Trade Representative announced that they would not appeal the WTO panel ruling. Instead, they pointed out that they would establish an interagency committee to monitor Japan's film market.

As noted in last year's Survey, China's photographic industry is going through a major restructuring. In effect, Kodak has bought all of the domestic Chinese photographic capability with the exception of the largest producer, Lucky Film. Under the terms of the agreement as spelled out by Kodak, they have agreed to "invest more than \$1 billion in China over the next several years. The investment will be used to upgrade technology, improve manufacturing capacity, and expand distribution and marketing capability needed to build and support a strong domestic Chinese imaging industry". Kodak point out that fewer than one Chinese household in ten owns a camera, adding that only around four rolls of film are used on average per camera each year, a small percentage of usage rates in other countries.

Kodak has set up two companies, which it controls, to facilitate its move into the Chinese market. Although there are certain restrictions on what it can and cannot do, it appears as if Kodak has a reasonable

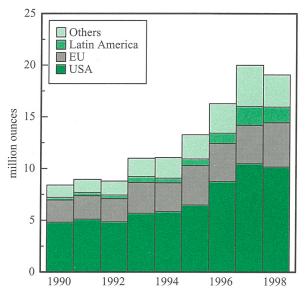
degree of freedom to develop its involvement in the local industry as it sees fit.

In the main, actual production of film and photographic products in China appears to have remained effectively unchanged in spite of all these changes. GFMS estimates that there was a small increase in production related to the slight fall in smuggled film available locally (due to the clampdown on smuggling mentioned earlier). Production is thought to have increased by around 2% to 6.1 Moz (190 t).

Jewelry and Silverware

- At 79.7 Moz (2,480 t) European jewelry and silverware demand was little changed in 1998, as after two years of strong growth production of jewelry stabilized.
- Fabrication in North America declined by a little over 2% in 1998 as small rises in US and Canadian production failed to offset a fall in Mexican jewelry output.
- Turkish demand fell by close to 5%, while Indian fabrication declined by 17% to 71.6 Moz (2,230 t), a fall of 14.7 Moz (460 t).
- Thai silver jewelry fell for the fifth successive year to 23.9 Moz (740 t).

Figure 53
Official Italian Jewelry Exports



Europe

The **Italian** industry used 2% more silver in 1998, its raw material requirements reaching 45.5 Moz (1,420 t).

Silver jewelry, which accounts for the larger share of demand, grew a modest 2% to 26.2 Moz (810 t), consolidating after three years of double-digit expansion. Exports, which consist largely of chain, were the driving force behind this growth in output but ran out of steam by the second quarter of 1998. Weaker world economic growth and high inventories in the leading US market resulted in a demand slowdown, such that in the second half of 1998 exports actually fell year-on-year. For the year as a whole, exports of jewelry fell by some 5% (see Figure 53). Shipments to other European Union countries increased but declined to most other destinations including the United States, South America and East Asia.

Fortunately, the Italian domestic market picked up the slack left by weaker export demand, growing by no less than 15% last year. This was possible thanks to local manufacturers offering innovative and well-designed jewelry that met the prevailing "white-look" fashion. To a limited extent, growth in sales has also been achieved at the expense of gold jewelry - silver jewelry providing a more affordable alternative to cash-strapped consumers than white gold.

Silverware production rose 1% to 19.3 Moz (600 t), the first year of growth since 1992. In the intervening

period (1993-97) production had almost halved due to a collapse in demand for traditional, heavy silverware articles. Last year, however, slow sales of traditional articles were more than offset by the growing production of a vast range of decorative objects and accessories ranging from silver boxes to bread knives. New, keenly priced, fashionable, giftware objects and modern flatware designs have attracted consumers. Manufacturers also benefited from some local stockbuilding last year after the first quarter. Exports fared less well in 1998, declining by some 5%. Although they had, until last year, been growing quite rapidly, exports still only account for about 20% of Italian silverware production (compared to a share of around three-quarters in the case of silver jewelry).

In recent years **Spain** has imported an increasing amount of Italian jewelry and silverware, something that has left little room for growth in local manufacture. Although imports of Italian jewelry barely rose in 1997, last year by contrast there was a strong increase. This growth in imports squeezed local production, it falling by nearly 4% year-on-year. By contrast, Spanish manufacturers of solid silverware recorded a 10% rise in output despite imports of Italian articles hitting the 1 Moz (30 t) level.

UK jewelry offtake declined by 3% last year in stark contrast to the performance of the gold jewelry sector. Significantly higher imports, encouraged by the currency appreciation and high consumer demand crowded out local fabrication which declined despite higher exports of hollow-ware and cutlery.

The jewelry and silverware industries in **France** had a good year with jewelry exports showing strong growth. The main export markets are Japan and other European Union countries. Imports also rose strongly reflecting healthy domestic demand. It is noteworthy that last year, for the first time, the quantity of jewelry imported from Thailand overtook that from Italy.

Greek fabrication fell by 10% in 1998 to 4.1 Moz (130 t). Lower tourist purchases and high unemployment, which affected domestic demand, contributed to the decline.

North America

During the 1990s the trend in the **United States** has been for jewelry fabrication to increase and silverware fabrication to decrease. Last year was no different, although the outcome was a lot closer, with output of jewelry rising by just 2% to 6.8 Moz (210 t) and production of silverware falling by only 1% to 5.8 Moz

(180 t). At a combined 12.6 Moz (390 t) this left the category little changed from its 1997 level.

On the jewelry side there was good growth in demand for silver chains. Companies in the North East of the country, in particular, benefited from this tendency. On the other hand, manufacturers in the South West were hit by stronger import competition in their specific markets.

Overall, however, after growing substantially during the 1990-97 period, last year the increase in US jewelry imports was restricted to just 3% (see Figure 54). Imports from the three largest suppliers to the US market, Italy, Thailand and Mexico actually fell year-on-year. Growth instead came from a number of other countries, principally China, Canada and the Dominican Republic.

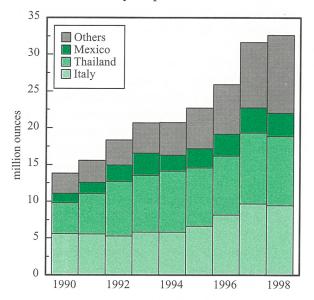
Mexican fabrication was negatively affected by the gyrations in the silver price and adverse developments on the foreign trade front. The volatility of the silver price not only made it difficult for local manufacturers to plan production but also led to some inventory reduction. In the domestic market, Mexican companies were under pressure last year from a nearly 50% rise in jewelry imports from Italy. Difficulties were also experienced by the export sector. Low cost Asian goods have won market share from Mexican producers in the United States. In 1998 official US imports of Mexican silver jewelry declined by 7%.

Middle East

In the Middle East, there are only three countries with substantial jewelry and silverware industries, namely Turkey, Israel and Egypt, though modest quantities of silver jewelry are produced in Iran, Saudi Arabia and Syria. Much of the silver jewelry on display in the region's souks is imported from Italy. Indeed, for many countries in the Gulf, in particular, the only significant use of silver is in the fabrication of carat gold jewelry. The 21 carat gold alloy that is widely used in the Middle East contains typically 5-7% silver, so for the region as a whole, silver offtake for the manufacture of gold jewelry amounts to only around 1 Moz (30 t).

The largest fabricator in the Middle East continues to be **Turkey**, thanks to its production of silverware, which is bought by locals as well as visitors. Demand from both was down last year. In the past two years, the Turkish economy has suffered collateral damage, first from the East Asian crisis and then, in mid-1998 from the problems in the emerging markets. But in

Figure 54
US Silver Jewelry Imports



addition, local demand for silverware has continued to suffer from a secular decline due to a change in tastes, especially on the part of the younger generation. Sales to tourists have been affected because of the perceptions about security in the minds of many of the wealthier potential visitors. So although the number of tourists visiting Turkey has held up well, they have tended to be younger and less wealthy than in recent years. Such tourists are less likely to be in the market for heavyweight silverware, though they are certainly potential buyers of jewelry. This led to some workshops switching some of their capacity from gold to silver jewelry.

The only real bright spot last year was in the export sector, where Turkey's cost advantages were reflected in increasing shipments of silverware to Italy, Germany and the United States.

In **Egypt**, the dependence of the silver market on the tourist sector is, if anything, even greater than in Turkey. The major part of fabrication consists of jewelry and small gift items, such as pharaonic pendants that are purchased in the bazaars near the ancient sites and the hotel shopping arcades in the main resorts. In the early months of 1998, the tourist business was at a low ebb in the aftermath of the Luxor massacre perpetrated in November the previous year. The number of arrivals was well down in what is the peak season and worse, from the point of view of the jewelry trade, the majority of visitors seemed to consist of students, intent on taking advantage of the

cheap offers that had become available. Cancellations were not limited to hotel bookings. Jewelry manufacturers also saw orders disappearing during this period. Fortunately, the silverware sector is more dependent on sales to locals and thus benefited from the continued buoyancy of the economy, which has been such a feature of recent years.

In the second half of the year, after the summer lull, the tourist sector staged a remarkable recovery and the silver business quickly saw its fortunes restored. By the first quarter of 1999, fabricators were reported to be running at full capacity for the first time in several years.

The only other significant fabrication of silverware can be seen in **Dubai**'s gold souk building, where an increasing percentage of the ground floor is being devoted to various gift items, mostly manufactured in the neighbouring emirate of Sharjah.

Indian Sub-Continent

Offtake of silver for the manufacture of jewelry and silverware in **India** represents one of the twin pillars of Asian demand (the other being Japanese industrial and photographic fabrication). Just over two-thirds of Indian offtake last year was in the form of jewelry and silverware, a combined category which encompasses an enormous range of products used for adornment, investment, religious devotion, decoration and as everyday utensils. It should be noted that the data shown in fabrication tables for earlier years have been revised (generally downwards) taking account of new research which indicates a higher level of investment buying of bullion bars in recent years.

The distribution of demand across the country is by no means uniform, reflecting disparate cultural, economic and even religious factors. The north of the country is responsible for the bulk of fabrication demand - primarily in the form of traditional heavyweight investment jewelry. It is this type of jewelry - bought above all by purchasers in rural areas - which has been mainly responsible for the phenomenal growth of Indian offtake in the past decade. Urban buyers, on the other hand, are more likely to purchase silver utensils and lightweight jewelry, such as the ubiquitous payal or ankle chain.

The sharp fall in fabrication last year stemmed from three adverse developments. The most important of these was the 14% year-on-year rise in the Indian silver price, equivalent to 6% in real terms, and the first substantial increase of the past decade. The

increase was only marginally greater than that in the international price in spite of a 13% weakening of the rupee. This was because, with the advent of OGL imports, the fall in the local premium compensated almost exactly for the weakening of the rupee. Nevertheless, with the gold price showing a corresponding fall in real terms of 16%, the result was a significant shift in buying from silver to gold. Of course, the price did not rise in a straight line: most of the damage was done in the first quarter, during which the local price briefly went to a discount to London, indicating by how much net demand had been affected by the rising price. In the following months, demand bounced back dramatically as the price fell back, second quarter bullion imports being the third highest on record. However, the pace was not sustained in the second half of the year in spite of a further weakening of the price.

After the price, the next most important influence on silver demand last year was the performance of the agricultural sector. The index of agricultural production for the 1997/98 farming year showed the most significant downturn for the past decade. The problem was not a lack of rain but rather a surfeit, with unseasonal storms affecting both the winter crop, in the early months of 1998, and the main summer crop in the third quarter. As a result, farmers' incomes were reduced and so, inevitably, were their purchases of silver. But consumers also suffered from the resulting high prices of foodstuffs and this led to reduced spending on non-essentials, including silverware. Although agricultural output suffered from the excessive rains during the past year, these have, somewhat paradoxically, helped to produce a record winter crop in early 1999, which ought to augur well for silver demand in the second quarter.

The final negative factor for silver last year was the generally weak tone of the economy, mostly because of a spillover from the East Asian crisis. With the depreciation of the rupee being quite modest, exporters found it difficult to compete with the very low-priced goods available in the international marketplace from countries such as Korea, Thailand and Malaysia. GDP growth over the last two years has slipped back towards 5% from the 7% level which had been achieved for three years in a row during the middle of the decade.

Elsewhere in the Sub-continent, demand also declined last year. The fall in **Pakistan** was particularly sharp, the result of the country's economic

difficulties, especially in the second half and the devaluation of its currency in mid-year.

East Asia

Thai jewelry and silverware fabrication fell sharply in 1998, by almost 11%, the fifth year in a row in which a fall has been recorded. Two major factors were at work in driving down overall silver offtake. Firstly, and most importantly, the collapse of the baht and the Thai economy had a severe impact on virtually all the major silver fabricators, for reasons that we discuss in more detail below. Secondly, Thai manufacturing is moving to higher value added products as competition from markets like Indonesia at the lower, plain jewelry, end of the market increases.

Turning to the first of these two points, it is worth emphasising that the Thai jewelry industry is centered around exports, either directly or via tourist buying. To suggest, as some have, that there was growth in Thai silver offtake in 1998 on the back of higher local demand simply misses the point. No self-respecting Thai woman would substitute silver for gold jewelry. To the extent that there is domestic *consumption* in Thailand, this is centered around the Northern belts of the country, and is mainly silverware demand, not jewelry. Movements in offtake in 1998 were wholly dictated by developments in the export market.

However, contrary to what might have been expected, it was not a lack of interest from the main importing countries like the US that drove down the demand for silver. In fact, interest in Thai silver jewelry actually increased over this period, very much as one would have expected in the light of the collapse of the baht in July, which drove down local costs.

As noted in last year's Survey, the precipitous collapse in the baht had the perverse effect of reducing the amount of fabrication that many manufacturers could take on. Later in 1998, when the baht started to strengthen, there was a similar effect of the willingness of manufacturers to take orders, although for different reasons.

In the first instance, when the baht was weakening, many fabricators found themselves facing severe financing constraints, and simply could not fill the orders coming through their doors. It was not uncommon to hear fabricators describing how they had turned away large orders from long-standing customers because they could not finance the work in progress. The problem was especially acute for the smaller informal workshops who service much of the Thai

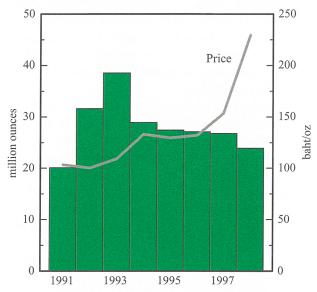
silver industry, but even the better capitalized and established firms faced problems in raising finance from the banks as the full impact of the Asian crisis took hold. Of the group of fabricators regularly surveyed by GFMS on field trips to Thailand, *not one* reported increased production in 1998 (by GFMS estimates, this group accounts for around 40% of Thai silver fabrication alone).

Ironically, the problem did not disappear when the baht started to strengthen in 1998. It simply replaced one problem with another. In this case, fabricators were unwilling to buy silver to fabricate because they were worried about losing money as the baht strengthened. The logic behind this was simple but cruel. Not being able to hedge, fabricators were unwilling to buy silver at say a higher baht price to find it strengthening against the dollar a few days later. For instance, in July, the baht went from 44 to the dollar to 40, around a 10% movement, in only two days. Although most movements were not as pronounced as this, fabricators were in the position of losing a lot of money in a very short space of time. The result was that they held back on purchases until they felt that the baht had stabilised sufficiently to take the risk of effectively buying US dollars.

It is interesting to note that the price spike at the beginning of 1998 did not appear to be a major factor in determining the drop in offtake, although it did compound the problem of financing work in progress and stock.

The second reason for the decline in Thai silver offtake concerns changes in the types of jewelry being produced. Rising competition at the lower end of the silver jewelry market, from the likes of the Chinese and Indonesians amongst others, has prompted many Thai fabricators to move "upmarket" into higher value added areas of the business. It is not uncommon to find some fabricators whose dollar revenues have held steady or even increased, but whose silver use has fallen by 30-40%. The main reason for this is that they are now producing gemset jewelry where the silver content of any piece is small. This move has been partly self-imposed because of competition, but is also reflective of changing tastes in markets like the United States and Europe. In the United States, for example, blue topaz and amethyst gemset silver jewelry has made inroads into the plain market, and Thai fabricators have seen this in the types of items being ordered by the large US wholesalers and stores. Similar trends have also been evident in Europe, with

Figure 55
Thai Jewelry and Silverware Fabrication



synthetic topaz, cubic zirconia, and sapphire gemset jewelry becoming increasingly popular.

All the indications are that silver jewelry fabrication demand in **Indonesia** fell sharply in 1998, by close to 40%, taking offtake down to only 2.2 Moz (70 t). Two factors underpinned this fall. Firstly, social unrest in Indonesia hit the tourist trade, and sales in the major destinations such as Bali fell as a result. Secondly, the use of silver in gold carat jewelry alloying fell sharply as the local gold industry effectively collapsed. One bright spot was the rise in exports to the United States.

There was a precipitous collapse in **Korean** jewelry and silverware demand in 1998. GFMS estimates that demand fell by close to 60% to 2.6 Moz (80 t). Developments in the silver market mirrored what was happening in the gold market, where domestic consumption all but evaporated early in 1998, with the only demand being seen in the export markets.

Most suppliers to the local market noted that spoon demand fell sharply, and that many of the fabricators had either shut down or suspended production. Some of the decline in new silver demand was undoubtedly the result of increases in scrap, but most was due to the collapse in total demand.

Coin and Medals

 World coin fabrication fell by 2.9% in 1998 despite higher offtake in Germany, Canada and the United States. North American production is expected to continue rising in 1999.

The 2.9% decline in world coin fabrication last year to 27.2 Moz (850 t) was less pronounced than many would have expected.

Given the complete absence of coin demand last year in Japan, which absorbed over 7 Moz (220 t) in 1997, it was arguable that coin demand would continue its downward trend of the past four years. However, increased offtake in Europe, North America and Australia mitigated the decline. Elsewhere Chinese fabrication fell by 14%.

European offtake rose 6.2 Moz (190 t) to its second highest level this decade. **German** fabrication of the silver circulating coin effectively accounted for most of this increase. Last year's production consisted of four issues, each of 4.5 million coins. The main themes for these issues included the fiftieth anniversary of the Deutschemark. There was also an additional production of four proof issues of 1 Moz (30 t) each. All coins were minted in sterling 925 silver, weighing 15.5 grams. The change from 625 silver, last used for the 1997 issues, reflected that, by and large, the coins are purchased as collectors' items.

The only other increase of note was the 20% rise in **Portuguese** fabrication to its highest level this decade. The commemorative issue to mark Expo-1998, held in Lisbon, and also minted in sterling silver, made a significant contribution to the 1 Moz (30 t) total.

After a successful launch in 1994, production of the **Spanish** Pta2000 silver circulating coin has consistently recorded double-digit declines. However, last year's offtake of 1.7 Moz (50 t) represented a fall of just 3.6% on 1997.

North American fabrication bounced back to its 1996 total of 7.8 Moz (240 t) after falling by almost 10% in 1997.

The 0.5 Moz (14 t) increase in **US** fabrication was effectively due to a 17% rise in Eagle production. Given the strength of the increase in second half fabrication the rise may have been significantly higher had December output not been limited after production of 1998 issue coins was halted early in the month. Demand has remained at a high level into 1999. During the first four months of this year over 2.8 Moz (90 t) of coins have already been minted representing 65% of last year's total. Much of the increase since mid-1998 can be attributed to "Y2K" demand.

Public interest has not only led to higher Eagle

demand, but has also resulted in increased demand for silver coin bags. These contain pre-1964 40% and 90% silver coins with a US\$1,000 face value, weighing roughly 55 pounds. In line with silver Eagle sales, demand for these bags jumped in January 1999 with, for example, bags being delivered for \$6,000 compared to the already high \$4,600 being quoted at the end of December 1998.

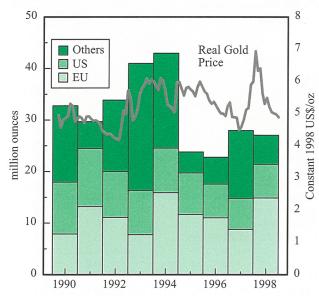
Commemorative programs in the United States have been cut back for a number of years, to ensure sell outs and also in response to excess capacity in the market. However the decline in 1998 was much smaller than in previous years. Last year's total included issues to commemorate Robert F Kennedy, Black Patriots and the Law Enforcement Memorial.

Canadian fabrication was split almost 50:50 between the Maple Leaf and commemorative issues. Maple Leaf offtake increased four-fold to its highest level since 1994, despite a weak second quarter. Fourth quarter output of over 0.3 Moz (9 t) helped push the annual total to over 0.5 Moz (15 t).

Australian offtake rose to its highest level since 1994 largely as a result of coin production for Sydney 2000 Olympics. There are, in total, sixteen designs, each of 100,000, 1oz coins, with a A\$5 face value.

Chinese fabrication declined by 14% to 2.4 Moz (80 t). Three main factors accounted for the lower production. Firstly, the Asian crisis hit incomes and so sales were lower. Secondly, 1997 offtake was significantly higher due to the Hong Kong Return commemorative coin. Finally, in late 1997, the PBOC issued regulations on coin dealing, stating that only officially registered dealers could buy and sell coins which may have adversely affected purchases.

Figure 56
World Coin Fabrication



including the use of scrap)									
Million ounces									
	1990	1991	1992	1993	1994	1995	1996	1997	1998
Europe									12/15
Germany	2.6	5.7	5.6	2.8	7.1	2.4	4.6	3.7	10.1
Spain	0.4	1.1	0.4	0.3	4.8	4.0	2.8	1.8	1.7
Portugal	0.1	0.0	0.1	0.3	0.4	0.5	0.8	0.8	1.0
UK & Ireland	0.4	0.4	0.5	0.7	0.8	0.7	0.6	0.6	0.6
Italy	0.4	0.6	0.4	0.4	0.5	0.5	0.5	0.4	0.4
Austria France	0.5 2.1	0.6 2.3	0.5 2.1	0.5 2.1	0.5 1.0	0.6 1.1	0.4 0.3	0.3	0.3
Switzerland	0.2	1.6	0.4	0.3	0.3	0.4	0.5	0.3 0.6	0.3
Poland	0.3	0.2	0.4	0.3	0.2	0.4	0.0	0.0	0.3
Belgium	0.5	0.3	0.0	0.0	0.0	0.2	0.1	0.1	0.1
Netherlands	0.7	0.1	0.0	0.0	0.6	1.1	0.2	0.1	0.1
Czech & Slovak Republics	0.1	0.1	0.1	0.0	0.0	0.1	0.0	0.1	0.1
Finland	0.2	0.2	0.2	0.0	0.1	0.1	0.1	0.1	0.0
Norway	0.0	0.5	0.9	0.3	0.0	0.0	0.0	0.0	0.0
Denmark	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.0
Other	0.1	0.1	0.2	0.4	0.1	0.2	0.3	0.1	0.2
Total Europe	8.6	13.8	11.7	8.3	16.3	12.3	11.5	9.2	15.4
orth America									
United States	10.1	11.3	8.9	8.6	8.7	8.1	6.6	6.0	6.5
Canada	1.9	0.9	0.8	1.2	1.5	0.7	0.7	0.7	1.1
Mexico	1.2	1.6	8.7	17.1	13.0	0.6	0.5	0.4	0.2
Total North America	13.3	13.7	18.4	26.9	23.2	9.3	7.8	7.1	7.8
Central & South America	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total Central & South America	0.1	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Iiddle East									
Israel	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.1
Egypt	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0
Total Middle East	0.0	0.0	0.1	0.0	0.7	0.1	0.1	0.1	0.1
ast Asia									
Thailand	0.0	0.0	0.1	0.2	0.2	0.3	0.5	0.3	0.2
Singapore	0.1	0.0	0.9	0.1	0.1	0.1	0.1	0.0	0.1
Japan Other	8.9 1.0	0.0	0.0	2.4 0.0	0.0	0.0	0.0	7.2	0.0
Total East Asia	10.0							0.0	0.0
	10.0	0.1	1.0	2.7	0.3	0.4	0.6	7.5	0.3
ceania Australia	0.4	0.5	2.1	2.3	1.6	0.7	0.8	0.8	1.0
Total Oceania	0.4	0.5	2.1	2.3	1.6	0.7			
Vestern World Total							0.8	0.8	1.0
other Countries	32.4	28.3	33.5	40.3	42.2	22.8	20.8	24.8	24.6
China	0.4	1.4	0.4	0.4	0.7	0.8	1.4	2.8	2.4
Soviet Union/CIS	0.0	0.0	0.4	0.4	0.7	0.8	0.6	0.4	0.2
North Korea	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2
Total Other Countries	0.4	1.4	0.5	0.7	0.9	0.9	2.0	3.2	2.6
Vorld Total	32.8	29.7	33.9	41.0	43.0	23.8	22.8	28.0	27.2

World Silver Survey 1999

Appendix I

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Supply									
Mine Production	16,122	15,739	14,956	14,406	13,934	14,896	15,113	16,149	16,969
Net Official Sector Sales	22	_	-	408	806	1,044	841	227	1,613
Old Silver Scrap	4,193	4,402	4,596	4,599	4,706	5,048	4,907	5,247	5,934
Hedging	473	591	40	832	-	205	-	2,074	158
Implied Disinvestment	1,612	1,746	3,351	4,175	4,813	3,119	4,807	3,046	1,470
Total Supply	22,422	22,478	22,943	24,420	24,260	24,312	25,668	26,743	26,144
Fabrication Industrial	8,656	8,452	8,225	8,568	8,953	9,393	9,462	10,191	10,068
	8,656 6,878	6,726		6,535	8,953 6,628	9,393 6,857	6,986	7,227	7,628
Photography Silverware /Jewelry	5,866	6,043	6,542 6,576	8,044	7,056	7,324	8,134	8,455	7,628
Official Coins	1,022	923	1,056	1,275	1,339	739	709	870	849
Total Fabrication	22,422	22,144	22,399	24,420	23,976	24,312	25,290	26,743	26,144
Net Official Sector Purchases		334	544	,		,			,
Hedging	_	-	-	_	284	-	378	-	-
Implied Investment	-	-	-	-	-	-	-	-	_
Total Demand	22,422	22,478	22,943	24,420	24,260	24,312	25,668	26,743	26,144
Silver Price (London US\$/oz)	4.832	4.057	3.946	4.313	5.285	5.197	5.199	4.897	5.544

Figure 57
World Silver Supply

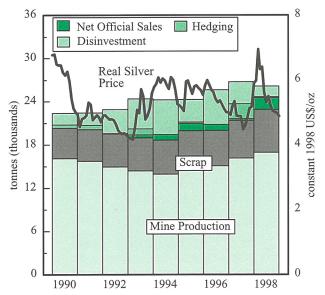
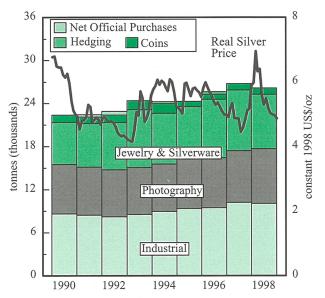


Figure 58
World Silver Demand



World Silver Survey 1999

Table 2	2		
World	Silver	Mine	Production
Tonnes			

Tonnes										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Europe										
Poland	832	899	798	915	859	984	953	1,050	1,119	
Sweden	224	254	282	278	252	250	241	265	260	
Spain	230	233	233	183	176	174	180	191	176	
Greece	63	70	61	59	45	45	16	36	64	
Serbia	106	92	80	25	28	31	34	39	39	
Romania	60	50	48	45	42	44	44	43	39	
Portugal	42	43	38	36	32	39	34	34	32	
Finland	29	30	27	29	26	27	34	32	30	
Bulgaria	106	59	84	96	56	44	35	31	25	
Ireland	9	11	13	13	17	14	15	13	11	
Czech & Slovak Republics	26	28	20	16	12	10	7	8	8	
Italy	14	14	12	5	14	14	9	4	4	
Norway	9	10	11	7	7	. 5	4	4	4	
France	21	28	13	12	3	4	3	2	1	
Other	21	8	2	2	2	2	2	2	2	
Total Europe	1,792	1,829	1,722	1,721						
	1,792	1,829	1,722	1,721	1,571	1,687	1,609	1,754	1,813	
North America Mexico	2,453	2,284	2.006	2.215	2.215	2.250	2.520	2.701	0.077	
			2,096	2,215	2,215	2,258	2,529	2,701	2,877	
United States	2,125	1,848	1,804	1,645	1,480	1,550	1,556	1,966	1,954	
Canada	1,381	1,262	1,169	879	740	1,245	1,243	1,213	1,125	
Total North America	5,959	5,394	5,069	4,739	4,435	5,053	5,327	5,881	5,956	
Central & South America										
Peru	1,927	2,087	1,668	1,671	1,742	1,908	1,968	2,077	2,024	
Chile	655	677	1,025	970	983	1,042	1,144	1,091	1,344	
Bolivia	357	375	316	332	353	428	384	387	406	
Argentina	83	70	46	43	38	40	31	33	69	
Honduras	31	43	35	24	27	30	38	45	45	
Brazil	35	30	21	21	18	15	14	9	8	
Dominican Republic	23	22	13	17	9	21	17	12	7	
Other	9	11	15	15	39	10	9	9	9	
Total Central & South Ameri	ica3 120	3,315	3,139	3,093	3,209	3,493	3,605	3,663	3,912	
Asia	1043,120	3,313	3,137	3,073	3,207	3,73	3,003	3,003	3,912	
Indonesia	66	78	100	90	97	238	239	263	311	
Japan	149	171	172	137	134	100	89	87	95	
Turkey	28	40	78	72	67	65	90	90	87	
Papua New Guinea	107	124	95	96	77	66	60	49	58	
India	35	34	26	51	50	38	36	50	52	
Philippines	45	35	29	33	31	33	25	20	17	
Saudi Arabia	15	14	15	16	16	17	16	16	14	
Malaysia	12	13	15	14	13	11	10	10		
Thailand	14	17							7	
Other	69	61	5 76	3 61	4 79	7 80	8 77	3	4	
								80	88	
Total Asia	540	587	611	573	568	655	649	669	732	
Africa										
Morocco	185	206	152	237	258	204	200	260	306	
South Africa	160	171	182	195	192	178	171	163	157	
Namibia	93	92	89	72	62	66	42	39	14	
Zambia	19	14	18	18	11	8	9	7	8	
Zimbabwe	21	19	17	12	11	11	10	10	6	
Dem. Republic of the Congo	84	59	30	11	1	1	1	1	1	
Other	9	12	11	10	11	11	11	10	11	
Total Africa	571	573	499	555	545	479	443	489	502	
Oceania										
Australia	1,173	1,180	1,218	1,152	1,044	982	1,020	1,106	1,469	
New Zealand	9	11	23	26	24	30	31	33	26	
Fiji	1	0	1	1	1	2	2	2	2	
	1,183	1,191	1,242	1,179	1,069	1,014			1,496	
Intal ()coania		1.171	1.444	1,1/9	1,009	1,014	1,053	1,141	1,490	
Total Oceania Western World Total	13,165	12,890	12,282	11,860	11,397	12,381	12,687	13,597	14,412	

World Silver Survey 1999

World Silver Mine Prod	duction									
Tonnes										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Other Countries										
Soviet Union/CIS	2,174	2,013	1,831	1,690	1,532	1,482	1,356	1,304	1,302	
China	705	765	767	774	925	952	1,000	1,180	1,190	
Mongolia	28	21	23	26	27	28	29	31	33	
North Korea	50	50	53	56	53	53	40	36	32	
Total Other Countries	2,957	2,849	2,674	2,546	2,537	2,515	2,425	2,552	2,557	
World Total	16,122	15,739	14,956	14,406	13,934	14,896	15,113	16,149	16,969	

Figure 59
World Silver Mine Production

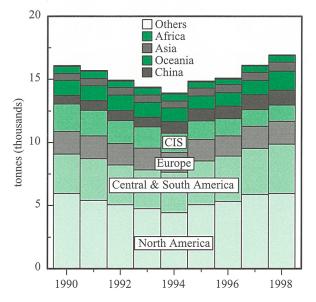
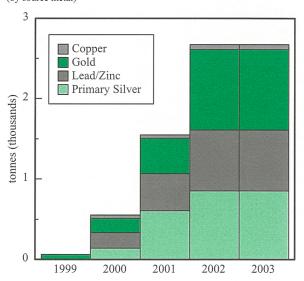


Figure 60
Cumulative Future Silver Mine Production
(by source metal)



	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Europe	1,,,,	1,,,1	1992	1990	1774	1775	1770	1337	1770	
Germany	500	500	500	490	480	460	480	500	510	
UK & Ireland	225	225	225	228	245	231	236	261	337	
Italy	85	85	85	85	87	100	110	105	145	
France	96	118	166	124	130	145	140	133	127	
Austria	60	60	60	60	60	63	55	56	57	
Netherlands	35	35	36	35	39	35	39	40	40	
Sweden	34	34	34	34	34	34	34	35	34	
Norway	24	24	24	24	24	24	30	30	25	
Czech & Slovak Republics	20	26	30	24	22	23	28	25	22	
Belgium	20	20	20	20	20	20	20	20	20	
Denmark	21	20	20	20	20	19	19	19	19	
Portugal	12	12	12	12	12	19	13	19		
									14	
Spain Switzerland	12 17	11 17	10	10	10	12	14	14	13	
Romania			17	44	15	47	48	20	10	
	3	3	3	3	3	3	3	3	3	
Other	42	44	46	47	48	46	48	49	48	
Total Europe	1,206	1,234	1,288	1,260	1,249	1,274	1,317	1,324	1,424	
North America										
United States	1,392	1,329	1,317	1,343	1,405	1,432	1,505	1,612	1,733	
Mexico	70	70	70	70	70	150	75	134	330	
Canada	41	41	41	41	41	52	55	50	60	
Total North America										
	1,503	1,440	1,428	1,454	1,516	1,634	1,635	1,796	2,123	
Central & South America										
Brazil	60	60	60	60	60	60	60	50	50	
Argentina	20	20	20	20	20	20	20	20	20	
Chile	14	14	14	14	14	14	14	14	17	
Other	26	26	26	25	23	23	23	23	29	
Total Central & South Ameri	ca 120	120	120	119	117	117	117	107	116	
Middle East										
Saudi Arabia & Yemen	2	2	19	25	58	94	40	101	64	
Turkey	55	58	60	63	70	72	60	50	53	
Egypt	35	31	20	32	28	25	22	10		
Other	6	6	6	11	11	11	11		5	
								11	12	
Total Middle East	98	97	105	131	167	202	133	172	134	
ndian Sub-Continent										
India	124	300	225	140	140	300	200	300	370	
Other	2	4	5	7	6	9	5	10	15	
Total Indian Sub-Continent	126	304	230	147	146	309	205	310	385	
East Asia		- * .		- ' '	- 10	207	200	210	303	
Japan	487	589	752	016	026	050	0.40	065	000	
South Korea	59	67	70	816	836 80	850	842	865	908	
Thailand	10	10	10	75		90	94	98	160	
Taiwan				10	10	10	11	25	30	
	30	30	25	22	20	20	20	22	24	
Hong Kong	8	8	8	8	8	9	9	11	15	
Philippines	4	4	5	5	5	10	12	13	13	
Vietnam	8	8	8	7	10	11	11	12	12	
Indonesia	4	5	7	7	9	10	11	11	12	
Singapore	9	9	9	9	12	12	11	11	12	
Malaysia	3	3	3	3	3	3	3	3	4	
Total East Asia	622	733	897	962	993	1,025	1,024	1,071	1,190	
frica										
South Africa	4	4	3	4	4	4	4	4	4	
Other	28	28	30	29	27	33	31	29	30	

Tonnes	e Recyclin	.g 01 01 a	ourap							
Tollies										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Oceania										
Australia	71	71	71	75	78	78	73	71	74	
Total Oceania	71	71	71	75	78	78	73	71	74	
Western World Total	3,778	4,031	4,172	4,181	4,297	4,675	4,538	4,884	5,479	
Other Countries										
Other	415	371	424	418	409	373	369	363	455	
Total Other Countries	415	371	424	418	409	373	369	363	455	
World Total	4,193	4,402	4,596	4,599	4,706	5,048	4,907	5,247	5,934	

Figure 61
World Scrap Supply

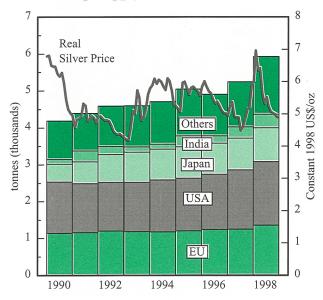
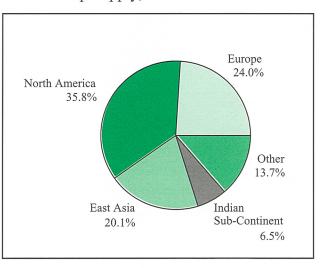


Figure 62 World Scrap Supply, 1998



(including the use of scrap) Tonnes										
1041100	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Europe										
Italy	1,599	1,766	1,897	1,781	1,636	1,576	1,642	1,774	1,773	
Germany UK & Ireland	1,688	1,800	1,706	1,507	1,642	1,431	1,419	1,431	1,508	
	777 619	790 628	835 629	882	971	1,005	1,071	1,104	1,265	
Belgium France	825	891	962	642 938	655 876	728 968	788 845	813 891	1,012 864	
Switzerland	178	237	208	194	221	229	243	298	332	
Spain	472	542	206	191	333	309	288	271	275	
Greece	100	105	110	115	120	118	130	140	126	
Poland	159	120	64	70	79	96	94	104	111	
Portugal	77	72	78	77	64	76	88	89	96	
Netherlands	86	68	66	65	81	98	67	65	65	
Norway	33	63	78	60	51	50	45	46	47	
Sweden	47	60	51	49	47	43	46	52	43	
Austria Denmark	48 33	53 30	50	48	46	51	46	42	42	
Czech & Slovak Republics	53 54	30 47	33 31	30 21	30 18	33 24	31 23	35 24	32 28	
Finland	43	46	40	28	31	27	30	29	28	
Romania	23	19	16	14	13	9	13	11	16	
Cyprus & Malta	7	7	8	8	11	12	13	12	11	
Other	30	29	32	34	27	28	28	23	24	
Total Europe	6,899	7,373	7,098	6,753	6,952	6,909	6,947	7,255	7,690	
North America								,,		
United States	4,226	4,208	4,230	4,361	4,639	4,876	5,026	5,374	5,872	
Mexico	438	468	712	994	859	544	646	736	690	
Canada	203	145	73	88	96	83	83	87	106	
Total North America	4,868	4,821	5,015	5,443	5,594	5,503	5,755	6,198	6,668	
Central & South America										
Brazil	211	208	206	215	257	291	262	260	253	
Argentina	126	126	126	126	126	122	118	118	97	
Peru Colombia	48	37	29	26	28	31	34	35	34	
Ecuador	33 12	33 12	34 12	33 17	33	33	33	33	33	
Chile	15	15	15	17	21 15	21 15	21 15	21	21	
Other	19	18	17	18	15	19	27	15 41	15 50	
Total Central & South Americ		449	438	451	495	532	510	523	503	
Aiddle East	70 1	112	150	131	173	332	310	323	303	
Turkey	153	145	170	185	161	189	198	203	191	
Israel	65	73	80	88	95	105	116	125	120	
Egypt	50	54	72	59	78	67	70	65	65	
Saudi Arabia	7	9	12	14	10	12	12	20	16	
Other	50	60	83	64	76	79	82	81	77	
Total Middle East	325	339	417	409	420	452	479	493	469	
ndian Sub-Continent India	1 455	1 205	1 000	2 202	2.020	2.150	2.001	2.024	2.245	
Bangladesh & Nepal	1,455 55	1,395 62	1,808 82	3,383 120	2,920 140	3,152 160	3,801	3,824	3,245	
Other	52	70	86	105	88	117	180 84	200 127	160 87	
Total Indian Sub-Continent	1,562	1,527	1,976	3,608	3,148	3,429	4,065	4,151	3,492	
ast Asia	1,502	1,041	1,270	2,000	3,170	3,743	4,003	4,131	3,474	
Japan	3,601	3,383	3,263	3,356	3,373	3,504	3,487	3,955	3,508	
Thailand	751	625	984	1,205	905	862	859	843	751	
South Korea	211	290	280	484	510	579	575	579	429	
Taiwan	140	111	134	149	164	179	198	214	220	
Hong Kong	75	65	71	81	106	107	117	138	112	
Indonesia	45	53	60	57	83	97	104	126	84	
Myanmar, Laos & Cambodia	31	31	31	31	31	33	34	30	25	

Table 4 World Silver Fabrication										
including the use of scrap)										
Tonnes	1990	1991	1992	1993	1994	1995	1996	1997	1998	
	1770	1771	1772	1773	1774	1775	1770	1991	1770	
Vietnam	9	9	9	12	16	20	· 21	22	19	
Malaysia	9	11	12	14	11	12	12	13	9	
Other	14	13	36	12	11	11	11	10	11	
Total East Asia	4,886	4,590	4,879	5,402	5,210	5,404	5,418	5,928	5,167	
Africa										
Morocco	14	15	15	14	14	17	18	20	18	
Tunisia	6	6	6	7	8	8	9	10	10	
South Africa	16	10	9	18	12	14	9	8	8	
Algeria	12	11	10	9	9	9	8	7	6	
Other	18	18	17	16	16	15	13	12	11	
Total Africa	66	60	57	64	59	63	57	56	53	
Oceania										
Australia	161	163	214	217	196	166	162	161	176	
Total Oceania	161	163	214	217	196	166	162	161	176	
Western World Total	19,230	19,323	20,094	22,346	22,074	22,458	23,393	24,764	24,218	
Other Countries										
China	684	730	743	797	917	953	1,013	1,116	1,124	
Soviet Union/CIS	2,508	2,090	1,562	1,271	985	901	884	864	802	
North Korea	0	2	0	7	0	0	0	0	0	
Total Other Countries	3,192	2,821	2,305	2,075	1,902	1,854	1,897	1,979	1,926	
World Total	22,422	22,144	22,399	24,420	23,976	24,312	25,290	26,743	26,144	

Figure 63
World Silver Fabrication

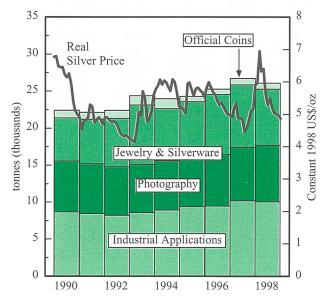
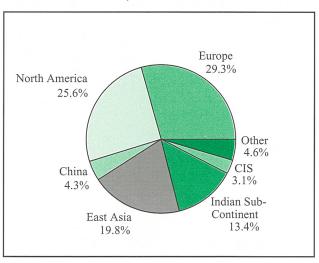


Figure 64
World Fabrication, 1998



Tonnes										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Europe										
Germany	695	656	622	580	560	575	535	555	571	
UK & Ireland	326	335	344	354	363	371	381	388	506	
Italy	296	308	315	331	333	348	366	371	348	
France	315	346	399	352	360	374	363	417	325	
Switzerland	159	177	188	174	203	206	215	269	311	
Spain	59	59	57	57	54	55	61	91	95	
Netherlands	54	54	54	54	54	54	54	52	52	
Poland	19	14	15	19	24	26	24	23	23	
Austria	19	19	19	19	19	22	19	18	17	
Czech & Slovak Republics	24	21	17	16	13	16	17	13	13	
Sweden	10	10	10	10	10	10	10	11	11	
Belgium	10	10	10	10	10	10	10	10	10	
Other	37	36	35	35	36	36	34	35	35	
Total Europe	2,023	2,045	2,085	2,011	2,039	2,103	2,089	2,252	2,317	
North America	1.500	1.500	1 (22	1	1.007	2670	0.400	0.5.15		
United States	1,523	1,533	1,638	1,751	1,886	2,050	2,120	2,343	2,520	
Mexico	80	80	80	80	86	79	81	89	100	
Canada	22	22	22	23	20	23	20	20	17	
Total North America	1,625	1,635	1,740	1,854	1,992	2,152	2,221	2,452	2,637	
Central & South America										
Brazil	75	75	75	78	100	108	102	105	108	
Argentina	40	40	40	40	40	38	36	36	36	
Colombia	9	9	9	9	9	9	9	9	9	
Other	14	14	14	14	14	14	14	14	14	
Total Central & South Ameri	ca 138	138	138	141	163	169	161	164	167	
Middle East	си 150	150	130	171	103	109	101	104	107	
Israel	12	1.0	0.1	06	20	20	22	21	21	
	13	18	21	26	28	30	33	31	31	
Turkey	24	23	27	29	26	29	28	31	28	
Egypt	3	3	4	3	3	3	4	3	4	
Other	0	0	9	0	0	0	0	1	1	
Total Middle East	40	44	61	58	57	63	64	66	63	
ndian Sub-Continent										
India	438	517	621	901	999	1,062	1,105	1,120	1,007	
Other	9	12	15	18	15	20	14	22	15	
Total Indian Sub-Continent	482	529	636	919	1,014	1,082	1,119	1,142	1,022	
East Asia	102	32)	050	717	1,017	1,002	1,117	1,174	1,022	
	1 440	1 477	1.071	1.407	1.501	1.000	1.600	1.040	1 (12	
Japan South Korea	1,448	1,477	1,371	1,425	1,591	1,667	1,622	1,848	1,643	
South Korea	71	125	125	260	311	369	370	382	349	
Taiwan	94	96	115	131	146	163	181	197	193	
Hong Kong	47	35	41	51	76	79	88	107	93	
Indonesia	12	18	22	12	11	12	13	15	16	
Total East Asia	1,672	1,751	1,674	1,879	2,135	2,289	2,273	2,549	2,304	
frica										
Morocco	2	2	2	2	2	5	7	7	7	
South Africa	15	9	7	16	10	10	5	5	5	
Other	7	7	7	7	7	7	7	5	5	
Total Africa	24	18	16	25	19	22	19	17	17	
Oceania		60								
Australia	61	60	61	63	67	76	70	66	72	
Total Oceania	61	60	61	63	67	76	70	66	72	
Vestern World Total	6,065	6,219	6,410	6,951	7,485	7,956	8,017	8,708	8,599	

Table 5 Silver Fabrication: Indu	strial Annl	ications								
(including the use of scrap)	strar Appr	ications								
Tonnes										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Other Countries										
China	537	549	585	625	722	755	790	841	859	
Soviet Union/CIS	2,054	1,684	1,230	992	746	682	655	642	610	
Total Other Countries	2,591	2,233	1,815	1,617	1,468	1,437	1,445	1,483	1,469	
World Total	8,656	8,452	8,225	8,568	8,953	9,393	9,462	10,191	10,068	

Figure 65
Main Components of Industrial Applications

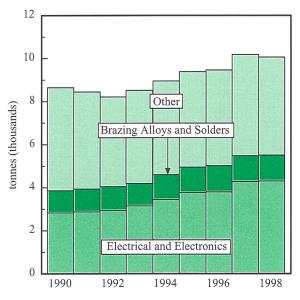
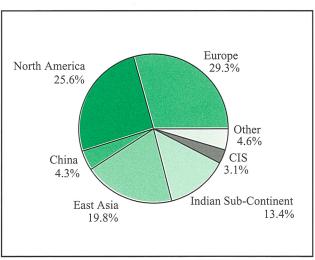


Figure 66
World Industrial Fabrication, 1998



	1990	1991	1992	1993	1994	1995	1996	1997	1998	
United States	725	731	802	890	983	1,120	1,129	1,303	1,373	
apan	697	697	631	650	701	743	706	804	738	
Germany	419	396	375	350	340	370	360	370	380	
China	236	241	255	267	330	340	350	378	365	
Switzerland	40	60	80	86	108	117	127	172	228	
United Kingdom	132	138	139	141	143	145	155	160	210	
France	150	165	193	155	168	190	195	238	188	
South Korea	0	19	16	140	164	200	199	201	188	
Гaiwan	69	70	85	89	102	113	130	146	148	
ndia	73	76	76	76	80	92	100	130	130	
taly	93	95	96	100	85	85	103	100	90	
Hong Kong	39	26	27	37	57	59	68	85	77	
Brazil	31	31	31	32	46	49	45	45	45	
Mexico	36	36	36	36	38	34	34	36	40	
Spain	26	28	28	30	28	28	28	29	30	
Turkey	24	23	27	29	26	29	28	31	28	
Vetherlands	20	20	20	20	20	20	20	18	18	
Australia	13	13	13	14	14	17	16	15	17	
Austria	7	7	7	7	7	7	7	7	7	
Romania	4	3	3	3	3	3	3	3	4	
Egypt	3	3	4	3	3	3	4	3	4	

China 124 140 156 162 171 187 200 210 230 apan 140 148 130 119 147 150 160 155 130 Germany 168 158 150 140 125 110 90 95 97 United Kingdom 70 70 70 71 72 72 72 72 75 tally 55 60 65 70 75 85 83 76 73 80 75 55 56 56 52 52 49 10 10 10 10 10 10 10 10 10 14 13 14 14 15 11 10 90 95 97 15 15 15 15 15 15 11 10 10 10 14 14 14 14 14 14 14 14 14 <											
China 124 140 156 162 171 187 200 210 230 dapan 140 148 130 119 147 150 160 155 130 Germany 168 158 150 140 125 110 90 95 97 United Kingdom 70 70 70 71 72 72 72 72 72 75 taly 55 60 65 70 75 85 83 76 73 Switzerland 75 80 75 55 56 56 56 52 52 49 ndia 40 45 45 45 45 50 60 65 50 47 Grance 55 65 74 55 45 40 42 43 32 Gapain 20 18 15 11 9 9 18 29 32 Gapain 16 16 20 23 25 32 35 34 31 Mexico 28 28 28 28 28 31 27 27 28 30 Gouth Korea 3 6 9 25 30 38 36 35 25 Australia 18 18 18 19 20 23 21 20 22 Gapain 13 13 13 13 16 13 13 10 Metherlands 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8		1990	1991	1992	1993	1994	1995	1996	1997	1998	
China 124 140 156 162 171 187 200 210 230 Japan 140 148 130 119 147 150 160 155 130 Germany 168 158 150 140 125 110 90 95 97 United Kingdom 70 70 70 71 72 72 72 72 72 75 Italy 55 60 65 70 75 85 83 76 73 Switzerland 75 80 75 55 56 56 52 52 49 India 40 45 45 45 50 60 65 50 47 France 55 65 74 55 45 40 42 43 32 Spain 20 18 15 11 9 9 18 29 32 </td <td>United States</td> <td>180</td> <td>174</td> <td>202</td> <td>224</td> <td>239</td> <td>249</td> <td>255</td> <td>260</td> <td>269</td> <td></td>	United States	180	174	202	224	239	249	255	260	269	
Japan 140 148 130 119 147 150 160 155 130 Germany 168 158 150 140 125 110 90 95 97 United Kingdom 70 70 70 71 72 72 72 72 75 taly 55 60 65 70 75 85 83 76 73 Switzerland 75 80 75 55 56 56 52 52 49 India 40 45 45 45 50 60 65 50 47 France 55 65 74 55 45 40 42 43 32 Spain 20 18 15 11 9 9 18 29 32 Taiwan 16 16 20 23 25 32 35 34 31	China	124	140		162		187		210		
Germany 168 158 150 140 125 110 90 95 97 United Kingdom 70 70 70 71 72 72 72 72 75 taly 55 60 65 70 75 85 83 76 73 Switzerland 75 80 75 55 56 56 52 52 49 ndia 40 45 45 45 50 60 65 50 47 France 55 65 74 55 45 40 42 43 32 Spain 20 18 15 11 9 9 18 29 32 Faiwan 16 16 20 23 25 32 35 34 31 Mexico 28 28 28 28 31 27 27 28 30 Sou	apan	140	148	130	119	147	150		155		
United Kingdom 70 70 70 70 71 72 72 72 72 72 75 taly 55 60 65 70 75 85 85 83 76 73 Switzerland 75 80 75 55 56 56 56 52 52 49 India 40 45 45 45 45 50 60 65 50 47 France 55 65 74 55 45 40 42 43 32 Spain 20 18 15 11 9 9 18 29 32 Faiwan 16 16 20 23 25 32 35 34 31 Mexico 28 28 28 28 28 31 27 27 28 30 South Korea 3 6 9 25 30 38 36 35 25 Sarazil 17 17 17 18 26 27 27 28 30 South Korea 3 6 9 25 30 38 36 35 25 Sarazil 17 17 17 18 26 27 27 25 25 25 Australia 18 18 18 18 19 20 23 21 20 22 Canada 13 13 13 13 13 13 16 13 13 10 Netherlands 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8		168	158	150	140	125	110	90			
Staly 55 60 65 70 75 85 83 76 73 Switzerland 75 80 75 55 56 56 52 52 49 India 40 45 45 45 50 60 65 50 47 France 55 65 74 55 45 40 42 43 32 Spain 20 18 15 11 9 9 18 29 32 Faiwan 16 16 20 23 25 32 35 34 31 Mexico 28 28 28 28 31 27 27 28 30 South Korea 3 6 9 25 30 38 36 35 25 Brazil 17 17 17 18 26 27 27 25 25 Australia 18 18 18 19 20 23 21 20 22 Canada 13 13 13 13 13 13 13 13 10 Netherlands 8 8	United Kingdom	70	70	70	71	72	72	72		75	
Switzerland 75 80 75 55 56 56 52 52 49 India 40 45 45 45 50 60 65 50 47 France 55 65 74 55 45 40 42 43 32 Spain 20 18 15 11 9 9 18 29 32 Faiwan 16 16 20 23 25 32 35 34 31 Mexico 28 28 28 28 31 27 27 28 30 South Korea 3 6 9 25 30 38 36 35 25 Brazil 17 17 17 18 26 27 27 25 25 Australia 18 18 18 19 20 23 21 20 22 Canada 13 13 13 13 13 13 13 13 13 <t< td=""><td>taly</td><td>55</td><td>60</td><td>65</td><td>70</td><td>75</td><td>85</td><td>83</td><td></td><td></td><td></td></t<>	taly	55	60	65	70	75	85	83			
France 55 65 74 55 45 40 42 43 32 Spain 20 18 15 11 9 9 18 29 32 Faiwan 16 16 20 23 25 32 35 34 31 Mexico 28 28 28 28 31 27 27 28 30 South Korea 3 6 9 25 30 38 36 35 25 Brazil 17 17 17 18 26 27 27 25 25 Australia 18 18 18 19 20 23 21 20 22 Canada 13 13 13 13 13 16 13 13 10 Metherlands 8 8 8 8 8 8 8 8 8 8 8 <td< td=""><td>Switzerland</td><td>75</td><td>80</td><td>75</td><td>55</td><td>56</td><td></td><td></td><td></td><td>49</td><td></td></td<>	Switzerland	75	80	75	55	56				49	
France 55 65 74 55 45 40 42 43 32 Spain 20 18 15 11 9 9 18 29 32 Faiwan 16 16 20 23 25 32 35 34 31 Mexico 28 28 28 28 31 27 27 28 30 South Korea 3 6 9 25 30 38 36 35 25 Brazil 17 17 17 18 26 27 27 25 25 Australia 18 18 18 19 20 23 21 20 22 Canada 13 13 13 13 13 13 13 10 Netherlands 8 8 8 8 8 8 8 8 Austria 5 5 5 5 4 4 3 3 3	ndia	40	45	45	45	50	60	65	50	47	
Spain 20 18 15 11 9 9 18 29 32 Faiwan 16 16 20 23 25 32 35 34 31 Mexico 28 28 28 28 31 27 27 28 30 South Korea 3 6 9 25 30 38 36 35 25 Brazil 17 17 17 18 26 27 27 25 25 Australia 18 18 18 19 20 23 21 20 22 Canada 13 13 13 13 13 16 13 13 10 Netherlands 8 8 8 8 8 8 8 8 Austria 5 5 5 5 4 4 3 3 3	France	55	65	74	55	45	40	42		32	
Faiwan 16 16 20 23 25 32 35 34 31 Mexico 28 28 28 28 31 27 27 28 30 South Korea 3 6 9 25 30 38 36 35 25 Brazil 17 17 17 18 26 27 27 25 25 Australia 18 18 18 19 20 23 21 20 22 Canada 13 13 13 13 13 16 13 13 10 Netherlands 8 8 8 8 8 8 8 8 8 Austria 5 5 5 5 4 4 3 3 3	Spain	20	18	15	11	9	9	18	29	32	
South Korea 3 6 9 25 30 38 36 35 25 Brazil 17 17 17 18 26 27 27 25 25 Australia 18 18 18 19 20 23 21 20 22 Canada 13 13 13 13 13 16 13 13 10 Netherlands 8 8 8 8 8 8 8 8 Austria 5 5 5 5 4 4 3 3 3	Γaiwan	16	16	20	23	25	32	35			
Brazil 17 17 17 18 26 27 27 25 25 Australia 18 18 18 19 20 23 21 20 22 Canada 13 13 13 13 16 13 13 10 Netherlands 8 8 8 8 8 8 8 8 Austria 5 5 5 5 4 4 3 3 3	Mexico	28	28	28	28	31	27	27	28	30	
Brazil 17 17 17 18 26 27 27 25 25 Australia 18 18 18 19 20 23 21 20 22 Canada 13 13 13 13 16 13 13 10 Netherlands 8 8 8 8 8 8 8 8 Austria 5 5 5 5 4 4 3 3 3	South Korea	3	6	9	25	30	38	36	35	25	
Canada 13 13 13 13 13 16 13 13 10 Netherlands 8 8 8 8 8 8 8 8 8 Austria 5 5 5 5 4 4 3 3 3	Brazil	17	17	17	18	26	27	27			
Netherlands 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 <th< td=""><td>Australia</td><td>18</td><td>18</td><td>18</td><td>19</td><td>20</td><td>23</td><td>21</td><td>20</td><td>22</td><td></td></th<>	Australia	18	18	18	19	20	23	21	20	22	
Netherlands 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 <td< td=""><td>Canada</td><td>13</td><td>13</td><td>13</td><td>13</td><td>13</td><td>16</td><td>13</td><td>13</td><td></td><td></td></td<>	Canada	13	13	13	13	13	16	13	13		
	Vetherlands	8	8	8	8	8	8	8			
srael 1 1 1 2 2 2 3 3 3 3	Austria	5	5	5	5	4	4		3		
	srael	1	1	1	2	2	2	3	3	3	

Table 6

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

	1000	1001	1002	1003	1004	1005	1000	1007	1000	
	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Europe										
Belgium	590	602	614	626	640	708	770	794	993	
UK & Ireland	375	383	406	422	495	519	566	592	639	
France	390	417	445	458	425	495	411	395	452	
Germany	500	515	490	480	500	460	430	450	307	
Romania	15	12	10	8	6	2	6	5	8	
Czech & Slovak Republics	20	15	5	0	0	0	0	3	8	
Hungary	12	11	10	8	8	8	7	7	6	
Bulgaria	1	1	1	1	1	1	1	1	0	
Poland	90	70	15	15	15	15	9	7	0	
Spain	50	45	20	11	6	3	0	0	0	
Total Europe	2,043	2,071	2,016	2,029	2,096	2,210	2,200	2,253	2,413	
North America										
United States	2,084	2,022	1,975	1,991	2,109	2,187	2,314	2,455	2,759	
Mexico	70	70	82	98	98	104	107	127	107	
Canada	90	60	0	0	0	0	0	0	0	
Total North America	2,244	2,152	2,057	2,089	2,207	2,291	2,421	2,582	2,866	
Central & South America										
Brazil	80	80	80	82	100	123	105	105	100	
Argentina	56	56	56	56	56	56	56	56	56	
Total Central & South Ameri	ica 136	136	136	138	156	179	161	161	156	
Indian Sub-Continent										
India	175	80	80	70	50	20	20	20	10	
Other	5	6	6	8	7	8	9	10	12	
Total Indian Sub-Continent	180	86	86	78	57	28	29	30	22	
East Asia										
Japan	1,757	1,796	1,805	1,779	1,713	1,770	1,800	1,822	1,810	
Taiwan	3	3	3	3	3	1	1	1	1	
Total East Asia	1,760	1,799	1,808	1,782	1,716	1,771	1,801	1,823	1,811	
Oceania										
Australia	70	70	70	65	60	50	49	51	51	
Total Oceania	70	70	70	65	60	50	49	51	51	
Western World Total	6,432	6,314	6,172	6,181	6,291	6,529	6,661	6,900	7,319	
Other Countries										
China	135	138	146	159	174	174	180	187	190	
Soviet Union/CIS	311	274	224	195	163	154	145	140	119	
Total Other Countries	446	412	370	354	337	328	325	327	309	
World Total	6,878	6,726	6,542	6,535	6,628	6,857	6,986	7,227	7,628	

T 11 7										
Table 7 Silver Fabrication: Jewelry	and Si	lverware								
(including the use of scrap) Tonnes										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Europe										
Italy	1,290	1,440	1,568	1,436	1,288	1,212	1,260	1,392	1,414	
Germany	411	451	420	360	360	320	310	310	315	
Greece	100	105	110	115	120	118	130	140	126	
Spain	350	403	115	115	125	127	140	124	126	
UK & Ireland	63	59	69	85	89	92	104	105	102	
Poland	42	30	31	32	35	49	57	71	83	
France	55	55	53	63	60	63	62	69	77	
Portugal	69	67	69	64	47	54	58	59	60	
Norway	20	36	36	37	37	37	33	33	35	
Sweden	36	49	40	36	37	32	35	40	31	
Denmark	27	27	27	27	27	27	28	32	29	
Finland	37	40	32	26	27	23	26	26	18	
Austria	15	15	15	15	12	12	13	13	15	
Cyprus & Malta	7	7	8	8	11	12	13	12	11	
Czech & Slovak Republics	7	7	6	5	5	5	5	6	5	
Other	38	36	35	33	31	32	28	29	32	
Total Europe	2,567	2,827	2,634	2,457	2,311	2,215	2,302	2,462	2,480	
	2,307	2,021	2,034	2,437	2,311	2,213	2,302	2,402	2,400	
North America	250	270	200	207						
Mexico	250	270	280	285	270	343	442	508	477	
United States	305	302	339	351	373	389	387	389	391	
Canada	31	36	27	27	30	38	41	47	55	
Total North America	586	608	646	663	673	770	870	944	923	
Central & South America										
Brazil	56	53	50	55	57	60	55	50	45	
Peru	46	35	23	24	26	29	32	33	32	
Colombia	24	24	24	24	24	24	24	24	24	
Ecuador	10	10	10	15	19	19	19	19	19	
Argentina	30	30	30	30	30	28	26	26	5	
Other	21	21	21	22	20	23	31	45	54	
Total Central & South Americ		173	158	170	176	183	187	197		
	u 107	173	130	170	170	103	107	197	179	
Aiddle East	100	100	4.40			4.60				
Turkey	128	122	143	156	134	160	170	171	163	
Israel	52	54	57	61	66	72	82	92	88	
Egypt	47	51	68	56	55	64	67	62	61	
Saudi Arabia	7	9	12	14	10	12	12	20	16	
Other	50	60	74	63	75	79	82	80	76	
Total Middle East	283	295	354	350	341	386	412	425	403	
ndian Sub-Continent										
India	842	798	1,107	2,412	1,871	2,070	2,676	2,684	2,228	
Bangladesh & Nepal	20	62	82	120	140	160	180	200	160	
Other	38	52	65	79	66	89	61	95	60	
Total Indian Sub-Continent	900	912	1,254	2,611	2,077	2,319	2,917	2,979	2,448	
ast Asia										
Thailand	750	624	982	1,199	899	852	844	834	744	
South Korea	140	165	155	224	199	210	205	197	80	
Indonesia	33	35	38	45	72	85	92	111	68	
Japan	118	109	87	77	69	67	65	60	55	
Myanmar, Laos & Cambodia	31	31	31	31	31	33	34	30	25	
Hong Kong	28	30	30	30	30	28	29	31	19	
Vietnam	9	9	9	12	16	20	21	22	19	
Taiwan	12	12	16	15	15	15	16	16	16	
Malaysia	9	11	12	14	11	12	12	13	9	
Other	11	11	8	8	7	8	9	9	9	
T . 1 T	1 1 4 1	1 007	1.260	1 655	1.040	1.000	1 006	4 000		

Total East Asia

1,141

1,037

1,368

1,655

1,349

1,330

1,326

1,322

1,043

Table 7 Silver Fabrication: Jewe	elry and Sil	verware								
(including the use of scrap)										
Tonnes										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Africa										
Morocco	12	13	13	12	12	12	11	13	11	
Tunisia	5	5	5	6	7	7	8	9	9	
Algeria	10	9	8	7	7	7	7	6	5	
Other	15	15	14	13	14	15	12	11	11	
Total Africa	42	42	40	38	40	41	38	39	36	
Oceania										
Australia	17	17	17	18	19	19	17	18	22	
Total Oceania	17	17	17	18	19	19	17	18	22	
Western World Total	5,723	5,911	6,471	7,962	6,986	7,263	8,069	8,385	7,534	
Other Countries										
Soviet Union/CIS	143	132	105	82	70	61	65	70	67	
Total Other Countries	143	132	105	82	70	61	65	70	67	
World Total	5,866	6,043	6,576	8,044	7,056	7,324	8,134	8,455	7,601	

Figure 67
World Jewelry Fabrication

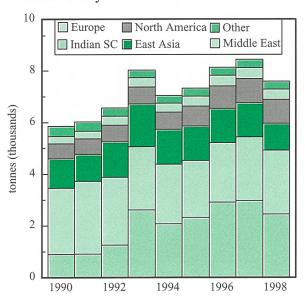


Figure 68
World Jewelry Fabrication, 1998

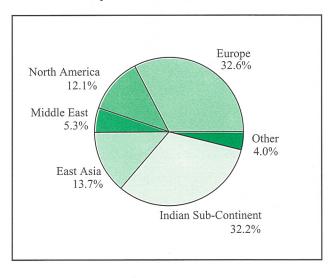


Table 8 Silver Fabrication: Coins	and Med	n1a								
(including the use of scrap)	alia ivicua	118								
Tonnes										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	
Europe										
Germany	82	178	174	87	222	76	144	116	315	
Spain	13	35	14	8	148	124	87	56	54	
Portugal	3	0	4	8	12	17	25	25	31	
UK & Ireland	13	13	16	21	24	23	20	19	18	
Italy	13	18	14	14	15	16	16	11	11	
Austria	14	19	16	14	15	17	14	11	10	
France	65	73	65	65	31	36	9	10	10	
Switzerland	6	50	11	10	9	13	18	20	9	
Poland	8	6	3	4	5	6	4	3	5	
Belgium Netherlands	14 21	11 2	0	1	0	5	3	4	4	
Czech & Slovak Republics	3	4	0 3	1 0	18 0	35 3	5 1	3	3	
Finland	5	5	3 7	1	3	3	3	2 2	2 2	
Norway	0	15	29	10	1	1	0	0	0	
Denmark	3	0	3	0	0	3	0	0	0	
Other	3	3	7	13	4	6	10	5	8	
Total Europe	267	431	364	257	507	382	357	288	482	
North America	201	731	201	231	301	302	331	200	402	
United States	314	351	278	268	271	250	205	187	202	
Canada	60	27	24	38	46	22	203	20	34	
Mexico	38	48	270	531	405	18	16	12	6	
Total North America	413	426	572	837	722	290	243	220	242	
Central & South America	120	120	3,2	037	122	270	∠ ⊤3	220	272	
Other	3	2	6	2	0	1	1	1	1	
Total Central & South Ameri		2	6	2	0	1	1	1	1	
Middle East										
Israel	0	1	2	1	1	3	2	2	2	
Turkey	1	0	0	0	0	0	0	1	0	
Egypt	0	0	1	0	20	0	0	0	0	
Total Middle East	1	1	3	1	21	3	2	2	2	
East Asia					-	Ü		_	_	
Thailand	1	1	2	6	6	10	15	9	7	
Singapore	3	2	28	4	4	3	3	1	2	
Japan	277	0	0	75	0	0	0	225	0	
Other	32	0	0	0	0	0	0	0	0	
Total East Asia	312	3	30	85	11	13	17	234	10	
Africa										
South Africa	0	0	1	0	0	1	1	0	0	
Total Africa	0	0	1	0	0	1	1	0	0	
Oceania										
Australia	13	16	66	71	50	21	26	26	31	
Total Oceania	13	16	66	71	50	21	26	26	31	
Western World Total	1,009	879	1,041	1,253	1,311	711	647	771	768	
Other Countries				,	-,-					
China	12	43	12	13	21	24	43	88	75	
Soviet Union/CIS	0	0	3	2	6	4	19	12	6	
North Korea	0	2	0	7	0	Ó	0	0	0	
Total Other Countries	12	44	15	22	27	28	62	99	81	
World Total	1,022	923	1,056	1,275	1,339	739	709	870	849	
WORLD LOIN	111/./.		11130			/44				

Appendix II

Silver Prices, 1978-98

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
1978	5.422	1,393	110.26	367	844	148	350	0.12
1979	11.068	1,896	225.99	780	1,722	296	652	0.25
1980	20.984	2,783	429.67	1,530	4,098	578	1,226	0.48
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

^{*} 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 market.

2. Real Prices** (Constant 1998 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
	ΟΒΦΙΟΣ	Rupeerkg	. Danid OZ	T CHI T C G	WOIDOZ	Life	DIVING	1 030/02
1978	13.552	8,364	328.26	551	3,600	723	608	130.42
1979	24.866	10,716	612.18	1,129	6,211	1,260	1,088	212.98
1980	41.526	14,112	972.32	2,056	11,482	2,029	1,940	290.95
1981	18.801	11,884	459.56	952	5,306	1,127	1,134	135.53
1982	13.383	11,115	347.69	791	4,011	870	874	134.68
1983	18.710	12,765	483.52	1,068	5,938	1,229	1,285	214.56
1984	12.783	12,056	351.12	744	4,298	914	996	128.16
1985	9.295	12,611	296.42	551	3,409	685	759	93.63
1986	8.126	12,269	251.21	345	3,004	450	500	106.08
1987	10.068	14,079	307.90	380	3,482	480	530	132.91
1988	9.007	15,648	271.44	311	2,692	427	477	95.23
1989	7.233	16,093	220.36	276	1,967	356	417	72.32
1990	6.029	14,719	181.93	247	1,678	257	307	57.35
1991	4.857	13,330	144.15	187	1,334	210	256	42.11
1992	4.586	12,927	134.01	168	1,301	193	225	36.37
1993	4.868	9,883	140.90	159	1,392	254	250	36.47
1994	5.813	9,961	162.91	178	1,611	312	292	45.27
1995	5.559	9,061	150.73	161	1,456	294	249	62.71
1996	5.405	8,833	145.01	186	1,448	268	258	55.27
1997	4.974	7,923	160.44	192	1,545	273	276	44.96
1998	5.544	8,016	229.30	233	2,498	309	314	50.65
** Derived from	om the actual prices	s shown above u	sing consumer p	rice indices.				

⁸¹

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	
1975	5.2110	3.9280	4.4256	5.2500	3.9200	4.4193	
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	

2. US Prices

	Com	nex Spot Settle	Han	dy & Harman		
	High	Low	Average	High	Low	Average
January	6.1030	5.4400	5.8229	6.2550	5.4650	5.8458
February	7.2600	6.0070	6.6947	7.3100	6.1800	6.7371
March	6.5100	5.7980	6.1878	6.5400	5.7300	6.1718
April	6.5500	6.1150	6.2920	6.5300	6.1100	6.2903
May	6.1080	5.0400	5.4870	6.1700	5.0750	5.5971
June	5.5070	5.0550	5.2642	5.4350	5.0600	5.2605
July	5.7800	5.2690	5.4429	5.8000	5.2750	5.4686
August	5.4430	4.6180	5.1224	5.3100	5.0200	5.1800
September	5.3600	4.7300	4.9739	5.3700	4.8500	5.0175
October	5.2550	4.7600	4.9470	5.3700	4.8450	5.0018
November	5.1210	4.8250	4.9538	5.1400	4.8400	4.9839
December	5.0250	4.6640	4.8497	5.0500	4.7400	4.8997
Year	7.2600	4.6180	5.4894	7.3100	4.7400	5.5493

Appendix IV

Rank	Mine	Country	Owner(s)	1997	1998
1	Proaño*	Mexico	Industrias Peñoles SA	19.3	21.1
2	Chimberos	Chile	Cia. Minera Mantos de Oro**	0.0	19.8^
3	Greens Creek	United States	Kennecott/Hecla Mining Co	9.8	9.5
4	Imiter	Morocco	ONA Pôle Mines	7.3	7.7^^
5	Rochester	United States	Coeur d'Alene Mines Corp	6.7	7.2
6	Sunshine	United States	Sunshine Mining and Refining Company	4.3	5.8
7	Uchucchacua	Peru	Cia. de Minas Buenaventura SA	4.7	5.5
8	Real de Angeles	Mexico	Grupo Frisco	6.1	5.0
9	Lucky Friday	United States	Hecla Mining Co	1.9	4.1
10	Galena	United States	Silver Valley Resources***	1.5	3.3
11	Quiruvilca	Peru	Pan American Silver Corp	2.8	3.1
12	Orcopampa	Peru	Cia. de Minas Buenaventura SA	3.0	2.9
13	La Encantada	Mexico	Industrias Peñoles SA	2.4	2.2
14	Julcani	Peru	Cia. de Minas Buenaventura SA	1.7	1.8
15	DeLamar	United States	Kinross Gold Corp	1.3	1.2

Silver Mine Production by Source							
Million ounces							
	1995	1996	1997	1998			
Primary							
Mexico	39.5	44.3	50.1	51.2			
United States	15.3	22.0	32.6	34.7			
Peru	19.9	20.6	21.0	21.4			
Other	17.5	18.3	16.8	35.1			
Total	92.1	105.3	120.5	142.5			
Gold							
United States	17.2	11.6	15.4	12.9			
Canada	12.4	13.7	13.3	12.4			
Mexico	9.1	9.5	10.9	11.3			
Other	38.6	41.6	43.9	35.4			
Total	77.3	76.3	83.5	72.0			
Connor							
Copper Chile	31.0	30.0	33.1	35.3			
CIS	18.0	18.1	16.6	16.7			
Canada	12.3	12.4	13.0	13.1			
Other	60.4	56.9	56.2	55.8			
Total	121.7	117.4	118.9	121.0			
Lead-zinc							
Australia	28.3	29.4	34.8	46.8			
Peru	34.8	35.7	38.4	35.8			
Mexico	22.1	25.5	23.8	27.9			
Other	95.1	90.3	93.0	92.6			
Total	180.2	180.9	190.0	203.1			
Other	7.5	6.0	6.4	6.9			
TOTAL	478.8	485.9	519.3	545.5			
	12-7-14						

Silver Mine Producti	on by Ma	in Region a	nd Source	e Metal
Million ounces				
	1995	1996	1997	1998
North America				
Primary	54.7	66.4	82.7	85.9
Gold	38.7	34.8	39.7	36.6
Copper	27.8	25.5	24.1	24.2
Lead-zinc	39.4	42.6	40.8	43.0
Other	1.9	2.0	1.9	1.7
Total	162.5	171.3	189.2	191.4
Central & South America	ì			
Primary	20.5	20.9	21.1	39.2
Gold	18.6	21.6	21.1	12.8
Copper	23.7	23.8	22.9	23.1
Lead-zinc	49.4	49.4	52.5	50.6
Other	0.2	0.2	0.1	0.1
Total	112.4	115.9	117.7	125.8
Europe				
Gold	0.7	0.7	0.7	0.7
Copper	38.5	37.3	41.1	42.2
Lead-zinc	13.4	13.0	13.3	13.3
Other	1.6	0.7	1.3	2.1
Total	54.2	51.7	56.4	58.3
Rest of World	149.7	147.0	156.0	170.0
Total	478.8	485.8	519.3	545.5

Appendix V

	Comex	LBMA Clearing Turnover*					
	Futu	ires	Optio	Options		Value (US\$bn)	Number transfer
	Turnover	Open Interest	Turnover	Open Interest	transferred (millions)	(035011)	transie
Jan-96	415,801	103,795	96,745	83,823			
Feb	583,767	92,401	103,536	68,537			
Mar	368,175	96,192	85,239	75,645			
Apr	547,629	98,613	83,573	67,805			
May	334,973	100,813	95,803	88,189			
Jun	549,631	103,592	113,216	79,433			
Jul	296,905	106,529	78,605	93,963			
Aug	460,686	90,297	72,897	72,572			
Sep	316,366	98,110	73,145	77,896			
Oct	321,781	96,778	61,812	86,518	279.4	1.4	48
Nov	415,441	86,048	45,369	53,601	244.3	1.2	48
Dec	259,653	84,693	39,299	59,319	248.8	1.2	49
Jan-97	401,995	89,932	63,588	70,746	294.4	1.4	55
Feb	530,514	90,704	89,431	61,542	275.0	1.4	56
Mar	360,871	91,324	64,742	70,477	284.1	1.5	56
Apr	493,999	85,175	68,202	65,112	253.0	1.2	48
May	280,536	91,933	53,886	80,008	236.5	1.1	45
Jun	472,306	91,277	53,607	56,400	270.5	1.3	51
Jul	340,245	97,043	64,131	74,762	270.6	1.2	52
Aug	425,471	77,625	61,832	69,619	263.3	1.2	50
Sep	335,400	95,589	67,412	85,120	314.3	1.5	48
Oct	430,397	94,671	100,228	107,010	345.5	1.7	59
Nov	488,024	90,126	60,272	82,173	327.9	1.7	67
Dec	333,762	98,906	95,592	106,258	395.8	2.3	69
Jan-98	352,688	105,152	84,147	116,984	330.4	1.9	63
Feb	550,800	101,987	132,311	117,511	347.8	2.4	69
Mar	368,127	85,986	74,310	119,826	272.1	1.7	58
Apr	360,130	76,882	64,626	89,894	230.7	1.5	52
May	310,130	91,571	76,681	106,995	266.5	1.5	58
Jun	393,971	79,898	56,802	79,783	217.9	1.1	48
Jul	278,774	81,144	67,854	89,839	233.5	1.3	47
Aug	367,257	80,983	52,059	75,667	223.4	1.2	44
Sep	283,475	71,779	66,718	89,108	232.2	1.2	46
Oct	280,066	74,722	62,102	95,772	249.4	1.2	44
Nov	319,216	74,758	43,630	57,240	169.1	0.8	34
Dec	229,982	75,353	36,813				38
Dec	229,982	/5,353	36,813	60,858	202.2	1.0	38

THE SILVER INSTITUTE

1112 SIXTEENTH STREET, NW SUITE 240 WASHINGTON, DC 20036 TEL: (202) 835-0185

FAX: (202) 835-0155

EMAIL: INFO@SILVERINSTITUTE.ORG

WWW.SILVERINSTITUTE.ORG

