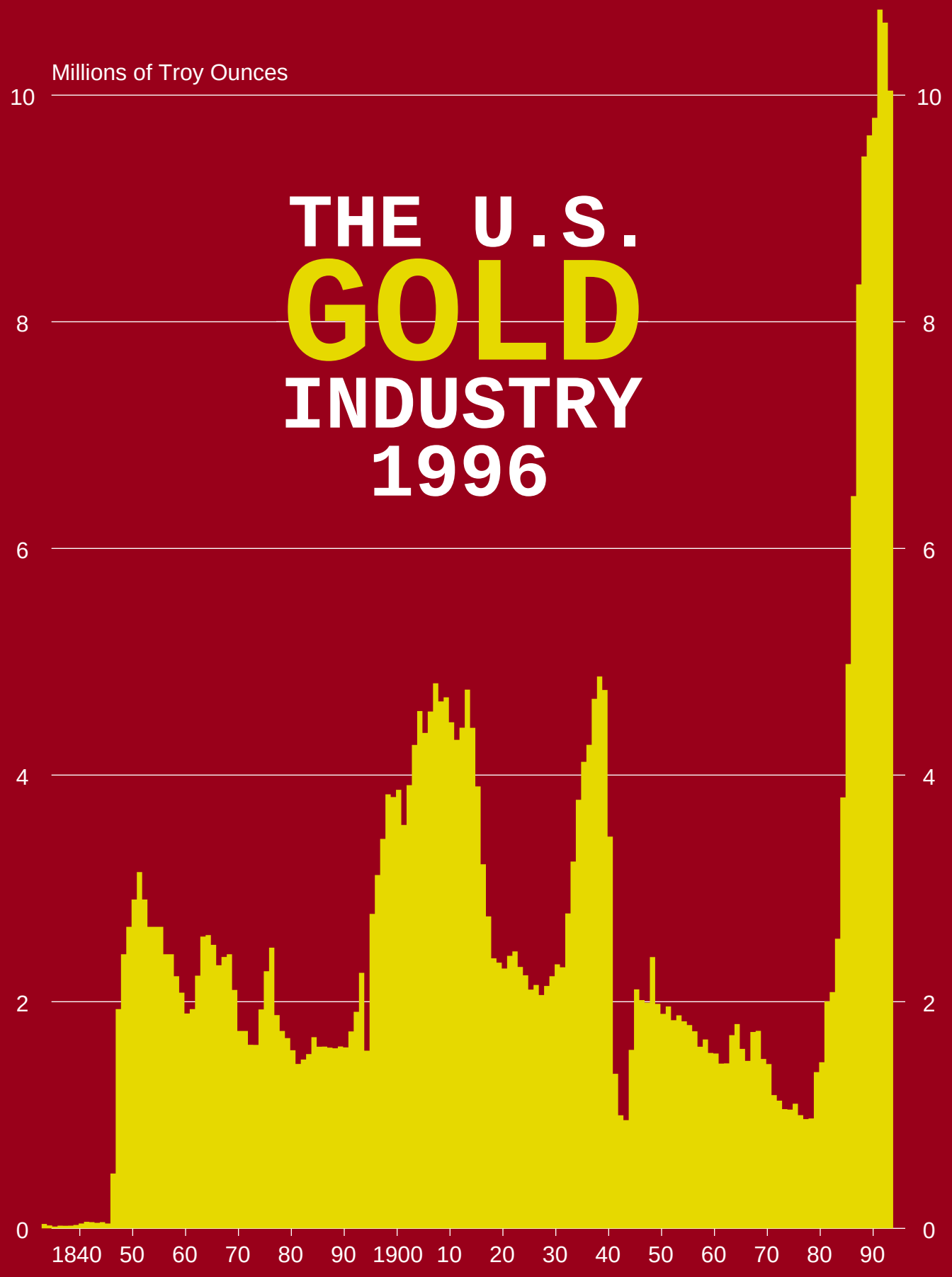
THE U.S. GOLD INDUSTRY 1996



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THE U.S. GOLD INDUSTRY 1996

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PREFACE

This is the fourth report in a series of biennial overviews of the U.S. gold industry. As in the previous three reports (Dobra and Thomas, 1991, 1992, 1995), this report examines industry investment activity in exploration and development both domestically and internationally, domestic production and costs, and public policy issues of concern to the industry.

In the most recent report, public policy issues related to mining law reform issues being debated in the 103rd Congress were a matter of great concern to both policy makers and the industry and, accordingly, received considerable attention (Dobra and Thomas, 1995). Since that report was published, however, these issues have diminished somewhat in their urgency although they may well return in the 105th Congress. As a result of policy developments and trends in the industry, this report deals only briefly with mining law reform issues and focuses on other policy issues facing the industry in the U.S. More generally, this report addresses issues of interest to investors, both the investing public and institutional investors.

Also as in previous studies, data sources for this study largely consist of publicly available information from companies' annual reports and 10K filings with the U.S. Securities and Exchange Commission. This information is supplemented with data collected in a confidential survey of producers' U.S. operations to determine production costs, capital expenditures, ownership patterns, financial practices, and related issues for the industry.

OVERVIEW

Estimates of U.S. gold production in 1995 vary slightly by source because of difficulties in tracking numerous small producers and by-product producers and range from 10.59 million troy ounces (329.3 tonnes) (Murray and others, 1996) to 10.04 million ounces (312.3 tonnes) (U.S. Geological Survey–Mineral Industry Surveys Program, on website http://minerals.er.usgs.gov.80/minerals/, July 2, 1996). Table 1 shows an estimate of 1995 U.S. gold production of 10.17 million troy ounces worth $3.91 billion at the 1995 average spot price of $384 per ounce. Based on this estimate, production in 1995 was down slightly from the previous three years but in excess of 10 million ounces for the fourth consecutive year. With this level of production, the U.S. remained the second largest producer in the world behind South Africa and is likely to remain in that position through 1999 although it is expected that U.S. production will increase by approximately 20% and South African production will decrease by approximately 13% during that period to narrow the gap (The Gold Institute, 1996).

As in previous years, primary U.S. gold production was centered in Nevada, which produced just under 6.8 million ounces (212 tonnes), approximately two-thirds of total U.S. production, followed by California (783,000 ounces), Utah (729,000 ounces), South Dakota (559,100 ounces), Montana (437,000 ounces), Alaska (141,800 ounces), and South Carolina (111,000 ounces). Also as in previous years, although gold is mined from hundreds of lode mines and placer sites across the U.S., almost 40% (3.9 million ounces) comes from the two largest producers' (Barrick Gold and Newmont Gold) operations on the Carlin Trend in north-central Nevada. Along the same line, the top four producers, which include Santa Fe Pacific Gold and Homestake Mining, as third and fourth, respectively, account for almost 55% of U.S. production or 5.5 million ounces.

Table 1 shows gold and silver production by state for 1995, including both primary and by-product production. All but about 600,000 ounces of gold production is considered primary production. Just over 500,000 ounces by-product gold production is from the Bingham Canyon copper mine near Salt Lake City and the rest is from copper production in Arizona. Most silver production is a by-product of gold except for silver by-product production from

TABLE 1. U.S. gold and silver production by state, 1995

State	Gold Production (oz)	Gold Production (%)	Gold Production ($1000)	Silver Production (oz)	Silver Production (%)	Silver Production ($1000)	Total ($1000)
Alaska*	141,800	1.4	54,474	0	0.0	0	54,474
Arizona*	89,400	0.9	34,344	5,529,800	10.8	28,866	63,209
California	783,000	7.7	300,797	389,015	0.8	2,031	302,828
Idaho	96,500	1.0	37,071	5,176,150	10.1	27,020	64,091
Missouri	0	0.0	0	1,459,610	2.9	7,619	7,619
Montana	437,200	4.3	167,955	2,436,970	4.8	12,721	180,676
Nevada*	6,765,000	66.5	2,598,842	20,961,800	41.0	109,421	2,708,263
South Carolina	111,000	1.1	42,642	0	0.0	0	42,642
South Dakota*	559,100	5.5	214,784	0	0.0	0	214,784
Utah	729,700	7.2	280,322	4,358,000	8.5	22,749	303,070
Other	460,000	4.5	176,714	10,802,400	21.1	56,389	233,102
Totals	10,172,700	100.1	3,907,945	51,113,745	100.0	266,814	4,174,758

London gold and silver prices

*Production data are from respective state sources, other state data are from the U.S. Geologic Surveys—Mineral Industry Surveys Program on website http://minerals.er.usgs.gov.80/minerals/.

the copper operations. Some primary silver production, however, occurs in the Coeur d'Alene mining district in northern Idaho and at the Candelaria Mine operated by Kinross in west-central Nevada. The largest silver producer in the U.S., Echo Bay Mines' McCoy/Cove Mine in north-central Nevada produces over 9 million ounces of silver but, at current silver prices, would very likely be uneconomic without its gold credits. McCoy/Cove is scheduled to cease mining by 1999; however, the reopening of the Green's Creek Mine in Alaska by Kennecott and Hecla Mining in 1997 is expected to add 10 million ounces to U.S. silver production (The Silver Institute, 1996).

The total value of U.S. gold output in 1995 was $3.91 billion (table 1) which, when combined with $267 million in silver by-product output, raises the value of industry output to $4.17 billion, slightly higher than the $4.09 billion produced in 1993 as reported by Dobra and Thomas (1995) in the previous edition of this series.

Table 2 shows the economic impacts of this production using economic impact multipliers developed by the U.S. Bureau of Economic Analysis (1992). The total shows the total impact of the precious metals industry, including both direct and indirect impacts, on employment, statewide economic output, and statewide household earnings. Direct impacts include jobs, earnings, and output in the precious metals industry itself. Indirect impacts include jobs, output, and household earnings in other industries created by expenditures in other sectors by precious metals producers and their employees.

The $4.2 billion in industry output generated 90,271 jobs in producing states alone, with the bulk (51,457) of these jobs in Nevada (table 2). In addition, this $4.2 billion in production induced an additional $3.7 billion in state output for a total impact on overall economic output in producing states of $7.8 billion. Of this $7.8 billion in output, just over $2.4 billion accrued to households in producing states as earnings.

Note that the magnitude of the economic impacts is determined by the value of production in a state and its impact multipliers. These multipliers can vary significantly among states based upon the degree to which the precious metals industry in a particular state is linked to the state economy. For example, in states with relatively little economic development (e.g., Alaska) and states where the local infrastructure of businesses do not service the mining industry (e.g., California), a relatively higher percentage of purchases of equipment, supplies, and services is made out of state and, consequently, the impact multiplier is smaller. This is illustrated in table 2 by comparing California, which does not have much of a mining service sector, with Utah which, because of the long history of precious and base metals mining in the Salt Lake City area, has a mining service sector. Although the outputs of the precious metals industry in California and Utah are about equal in value, around $300 million, the number of mining and related jobs in Utah is two times higher than California (table 2). On the other hand, because of the types of industries linked to the precious metals industry in these respective states, although the employment impacts in California are significantly smaller than Utah, impacts on state output and household earnings are more comparable, reflecting the qualitative differences between the two states' economies.

These multiplier effects only capture economic impacts within the individual states shown. They do not reflect, for example, the purchase by a Nevada- or Montana-based mining company of heavy equipment made in Peoria, Illinois, where two major heavy equipment manufacturers are located. In 1995, purchases of this equipment by Nevada mining companies alone is estimated at $200 to $250 million per year over that past decade. This indicates that, in addition to the 90,271 jobs in or attributable to the precious metals industry in producing states identified on table 2, the Western precious metals industry created an additional 5,500 to 6,900 jobs in Illinois. It should be further noted that the precious metals industry purchases a

TABLE 2. Impacts of U.S. gold and silver production by state, 1995

State	Total Value ($1000)	Employment Impact (jobs)	Output ($1000)	Earnings ($1000)
Alaska*	54,474	757	96,500	27,798
Arizona*	63,209	2,010	154,977	51,389
California	302,828	5,602	621,039	170,977
Idaho	64,091	1,416	116,421	34,000
Missouri	7,619	178	15,394	4,282
Montana	180,676	4,553	365,272	105,587
Nevada*	2,708,263	51,457	4,832,354	1,485,211
South Carolina	42,642	1,045	79,292	22,604
South Dakota*	214,784	5,477	394,171	123,887
Utah	303,070	12,093	661,330	239,001
Other	233,102	5,683	461,421	140,064
Totals	4,174,758	90,271	7,798,221	2,404,800

London gold and silver prices. Impact multipliers are from U.S. Bureau of Economic Analysis (1992).

*Production data are from respective state sources, other state data are from the U.S. Geological Survey—Mineral Industry Surveys Program on website http://minerals.er.usgs.gov.80/minerals/.

wide array of industrial products and services besides heavy equipment from companies all across the U.S. and, therefore, has a positive economic impact on almost every state.

Another key point about the economic impacts of the precious metals industry is related to job quality. Although multipliers vary from state to state, a brief look at the household earnings multipliers for producing states shows higher than average multipliers for this sector, which would tend to indicate that a higher proportion of the gross value of industry output ends up in the earnings of households. Part of this impact is reflected in salaries in the industry itself. In Nevada, the 1995 average earnings in the metal mining industry (which almost entirely consists of employees in precious metals mining) were $47,540, almost twice the statewide average of $26,630 (Nevada Department of Employment, 1996). Also contributing to the relatively large impact on household incomes generated by the precious metals industry is the industry's reliance on services from relatively high wage sectors of the economy, e.g., engineering, geological, metallurgical, and financial consultants and service firms.

This is a key point for the western U.S. because, as pointed out in a report of a recent study by the Council of State Governments (Grose, 1995), the entire western region of the U.S. has seen its per capita income declining as a result in the decline of traditional resource-based extractive industries, like the gold industry, in favor of lower paying jobs in service sectors. This is particularly true of the western U.S. excluding California. The Council of State Governments' report states:

"In measure after measure of income or wealth, the West and the West without California have been shown to have changed for the worse relative to other regions and the nation as a whole."

This secular trend has also had implications for state government revenues and program needs in the West. The report further notes:

"... the West and the West without California ... (has) ... collected relatively lower revenues and spent relatively less in almost all major spending categories than other regions or the nation as a whole. At the same time, the growth of the under 18 and over 65 populations—those creating the most government demands—have grown faster since 1975 in the West."

Finally, the Council's study report concludes that the regional imperative is quality job growth and the task of policy makers is, to the extent that state policies can affect private sector investment decisions, promote the growth of industries that provide high quality jobs which could be defined in a manner consistent with the Council's study as high paying jobs that can raise per capita income and jobs in industries that pay taxes to state and local governments to provide the services needed.

This would appear to be precisely the kind of jobs described above in the precious metals industry. Yet, some critics of extractive industries have disagreed. For example, Power (1996, p. 112) states: "High wages are not the only relevant economic variable when evaluating whether a particular type of economic activity will contribute to the well being of a local community." This statement certainly seems reasonable but when Power (1996) offers other criteria as "Stability and tenure of employment, the number of jobs going to residents, and the impact on non-commercial but crucial economic resources such as environmental quality and public services," it scarcely appears that he is referring to the modern mining industry.

With respect to the "stability and tenure of employment," there are two kinds of instability that must be considered with respect to metals producing industries: short-term stability in minerals prices and the longer term instability associated with the exhaustion of orebodies and the closure of mines. With respect to price instability, certain mineral commodities with small markets such as molybdenum and uranium have, indeed, suffered employment instability because of drastic price changes. This, however, is less true of metals with larger world markets, such as gold, silver, and copper. Prices of these metals have exhibited varying degrees of cyclical instability over time, and producers have generally anticipated price changes in their mine plans so that short-term price changes have a larger impact on exploration than production. Producers have engaged in large-scale, long-term investments in plant and equipment on the basis of long-term price expectations and recent experience with price declines in the metals producing industries indicates that producers are generally prepared to wait for better times.

It is also certainly true that individual mineral deposits have become exhausted. On the other hand, some deposits have been remarkably long-lived. In the U.S., the Homestake Mine in Lead, South Dakota has operated continuously (with breaks during world wars) for over 120 years. While this is a unique case, the large-scale nature of deposits currently being developed in the U.S. along the Carlin and Battle Mountain Trends in Nevada and the pace of discovery and new mine development discussed below suggest that this industry and, indeed, some individual mines, can expect a relatively long life span. This focus on

the broader industry rather than an individual mine is critical, and failure to recognize this focus is, figuratively, "failing to see the forest for the trees."

Many other examples of how development of mineral resources has spurred broader economic development are available. South Africa is a prime example of a country that has been able to build a modern diversified industrial economy based on gold production in spite of obvious and severe social problems. Other less developed nations have had less success transforming mineral wealth into diversified economic growth but, in these cases, a wide variety of social and political factors have contributed. Indeed, even in the U.S., political factors have contributed to the instability of the industry as much or more than economic factors in the recent past. Political and regulatory decisions related to the nuclear power industry clearly dealt a death blow to the U.S. uranium industry. High coal severance taxes in Montana in the early 1980s contributed to the exit of the industry from that state. Threats from mining law reform in the U.S. in the early 1990s shifted a large share of the exploration portion of the precious metals industry offshore, and the virtual elimination of the threat of onerous reforms after 1994 brought it back. Hence, a good deal of the instability in extractive industries in the U.S. in the recent past is due to the political and regulatory environment rather than markets for commodities.

The prospect of achieving diversified economic development in the western U.S. is clearly enhanced by promoting a stable political and regulatory environment. These prospects are further enhanced by developing a commercial infrastructure to provide mining services and equipment to enterprises locally, regionally, and internationally. Such development is occurring in urban areas of the West servicing the more remote areas where mines are located. There is also ample evidence that Western urban mining-service centers such as Denver, Reno, and Salt Lake City are the bases for exporting U.S. technical expertise to the rest of the world. These technological and industrial infrastructures will continue to support these communities after local mines have been exhausted.

This broader economic development associated with mineral industry development also addresses the second additional criterion offered for assessing the desirability of mineral development: "the number of jobs going to residents." Indeed, when a mine opens in a Western community that is oriented to ranching or tourism it is not likely to be able to find geologists, metallurgists, or engineers in the local workforce to hire. The mine will have to fill these positions with workers from out of the area. On the other hand, less specialized positions are generally filled by local residents and existing local businesses generally benefit substantially. In addition, where reserves are sufficient to safely predict a long-term future for the industry, such as along the Carlin Trend in Nevada, residents are sending their children to college and technical schools to ultimately fill higher paid specialized positions. Hence, the implication that jobs are not going to local residents as a consequence of mineral development is simply not supported by the facts.

With respect to "the impact on non-commercial but crucial economic resources such as environmental quality and public services" by the Western minerals industry and the precious metals industry in particular, criticisms of the industry need to consider the environmental impacts of the industry in the context of modern reclamation laws rather than the impacts of mines abandoned before such laws were adopted. In our opinion, abandoned mines do represent a problem that needs to be addressed through reform of the nation's Superfund program, not the mining law. More to the point, the impact of mineral development in the western U.S. on "non-commercial but crucial economic resources such as environmental quality" cannot lead to significant environmental degradation unless states fail in their responsibility to regulate mine development activity.

Finally, with respect to the impact of mineral development on public services, the impacts of large-scale precious metals mine development in Nevada indicate a positive record which, in part, accounts for the strong support for the industry from its state legislature, Governor, and Congressional delegation. In 1995, firms producing in Nevada paid over $141 million in state and local taxes—more than $10,000 per employee. Relative to the impact of the industry on the demand for public services and relative to other industries in the state, mining is one of the highest taxed industries in the state.

This is not to say, however, that the mining industry can and should be relied upon as a stable source of funds by state and local government entities. Due to the cyclical nature of commodity prices and the exhaustion of individual orebodies, mining tax revenues can be unstable at times. However, it is for this reason that tax policy analysts typically recommend placing mining tax revenues in a trust fund and not using revenues for recurring governmental expenses (Ebel, 1990, p. 555).

U.S. GOLD INDUSTRY DEVELOPMENTS

Three major trends of interest in the North American gold industry have been: (1) a relative increase in U.S. investment by North American producers, stemming the growth in international investment by North American (both U.S. and Canadian based) companies; (2) the trend toward concentration in the industry through mergers and acquisitions; and (3) the trend toward underground development. With respect to the trend toward international investment, figure 1 shows the trends in U.S. and international investment by North American producers from 1992 through 1995 and projected for 1996 and 1998. The trends indicated by the figure show increased offshore investments which are widely perceived to be driven, in part, by the deteriorating investment environment in the U.S. These perceptions are, in large part, attributable to actions in the U.S. Congress and the Administration. After the 1994 election, however, trends from the 1996 survey suggest a reversal in investment trends that is reflected by figure 1.

While it is clear that the actions of Congress contributed to the trend toward international investment in the 1992-94 period, it is equally clear that the changing international political environment was also a factor. After the collapse of the Soviet Union, emerging nations began to recognize that natural resource development was a more viable means of promoting economic development and dealing with balance of payment problems than seeking "client state" status from

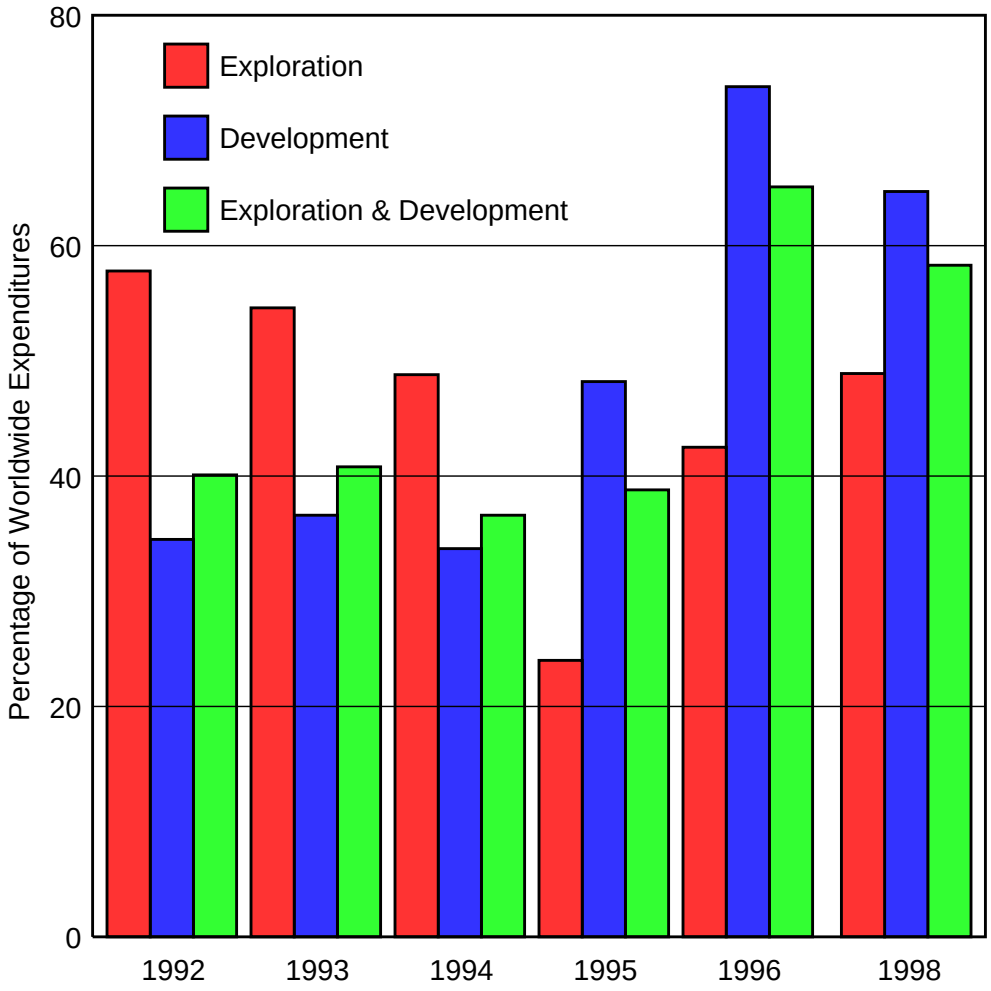

FIGURE 1. U.S. exploration and development expenditures as a percentage of worldwide expenditures from 1992 to 1995 and projected for 1996 and 1998.

cold war adversaries. Increased democratization of political regimes in Central and South America has led these nations to liberalize foreign investment policies and create resource development opportunities for North American companies with capital and technical resources available to diversify their political risk portfolios which were heavily weighted toward the U.S. Hence, the trend of the early 1990s toward international investment was a matter of both push and pull. Advocates of radical mining law reform pushed and new governments in developing countries pulled.

This trend toward diversification of political risk portfolios clearly played a role in the largest merger in the North American industry in the past two years, the merger between Houston-based Battle Mountain Gold and Toronto-based Hemlo Gold. Hemlo brought strong core Canadian assets to the merger while Battle Mountain brought assets in the U.S., South America, and Oceania to the merged company. Although such mergers can offer producers the advantage of diversifying risks, joint ventures on specific projects remains the more common way companies diversify both project and political risks. In these joint ventures which, in the U.S., range from the much discussed, multimillion-ounce Pipeline development in north-central Nevada, to the much smaller Crown Jewel project in eastern Washington state, companies acquire part of a project through stock ownership or partnership in an operating company.

As in other industries, mergers such as the Battle Mountain Gold - Hemlo accord are one of the means by which the U.S. industry has become more concentrated. However, in the past two years mergers have been a relatively less important factor in increasing industry concentration compared to the expansions of the major producers in the industry, such as Barrick Gold, Newmont Mining, and Santa Fe Pacific Gold. However, mergers will continue to play a role in increasing industry concentration. As a case in point, Homestake Mining announced on December 9, 1996 that it had reached agreement to acquire Santa Fe Pacific Gold, pending stockholder approval. This announcement came on the heels of a December 6, 1996 announcement of a tender offer for Santa Fe Pacific Gold by Newmont Mining. Hence, both forces driving increased industry concentration are still active.

The trend toward a smaller number of larger producers raises suspicions in some industries; however, in the case of the gold industry these suspicions are not well founded. For example, in spite of increased concentration in North America, North American producers still control a minor fraction of total gold supply which includes very substantial above-ground reserves. Hence, this increased concentration offers these large producers no leverage on prices. In addition, critics of large companies frequently cite their lack of exploration success which has forced the large producers to rely on smaller producers and exploration companies to find new orebodies. Hence, according to this school of thought, increased concentration in production creates more opportunities in other segments of the industry.

The most significant development in the U.S. precious metals industry in the 1995-96 period, however, is the resurgence of capital spending in the U.S. noted above. Capital spending on projects in Nevada, Alaska, and Washington are expected to total over $2 billion in this two- year period, with the bulk of the expenditures in Nevada (table 3). These expenditures are crucial to extending the life of the U.S. precious metals industry and, as indicated in the discussion of industry capital costs below, will bring almost 43 million ounces of new reserves into production. Hence, in these two years the industry will have added an additional four years of productive life at current levels of output.

These development projects have also had very significant economic impacts in the states where the development is occurring (table 3). Using RIMS multipliers (U.S Bureau of Economic Analysis, 1992) from the construction industry in the three respective states, table 3 shows the impacts of these development expenditures on statewide employment, output, and household earnings in a manner similar to table 2 for the economic impacts of production from existing facilities. The impacts shown on table 3, however, are one-time impacts from mine construction activities in these states spread over two years. Expenditures of $2,151 million will have created approximately 43,162 jobs (21,581 annually), increased state output by $3,697 million ($1,848 million annually) and increased household income $1,157 million ($578 million annually). When considered in conjunction with ongoing production-related impacts shown on table 2, precious metals industry production and development activities will have created approximately 110,900 jobs, $9.45 billion in industrial output, and $2.95 billion in household income annually over this two-year period.

The third trend noted above is the increasing number of underground development projects in the U.S. These developments are of interest for a number of reasons, some of which are discussed in greater detail below. More generally, however, the past few years have witnessed the depletion of a number of surface ore deposits and an

TABLE 3. Expenditure impacts on employment, output, and household incomes, 1995

State	Development Expenditure ($Millions)	Employment Impacts (Jobs)	Output Impacts ($Millions)	Earnings Impacts ($Millions)
Alaska	396.0	3,960	579.7	153.4
Nevada	1,615.0	134,884	2,802.5	905.0
Washington	140.2	4,318	314.7	98.5
Total	2,151.2	43,162	3,696.9	1,156.9
96-96 Annualized	1,075.6	21,581	1,848.5	578.5

Impact mulltipliers are from U.S. Bureau of Economic Analysis (1992).

increasing percentage of new U.S. higher grade reserves mineable from underground operations.

One significant factor in the beginning of a shift to underground development is that surface orebodies tend to be oxidized, which means that they were amenable to processing using low cost heap-leach technologies. Underground mineable orebodies, on the other hand, tend to be refractory ores which cannot be efficiently processed by heap-leach technologies and require costlier milling processes. Underground development is also more costly per ton of ore mined.

Offsetting the higher mining and processing costs associated with new U.S. underground developments, however, are the higher grades being found at depth. At the recently opened Meikle Mine developed by Barrick Gold on the Carlin Trend in northeastern Nevada, for example, average grades are reported at 0.6 ounces per ton, ten times richer than the average grade for U.S. operations reported in the 1994 edition of this publication. Other new underground mines under development have also reported grades well above the previously reported U.S. average. With these higher grades, development and production costs per ounce produced will fall in spite of higher costs per ton of ore mined.

Table 4 illustrates the effects of the shift toward production from near surface, low grade oxide ores to deeper, higher grade, refractory ores. And, although the table does not isolate the effects of the shift toward underground production, this shift clearly underlies the trend illustrated by the table. In 1994, 79% of the ore reported in a survey of U.S. producers was processed by heap-leach methods to produce 32% of the gold produced by the group of companies. Conversely, in 1994, 21% of the ore processed using various milling techniques produced 68% of the gold from the producers responding to the survey. By 1998, 29% of ore will be milled to generate 76% of production from this group (table 4).

A second significant factor in the beginning of a shift to underground development is its environmental impacts. Underground development will generally involve less surface disturbance and, consequently, smaller environmental impacts because less land will be disturbed by mining and heap-leach processing facilities. The survey of producers conducted for this study indicates that it is too early to try to quantify the environmental implications of the growth in underground mining, but this trend clearly works in this direction.

INDUSTRY PERFORMANCE

Short-term gold industry profitability is the product of three factors: gold prices, production costs and, more recently, companies' hedging practices. Long-term performance, of course, depends upon these short-term factors plus the ability of the industry to discover and develop new orebodies and the public policy environment in which the industry operates. These two issues are addressed below in later sections.

The first two of the three determinants of short-term performance named above, gold prices and production costs, are the most important factors. In the short run, the industry can make certain technical adjustments, primarily grade control, that will allow it to control its production costs. Realistically, however, with a fixed technology and orebody, this ability is limited. In addition, the industry has absolutely no control over gold prices which leaves producers completely at the mercy of the vagaries of gold prices and geology.

In an effort to characterize the profitability of the U.S. precious metals industry, the 1995 annual financial reports of 18 major U.S. precious metals producers were compiled and consolidated. Standard financial ratios such as profit margins, return on investment, and return on equity were then computed for each company and for the 18 companies in aggregate. These data were supplemented when possible with data from an industry survey conducted in the spring of 1996. These 18 companies are: Amax Gold, Barrick Gold, Battle Mountain Gold, Cambior, Coeur d'Alene Mines, Echo Bay Mines, FirstMiss Gold (now Getchell Gold), FMC Gold (now Meridian Gold), Glamis Gold, Hecla Mining, Hemlo Gold (which has merged with Battle Mountain Gold), Homestake Mining, Independence Mining, Newmont Mining, Pegasus Gold, Rayrock Yellowknife Mines, Placer Dome U.S., and Santa Fe Pacific Gold. These companies include 17 public companies with publicly available financial reports. One privately held corporation provided the data for this analysis on a confidential basis. Producers' operations outside the U.S. are included in the financial results because annual corporate reports generally do not differentiate certain financial data by state or nation. Approximately three-fourths of the net income reported on table 5, however, comes from U.S. operations.

TABLE 4. Trends in heap-leach and mill production, 1994-98

	1994	1995	Projected 1996	Projected 1998
Heap-Leach Processing				
Tons Processed (1,000)	134,929	134,460	135,836	101,329
Percent of Total	79%	78%	77%	71%
Gold Production (1,000 ozs.)	2,114	1,985	1,957	1,816
Percent of Total	32%	30%	28%	24%
Mill Processing				
Tons Processed (1,000)	35,682	37,074	39,482	40,863
Percent of Total	21%	22%	23%	29%
Gold Production (1,000 ozs.)	4,457	4,620	4,936	5,606
Percent of Total	68%	70%	72%	76%

Source: Survey of U.S. producers

TABLE 5. Industry profitability comparisons

Year	Revenue ($Millions)	Net Income ($Millions)	Total Assets ($Millions)	Shareholders' Equity ($Millions)	Return on Equity (%)
* U.S. PRECIOUS METALS PRODUCERS					
1986	1,799	142	5,357	3,034	4.7
1987	2,746	643	7,040	4,429	14.5
1988	3,341	692	8,786	5,569	12.4
1989	3,988	498	11,061	6,436	7.7
1990	4,670	171	11,650	7,063	2.4
1991	4,256	-74	11,469	7,102	-1.0
1992	4,263	149	9,173	5,199	2.9
1993	5,026	405	12,186	7,032	5.8
1994	5,155	438	13,503	8,347	5.2
1995	5,990	528	15,787	9,645	5.5
** ALL U.S. MINING					
FY 1986	33,999	-5,071	76,308	28,835	-17.6
FY 1987	34,718	-959	73,767	27,103	-3.5
FY 1988	38,316	635	72,976	26,728	2.4
FY 1989	40,635	1,840	73,957	28,893	6.4
FY 1990	42,738	2,463	74,464	30,215	8.2
FY 1991	39,692	626	74,099	30,574	2.0
FY 1992	36,575	145	73,998	30,298	0.5
FY 1993	41,162	1,296	83,863	36,984	3.5
FY 1994	43,005	1,468	92,199	38,743	3.8
FY 1995	45,473	1,584	97,896	41,797	3.8
** ALL U.S. MANUFACTURING					
FY 1986	2,251,786	84,004	1,978,238	882,411	9.5
FY 1987	2,371,005	114,641	2,079,761	900,908	12.7
FY 1988	2,591,322	154,307	2,246,788	955,988	16.1
FY 1989	2,697,933	138,975	2,391,096	1,000,111	13.9
FY 1990	2,683,233	111,411	2,553,610	1,041,735	10.7
FY 1991	2,753,021	68,939	2,625,629	1,067,335	6.5
FY 1992	2,365,082	67,811	2,517,393	1,005,403	6.7
FY 1993	2,961,293	75,113	2,864,820	1,035,114	7.3
FY 1994	3,173,860	129,407	2,981,131	1,101,376	11.8
FY 1995	3,410,829	204,029	3,209,741	1,234,274	16.5
** U.S. NONDURABLE MANUFACTURING					
FY 1986	1,109,711	50,875	1,026,503	441,515	11.5
FY 1987	1,190,525	61,943	1,072,838	454,159	13.6
FY 1988	1,307,538	87,377	1,160,835	486,991	17.9
FY 1989	1,387,989	80,433	1,266,255	503,240	16.0
FY 1990	1,449,081	70,570	1,343,353	527,425	13.4
FY 1991	1,441,429	61,432	1,395,588	551,745	11.1
FY 1992	1,266,220	57,069	1,362,661	542,505	10.5
FY 1993	1,522,568	61,732	1,506,606	555,775	11.1
FY 1994	1,543,356	67,385	1,555,080	577,570	11.7
FY 1995	1,670,576	104,263	1,657,561	620,206	16.8

* Compiled from corporate reports of U.S. producers for each year. The cohort group of companies included varies from year to year because of start-ups, shut-downs, acquisitions and mergers, however, in each year, the cohort accounts for at least 90 of primary U.S. gold production. Figures also include some non-U.S. operations because the annual reports do not distinguish financial data by country.

** Source: U.S. Bureau of Census, Quarterly Financial Report for Manufacturing, Mining and Trade Corporations, 1986 through 1995. U.S. Government Printing Office, Washington, D.C. Due to delays in reporting, data from this source are reported for the fiscal year data from the third quarter of one year through the second quarter of the next.

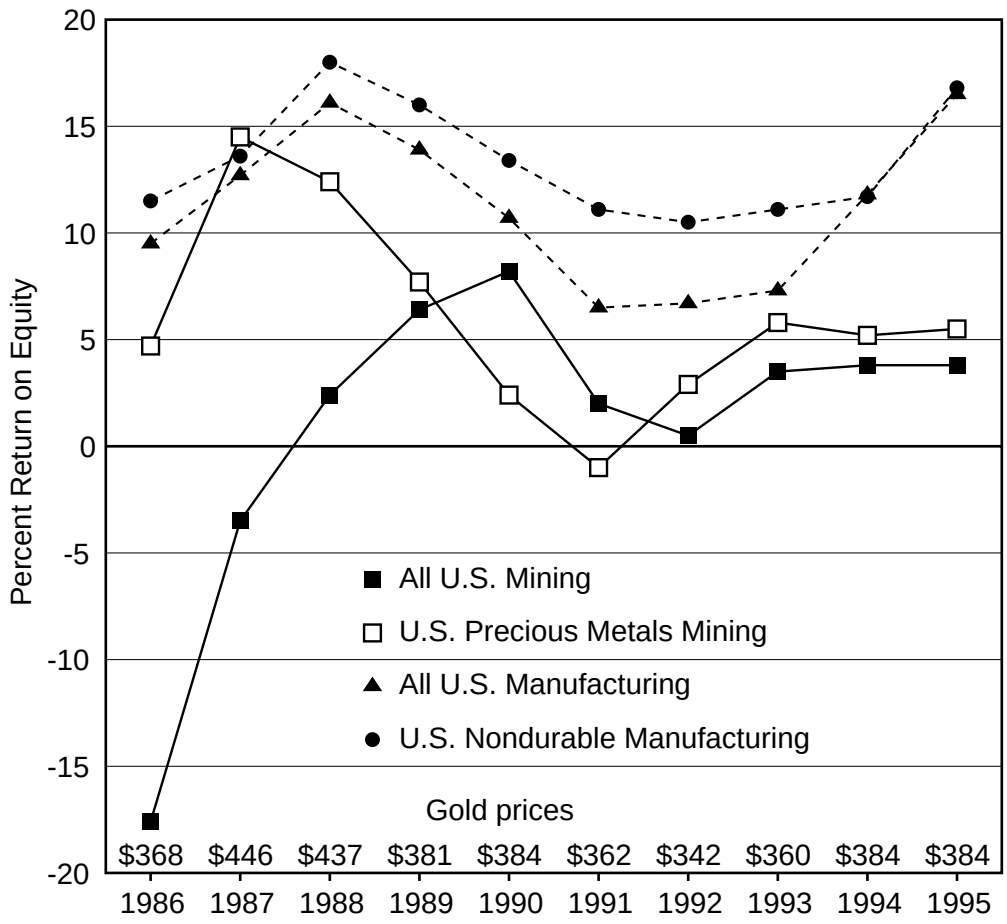

FIGURE 2. Return on equity of the precious metals industry in comparison with all mining and with manufacturing, 1986-1995. Annual average gold prices are shown along the bottom of the chart.

A common measure used to compare the profitability of different industries is return on shareholders' or owners' equity. This measure is widely used by Standard & Poor's *Industry Reports* because it accounts for factors such as corporate debt in measuring profitability.

In 1995 rate of return on equity for firms in the U.S. precious metals industry ranged from a high of 15.2% to a low of -57.8%. The weighted average return on equity for these companies was 5.47%, up slightly from 5.25% in 1994. Figure 2 and table 5 present data on the profitability of U.S. precious metals producers and several other comparison industries using rate of return on owners' equity.

Table 5 shows the aggregate revenue, net income, total assets, shareholders' equity, and return on shareholders' equity for U.S. precious metals producers, all U.S. mining, all U.S. manufacturing, and all U.S. nondurable manufacturing for 1986 through 1995. Data on the latter three industry groups are from the U.S. Bureau of Census (1986-1995). All mining and precious metals mining have generally been far less profitable over the past decade than manufacturing (table 5 and fig. 2). In the case of all mining, the industry was hit hard by low commodity prices in the recession in the early 1980s and, as a result, the industry went through some significant restructuring.

In the case of precious metals mining, the industry's profitability has varied directly with gold prices, which are shown on the bottom of figure 2. In 1987 and 1988, when gold prices averaged over $400 per ounce, the industry's profitability was comparable to the two manufacturing sectors shown on table 5 and figure 2. However, as gold prices fell in the early 1990s, industry profits declined accordingly.

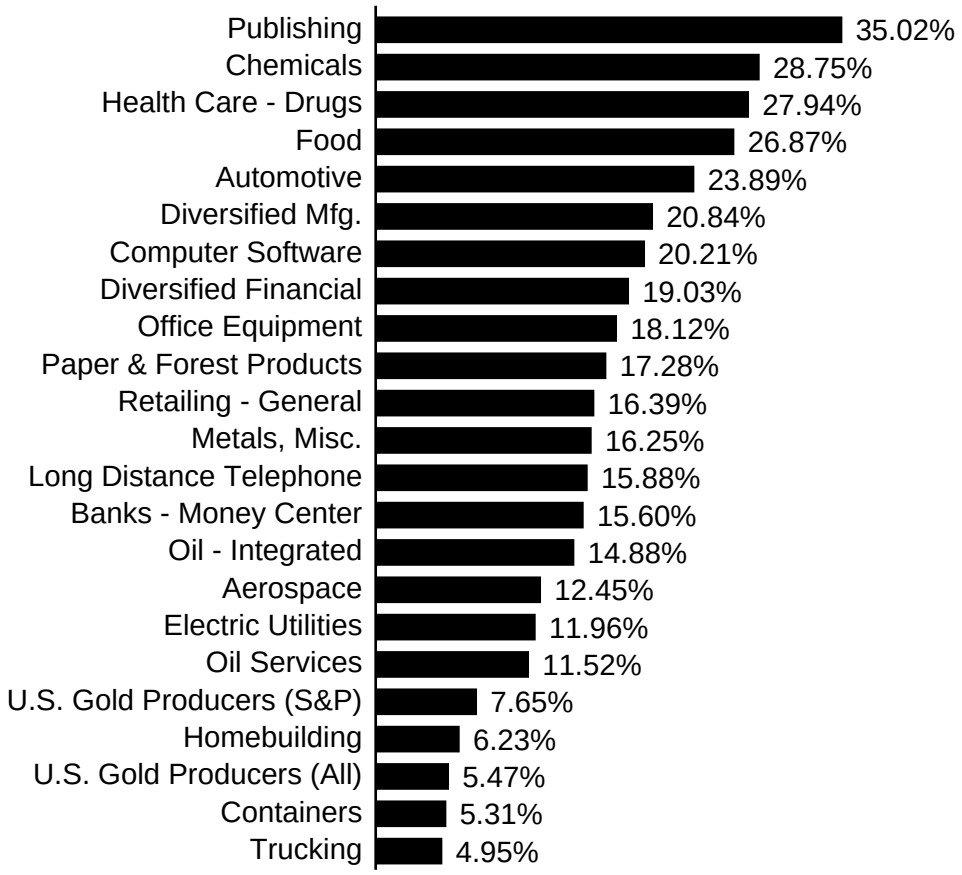

FIGURE 3. Industry profitability comparisons, 1995 return on equity for selected U.S. industries. (Based on Standard & Poor's (S&P) *Industry Reports*, April 1996.)

Another basis for comparing precious metals industry profitability to other industries comes from Standard & Poor's monthly publication *Industry Reports*, which reports on the profitability of 80 industry groups using companies selected by Standard & Poor's. Their gold producers category, for example, includes nine of the most profitable gold mining companies as opposed to the broader group of 18 used in table 5 and figure 2.

For comparison purposes 21 other industry groups tracked by Standard & Poor were selected at random to compare with Standard & Poor's gold producers group and the broader group of 18 companies with operations in Nevada. These industry groups' return on equity is illustrated in figure 3. As indicated, using either the Standard & Poor's gold industry group or the broader group of 18 producers, gold mining is near the bottom in terms of its profitability.

As the discussion of gold prices and production costs below indicates, there is a margin of $76 between 1996 average total production costs and prices, which amounts to a gross operating margin of 19.8%. This margin would appear to indicate fairly good profitability for the industry except that operating costs ignore the exploration and development costs that must be incurred to replace reserves exhausted by production. As the discussion of table indicated, approximately $1 billion were expended annually in 1995 and 1996 for these exploration and development activities. This sum amounts to approximately 26% of industry gross revenues and is well in excess of industry gross margins of profit. The industry was only able to show the profit margin of 5.47% cited above through the investment of funds from outside the U.S. industry. That is, while profit margins in the U.S. precious metals have been low relative to other industries, the industry and its new development targets have nonetheless continued to attract capital.

GOLD PRICES

In almost any discussion of gold markets with journalists or investors and potential investors, economists and analysts are asked about the prospects for gold prices. Economists and pundits have a number of standard answers to this question. The first and probably most accurate answer is that economists and analysts do not know. The second answer, also fairly accurate, is that if they did know, they would not tell but would be calling in their buy and sell orders from a beach in some tropical climate. The third and most serious answer is that gold prices are subject to rules of supply and demand in spite of frequent comments to the contrary. In the post-Bretton Woods era (post 1972), currencies are no longer tied to gold and gold prices have floated like currencies. Gold has largely been discarded as a monetary asset as, in John Maynard Keynes words, a "barbarous relic."

Average annual gold prices are shown in figure 4. Gold has been stuck in a $380 to low $400 trading range since 1994. The questions are: Will gold prices break out of this trading range, and which way will they go?

Under the monetary regime of Federal Reserve Board Chairman Alan Greenspan, however, gold has gained new luster. Greenspan has singled out gold prices as an indicator of inflation and, hence, as a factor in the Federal Reserve Board's policies concerning interest rate determination and currency management. Although the U.S. is not on the gold standard, statements of the Federal Reserve Board Chairman before Congress and to the press would lead a casual observer to conclude otherwise (for example, see the Wall Street Journal, September 10, 1996, "The Clinton economy," p. A18).

This policy carries a number of important implications for the gold industry. First, if the policy position is taken seriously, major movements in gold prices above their current range would be counteracted by the Federal Reserve Board. This, one would suppose, would be accomplished by tightening the rate of expansion of the money supply or by raising interest rates in the event dollar-denominated gold prices were rising, or taking the opposite actions if gold prices were falling.

But it is always difficult to take government policy statements seriously because they are always made under circumstances that are subject to change. Nonetheless, the implications of the Federal Reserve Chairman's stated

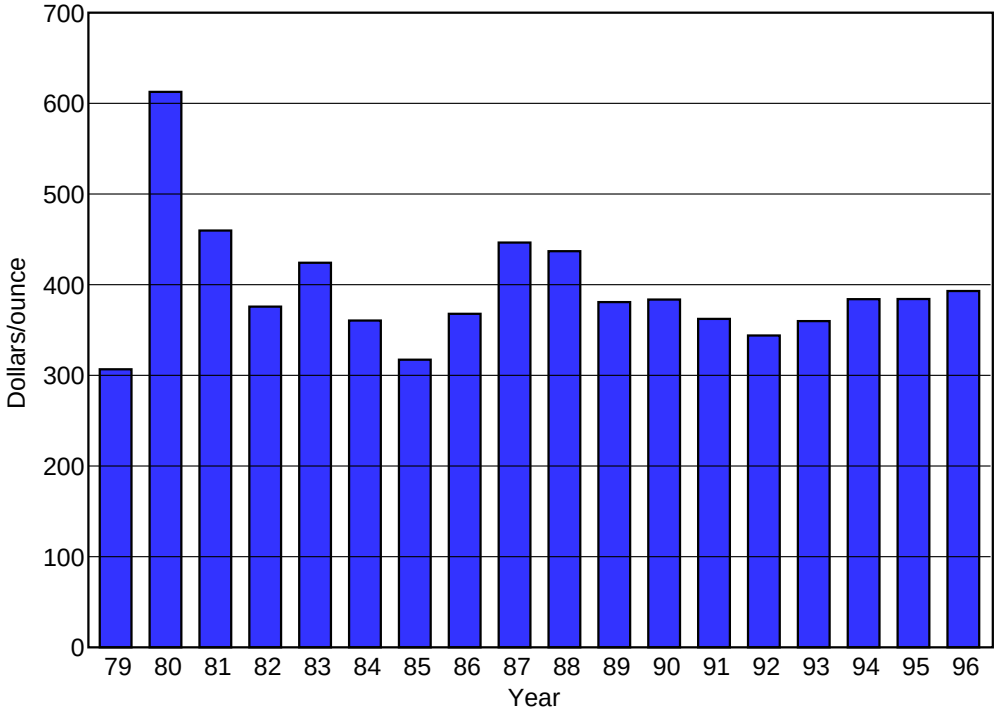

FIGURE 4. Gold prices (1979-1996).

policy are worth considering. The first implication is that if gold is going to be treated as a monetary asset, increases in the price of gold that are associated with declines in the U.S. dollar relative to the currencies of U.S. trading partners will result in restrictive monetary policies by the Federal Reserve Board. Consequently, if U.S. dollar-denominated gold prices rise, look for the Federal Reserve Board to take steps to slow gold down as a means of stabilizing the dollar. Conversely, if U.S. dollar-denominated gold prices fall, the Federal Reserve Board might take steps to support gold prices by weakening the dollar because these circumstances would put the U.S. in an unfavorable trade position. Note, however, that the lower end of the trading range has not yet tested the Board Chairman's resolve to peg the U.S. dollar to gold.

This is both good news and bad news for U.S. gold producers. The good news is that producers may be able to count on support of gold prices by monetary policy. Producers can take some comfort in the Federal Reserve Board's satisfaction with the current trading range. As noted, however, this supposition has to be tested. The bad news is that the Board will act to limit the upside in gold relative to the U.S. dollar.

This news, however, may not mean much since in the recent past gold prices have not appeared to respond to monetary and interest rate changes. In other words, it is not clear that the Federal Reserve Board could affect the dollar price of gold if it tried.

The Federal Reserve Board's new "gold policy" also says nothing about potential Board response to "real" changes in the price of gold, i.e., changes that result from fundamental supply and demand conditions in the market. These are the types of changes that result when there is an international crisis, or when people living in countries with rising prosperity but unstable monetary systems use gold as a hedge against their own money and banks such as in Asia, or when there is a major change on the supply side of the market, as when a major producer is in a period of decline, or major new prospects are developed. What makes gold markets interesting is that all of the above are occurring.

During 1996, the U.S. appeared to be on the verge of conflict with Iraq several times which, in 1991, sent gold prices over $400. These events did not escalate and, hence, gold prices were not significantly affected. Once the lopsided nature of the 1991 conflict became apparent, prices quickly retreated. Renewed hostilities probably will have little effect on gold prices unless the Iraqis or similar foes mount surprising resistance.

In Asia, economic growth is proceeding at rates well above world averages. These countries lack developed banking systems and stable regimes in some cases and, consequently, gold remains an investment good as a store of value in this part of the world despite being a "barbarous relic" in the U.S. Currently, over two-thirds of the world's annual physical gold production disappears into Asia. As long as these conditions prevail, strong economic growth and unstable monetary systems should sustain the demand for physical gold.

Discussion of gold prices typically evoke bearish, bullish, and neutral responses from analysts. An "academic" response has to fall into the third category and observe that the "fundamentals" of the market, i.e., mine supply and physical demand, have been positive for several years. World mine supply peaked in 1993 at 73.6 million ounces (2,290 tonnes). Meanwhile, physical demand has increased since 1990 from 99.4 million ounces (3,093 tonnes) to 116.4 million ounces (3,622 tonnes) in 1995. The difference between mine supply and physical demand, some 42.8 million ounces, has been met from above-ground stockpiles which are the nemesis of gold prices. This difference largely represents sale of above-ground stocks by investors, governments, and to a lesser extent (approximately 13%) from producer hedging. In other words, over the past few years, whenever gold prices have broken through the top of their trading range, someone has taken advantage by dumping several million ounces of gold into the market from above-ground stocks. Because there are over 4 billion ounces of gold in identifiable above-ground stocks around the world, this will always remain a distinct possibility and hangs over the gold market potential to move upward out of its trading range (Murray and others, 1996).

On the other hand, continued and even increasing reliance on gold as an investment commodity in the rapidly growing world markets of Asia suggests that an overly bearish outlook is also not in order. In a world of unstable governments, currencies, and markets, a highly liquid medium for storing wealth would appear to be in demand. In addition, although industrial, and particularly electronic, uses of gold currently account for a relatively small proportion of world demand, this proportion is much higher in developed countries and appear to be on the rise. Consequently, in spite of the dismissal of gold as a monetary asset by many in developed nations, gold has not been marginalized in the rest of the world and is likely to continue to be demanded at current levels for the foreseeable future.

TRENDS IN PRODUCTION COSTS

As noted in previous studies, the U.S. has developed a relatively large, highly efficient production base. Based on the trends in the industry discussed above, which saw reserves increase twice as fast as they have been depleted in the past two years and the development of higher grade orebodies, the industry would appear to be on course to maintaining its large and efficient production base. Indeed, in Nevada there are sufficient reserves to sustain current levels of state production for at least 20 years (Price, 1996). The efficiency of the industry is partially reflected in its production costs, which are among the lowest in the world (Murray and others, 1996, p. 27). Production costs only reflect short-term efficiency because in the long run producers must be able to replace reserves depleted in mining through successful exploration and development programs, which are not reflected in the short- and long-term production costs discussed below.

Table 6 and figure 5 summarize "cash" and average total costs per ounce for U.S. producers from 1989 to 1996. The gold industry, like other metal producers, focuses on cash production costs because these costs must be covered by prices in the short run to show a positive cash flow. Hence, using 1995 total cash costs of $256 per ounce, a price above $256 is required for the industry to break even on a cash-flow basis. Breaking even on a cash-flow basis, however, is not to be confused with making a profit. To break even the industry would also have to cover its non-cash costs which, in 1995, were an additional $51 per ounce and would require a gold price of $308 per ounce. Gold prices at this level would only allow producers to break even on average in a short-term accounting sense. From an economic perspective, however, at a price of $308 per ounce, the industry would not be able to cover its non-production costs such as exploration and development. The industry

TABLE 6. Cash and long-term average total costs per ounce at U.S. gold mines

	1989	1990	1991	1992	1993	1994	1995	1996*
Extraction	105	107	123	118	115	107	144	136
Processing	84	89	92	90	84	84	75	66
Administration	22	23	29	26	19	18	12	11
Royalties	12	10	12	12	13	14	17	13
Cash Costs	223	229	256	246	231	223	248	226
% Change		2.7	11.8	-3.9	-6.1	-3.5	11.2	-8.9
Taxes								
Property	2	2	3	3	3	3	3	3
Mining	7	6	5	5	5	5	5	5
Subtotal	9	8	8	8	8	8	8	8
Total Cash Costs	232	237	264	254	239	232	256	234
Non-Cash Costs	na	101	na	77	na	86	52	47
Total Costs		338		331		318	308	281
Average Price	381	384	362	342	360	382	384	384
% Change		0.8	-5.7	-5.5	5.3	6.1	0.5	0.0

All figures are in nominal U.S. dollars per ounce.
*1996 figures are projections
na - not available

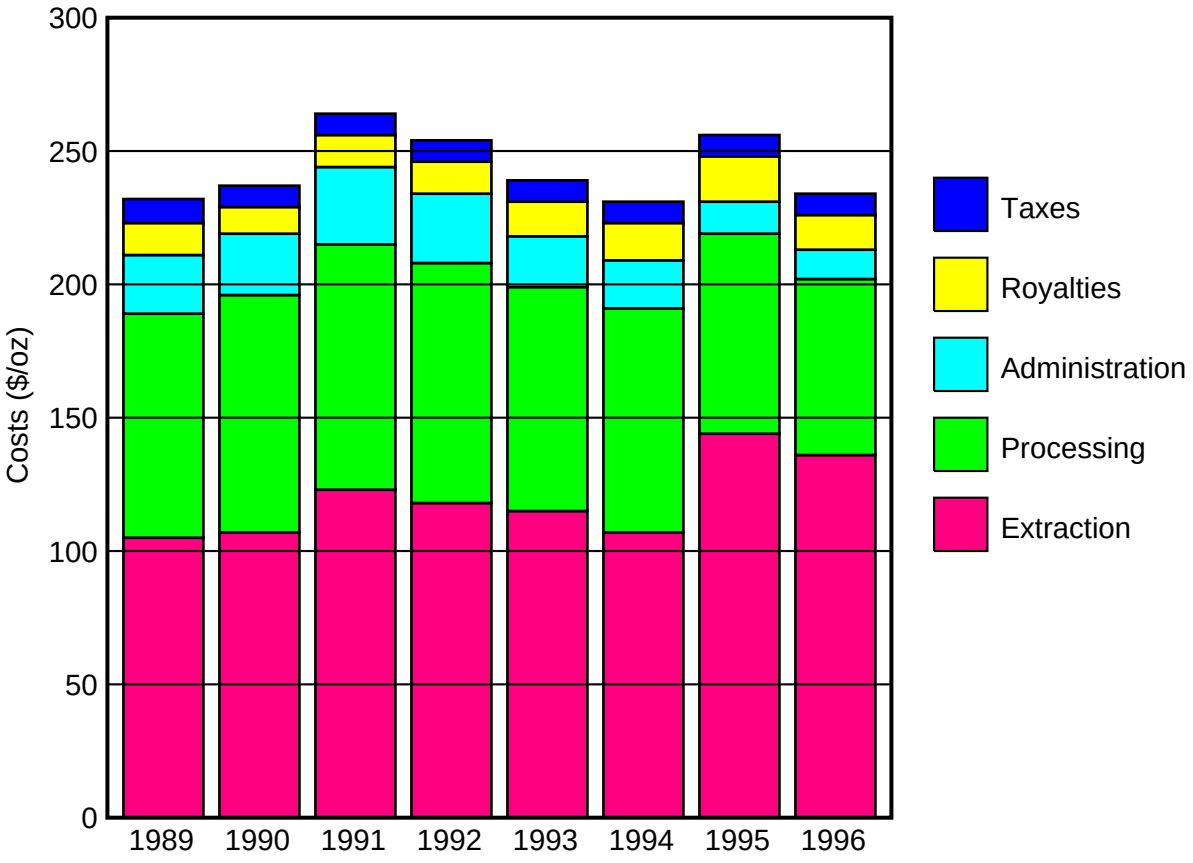

FIGURE 5. Cash costs per ounce at U.S. gold mines (1996 is a projection).

would also suffer a loss because it could not cover its implicit costs of capital or opportunity costs. These costs include what the industry could have earned on its investment if it had invested in something besides gold-producing capital.

In 1996 the industry, under the aegis of the Gold Institute, adopted a uniform format for reporting production costs to allow institutional and individual investors a better basis for comparing gold producers and their individual operations. The standardized format adopted by the industry differs slightly from the format that has been used in previous editions of this report. One notable difference is the treatment of royalties as a cash operating cost. Since royalties must be paid on production even though they are not a direct mining cost, this study and its previous editions have classified royalties as a cash operating cost. For purposes of maintaining comparability between this and previous editions of this report, this report has continued to include royalties in cash costs. Note, however, that this does not affect "Total Cash Costs."

The extraction category on table 6 includes direct mining expenses including the costs of transporting ore from the mouth of the mine to processing facilities. Hence, this category includes all in-mine expenses such as (non-exploration) drilling, blasting, and stripping. Processing costs include leaching and milling costs, by-product credits, and off-site refining costs. Administration expenses include insurance, on-site administration, and site-specific corporate charges. Finally, royalties include payments to owners of mineral rights for the right to mine.

The inclusion of property taxes on table 6 is also at odds with the industry-wide cash cost reporting standard. Property taxes would still be due in the short run if a mine were closed, which would indicate that they are fixed rather than cash costs. However, most states allow closed mines and facilities to be written down for impairment so that property tax liabilities are diminished upon closure. Although this generally takes some time, depending upon state tax laws and regulations, this fact suggests that property taxes are only assessed at the levels indicated by table

6 on a mine that is a going concern, which would indicate that property taxes are operating costs. In light of this ambiguity, property taxes are included in table 6 for purposes of comparison with previous years.

Total Cash Costs for the industry in 1995 were $256, the highest since 1991 and approximately 10% higher than 1994. These higher costs reflect a number of factors including greater stripping associated with expansions of ongoing mines and development work involved with increased underground mining. Both of these factors have contributed to the large increase in extraction costs over previous years. Projections for 1996, however, show extraction costs falling as stripping is completed at a number of large and expanding surface mines and initial underground work is completed at underground mines. These figures are expected to moderate in the next several years as the projection for 1996 indicates, but extraction costs are expected to stay above the low $100 per ounce range shown during the early years in table 6, when the industry was almost exclusively producing from surface mines.

Another notable development in trends in cash costs reflected in table 6 is the decline in processing costs. These cost reductions are primarily the result of processing higher grades and higher recovery rates associated with a relative increase in the tonnage of ores being milled as opposed to being processed by heap-leach recovery methods. Historically and currently, the vast majority of ore is processed through heap-leaching but the proportion of ore going to mills is rising. It is anticipated that these costs may fall slightly over the next several years.

The increase in royalty costs in 1995, as the projected royalty expense for 1996 indicates, is a one-time event. Indeed, it is expected that royalty expenses will decline since a significant part of the industry's royalty expenses are incurred at Newmont's Gold Quarry Mine which will be winding down operations. The Gold Quarry portion of Newmont's property carried the very high 18.5% royalty which has received considerable attention. However, it should be noted that the rest of the property is virtually royalty free. While much has been made about the Gold Quarry royalty, it is important to note that when it is averaged over the entire property, the effective royalty rate is reduced to less than 5% if no new reserves are found.

The continuing downward trend of administrative costs (table 6) reflects the maturation and corporate downsizing of the U.S. industry and the diversion of corporate time and effort to offshore developments. Administrative expenses are expected to continue to decline slightly in 1996 which, along with declines expected in every other non-tax cash cost category, will push industry total cash costs to $234 per ounce in 1996, close to the lowest level since these data have been gathered.

Figure 6 shows the cash costs for 22 mines producing 6.88 million ounces of gold, or approximately three-quarters of primary U.S. gold production. The width of each bar on the figure shows the mine's production and the height shows its cash costs broken down by the cost components shown on table 6, excluding taxes. Figure 6 also illustrates the degree to which production in the industry is concentrated in a few large producers. The widest bar on the figure represents the largest producer, Barrick's Goldstrike Mine on the Carlin Trend in northeastern Nevada with production in 1995 of over 2 million ounces. The second widest bar represents the output of Newmont's operations on the Carlin Trend. This bar actually represents the output of several mines on Newmont's property which are aggregated for a total of 1.6 million ounces of production in 1995. The next largest producers are Santa Fe Pacific Gold's Twin Creeks Mine on the Battle Mountain Trend in north-central Nevada with 424,000 ounces of production and Homestake Mining's mine in Lead, South Dakota with approximately 403,000 ounces. Together, these four mines account for approximately 4.5 million ounces of production, nearly one-half of total U.S. primary production. The top two mining operations, Barrick's Goldstrike and Newmont's Carlin Complex, account for 3.7 million ounces, nearly 40% of U.S. primary production.

Seven mines represented in figure 6, with cumulative production of 4.3 million ounces, have costs below $250 per ounce (one of these mines had too little production to show on the graph). The next 10 mines represented on the figure with cumulative production of 1.83 million ounces of production had cash costs between $250 and $300 per ounce. The remaining mines shown in figure 6 had cash costs over $300 per ounce and two of these had cash costs over $400 per ounce. These five high-cost mines had approximately 730,000 ounces of production in 1995.

It should be noted that figure 6 represents the industry cost structure at one point in time and, therefore, does not represent the long-term costs of these operations. The two lowest cost mines represented on the figure, for example, are near the end of their productive lives so their extraction costs are low because relatively little ore is being mined.

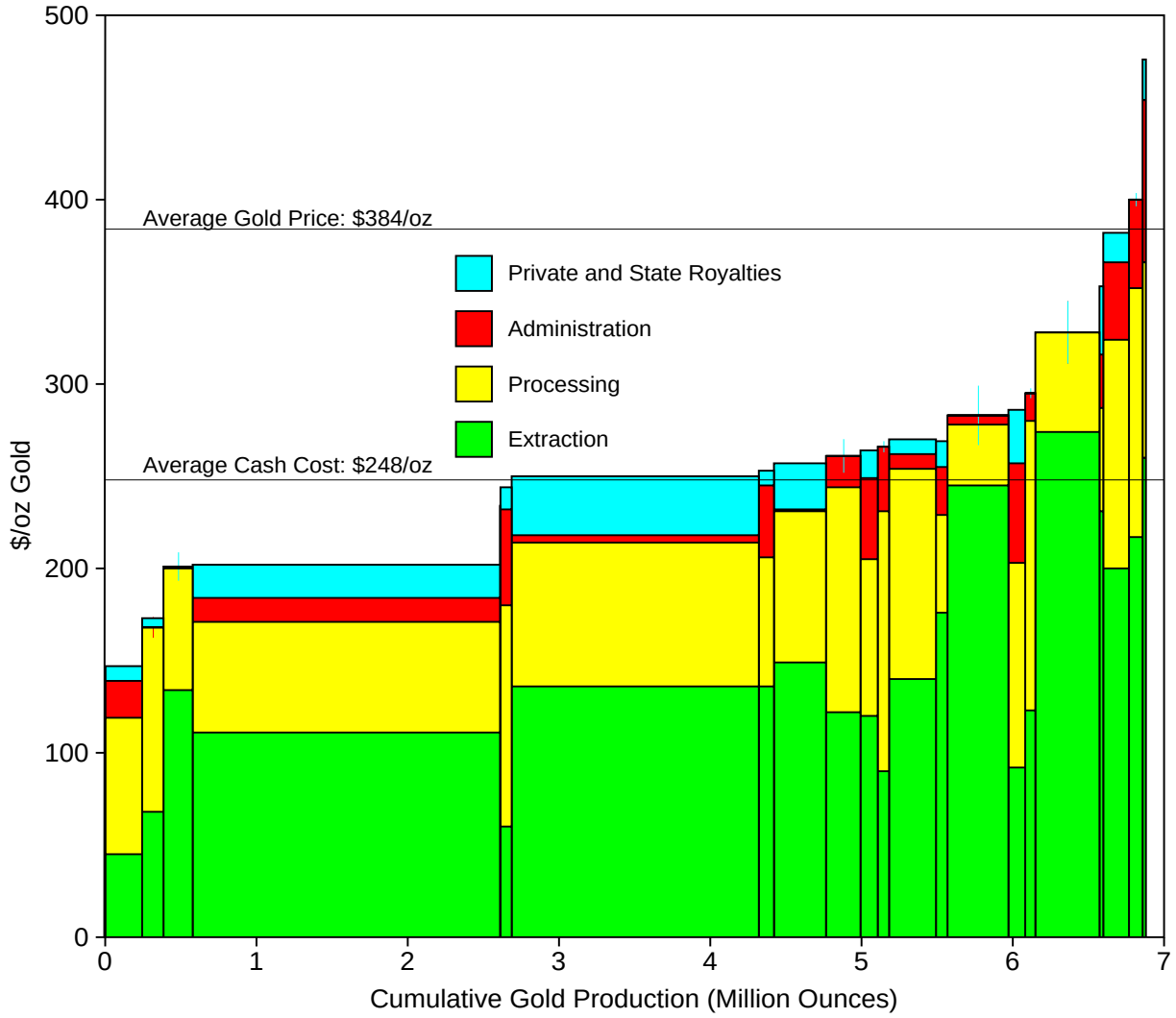

FIGURE 6. 1995 cash cost of production at U.S. gold mines.

Production is primarily coming from processing stockpiled ores or rinsing heap-leach pads. At the other end of the spectrum, two of the five high cost mines are undergoing expansions which lead to relatively high extraction costs in the current period while, in the long run, these costs will very likely fall.

A more reasonable view of the industry's cost structure is provided by figure 7 which shows long-term average production costs over the life of the mine on a present discounted value basis. The figure shows total costs, including both cash and non-cash costs, required to produce each respective mine's stated reserves. Future costs and revenues are discounted at 9% to reflect, on the capital cost side, the opportunity cost of capital and, on the revenue side, the present value of future production. The cost curve depicted by figure 7 shows the minimum price at which the 28 mines can sell their output and break even. It should be noted that the 28 mines represented on figure 7 are a slightly different group than the 22 mines represented on figure 6 and table 6 showing short-term cash costs. The group of mines represented by figure 7 includes eight mines which were not in operation in 1995 and, consequently, did not have reportable cash production costs. The group represented by figure 7 also excludes two mines which are currently in the process of closing. As shown by table 6, the group of 22 mines have long-term weighted average total costs of $308 per ounce while the larger group included in figure 7 have weighted long term average total costs of $311 per ounce.

The weighted average long-term costs for the 28 mines represented is $311 per ounce, $7 below estimated weighted long-term average cost in 1994 (table 6). Also in contrast to the long-term average total cost curve reported in the previous edition of this study, figure 7 shows a total of just under 104 million ounces of reserves in contrast to just under 80 million ounces in the previous study (Dobra and Thomas, 1995). This reflects significant growth in reserves.

While figure 7 provides a more accurate perspective on the industry's cost structure, it shares some of the limitations of the cash cost curve discussed above because it is based on information on reserves and costs that are currently available. Data on reserves are particularly critical since the discovery of new reserves will generally lower long-term average costs. For example, while five of the 28 mines depicted have long-term average costs below $250 per ounce, three of these mines are in the process of closing down because of the lack of reserves. Consequently, these operations will incur few costs to produce gold for a few more years.

On the other hand, three mines show costs between $250 and $300 per ounce. These include Barrick's Goldstrike property (which includes the recently opened Meikle underground mine), Placer Dome's Cortez Mine (which includes the Pipeline deposit under development) and Newmont's Carlin Complex. Together, these properties represent 55.7 million ounces of recoverable reserves, almost 54% of the total reserves reflected by figure 7. Consequently, these numbers are not likely to change, or, if they do, they will likely fall as new reserves are proven.

Twelve mines represented on figure 7 have costs between $300 and $350. These mines represent 32.9 million ounces of reserves, approximately 32% of the total of 103.8 million represented by the figure. These mines include two mines that are near the end of their productive lives and four under development where discovering new reserves is a distinct possibility. Mines in this group that are near the end of their productive lives will likely close down, while those under development may prove up new reserves and lower their long-term costs.

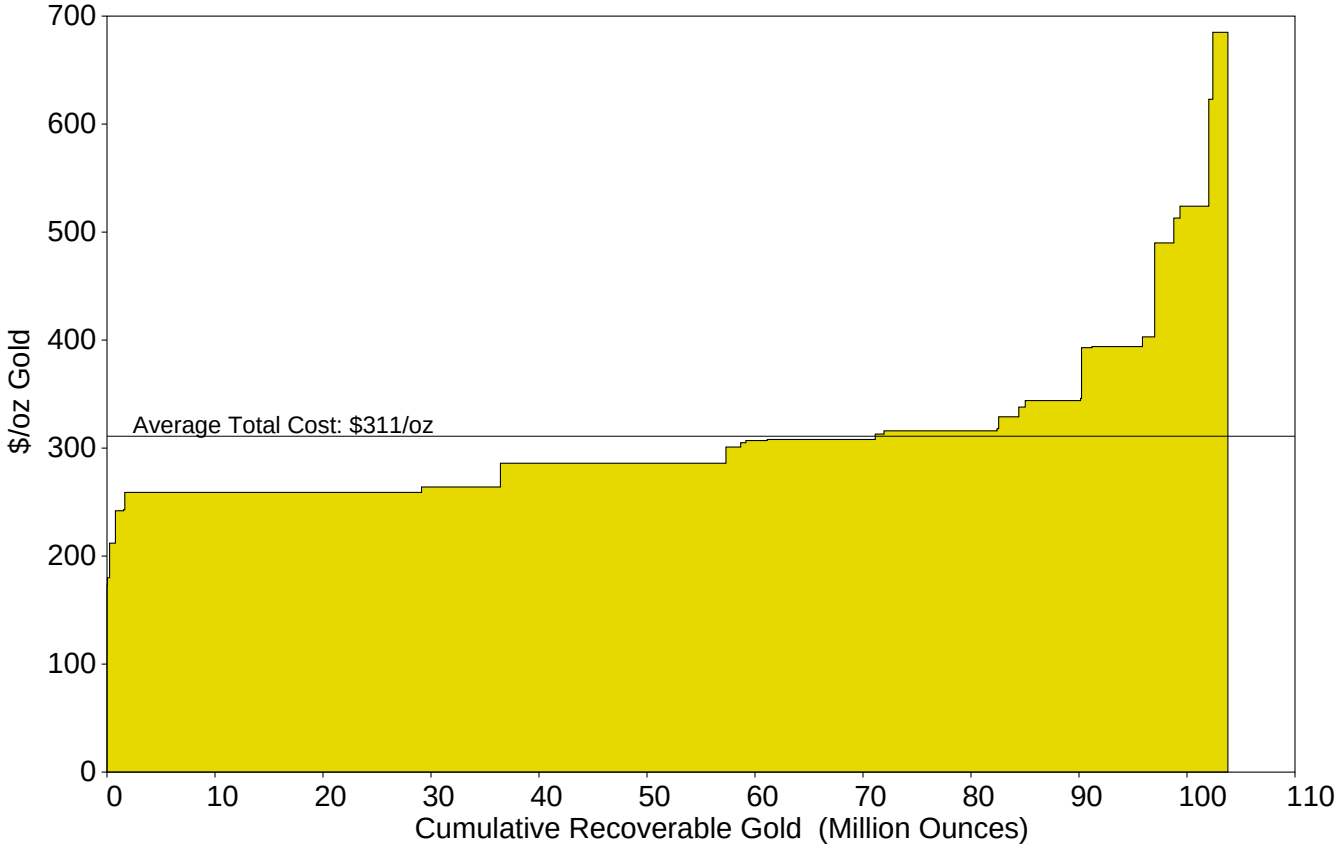

FIGURE 7. Long-term average total cost for selected properties.

HEDGING

The subject of hedging is included in this report because the growth in hedging practices in the industry reflects a trend toward increasing price risk management policies which challenge the conventional wisdom in the industry. Through hedging practices, producers are able to assure a price for their output and, depending upon the hedging strategy adopted, enhance their revenues. These practices have become so prevalent in the industry that, in 1995, over 10% of the industry's profits were earned in the finance department instead of the mine. This makes hedging an important element of precious metals producers' performance.

Hedging involves the use of various forward sales instruments that allow producers to guarantee and enhance the price received for their output. Hedging practices in mineral commodity producing industries are, in general, a response to a combination of factors that are relatively unique to these industries. These factors include a cost structure that is heavily dependent upon technological and geologic conditions, which are essentially fixed in the short run; and commodity prices that have shown significant volatility in both short- and long-term contexts. This leaves industry profitability highly dependent upon prices in the short run. Recent attempts by the Financial Accounting Standards Board to regulate financial disclosure of derivative trading have recently brought industry hedging practices under scrutiny. This development, plus a relatively large increase in the utilization of hedging instruments within the industry and their increasing importance to industry profitability, makes these practices worth closer examination.

By virtue of their investment in mineral commodity producing capital, these producers essentially are "long" in their commodity and are exposed to downside commodity price risks. Selling their production "short" in futures and options markets fundamentally serves the purpose of covering their long position and reducing these downside commodity price risks. Hence, in this case, forward sales are a risk-reducing activity.

It is also true that producers of manufactured goods and providers of services such as manufacturers of refrigerators and barbers are also "long" in their respective markets. However, there are two key differences. First, futures and options markets for manufacturers and service providers are virtually nonexistent. Lacking futures and options markets to short their products and services, manufacturers and service providers seek to negotiate long-term contracts as a means of reducing market risk.

Second, casual observation would suggest that producers of most manufactured goods and providers of services have not faced the same kind of price volatility that commodity producers (of all kinds) have faced. Whether volatility is the result of having organized futures and options markets or whether these markets developed because prices were volatile is a question for economic historians to resolve. Nonetheless, the relative price stability enjoyed by manufacturers and providers of services would tend to reduce their need for futures markets relative to commodity producers.

As the discussion of industry profitability suggests, price risk represents one of the more significant risks to the industry. As a consequence, hedging these risks has played an important part in the industry's growth and ongoing operations.

In the late 1980s many companies took advantage of gold loans to finance development of their properties. With a gold loan a producer borrows gold and monetizes it at current prices. The loan is repaid in gold at a future date. Since the future price of gold is always higher than the current price by the contango, the effective borrowing rate for a gold loan (even if spot prices remain constant) is very low (generally less than or equal to the real rate of interest). Hence, gold loans taken out in the late 1980s when prices were high (over $400 per ounce) and repaid in the early 1990s when prices were low ($340-360 per ounce) have substantially reduced the real cost of capital for projects financed with gold loan proceeds.

Since gold prices reached inflation adjusted lows in the early 1990s, gold loans have all but ceased to exist. Since then, the general sentiment of both producers and bullion market makers (i.e., banks) has been that prices will rise (and they have since the ten-year low price in the fall of 1993, but have remained essentially stagnant since early 1994). As a consequence, borrowers/producers have been unwilling to borrow and monetize future production at what they perceive to be low current prices to deliver at expected future higher prices, and gold loans have virtually disappeared from the market, especially large gold loans of several hundred thousand or a million ounces that were seen in the late 1980s.

Over the past three years producers have primarily used forward sales contracts, spot deferred contracts, and put-and-call options contracts as risk management and revenue enhancement devices. As of the fourth quarter of 1995, worldwide 1996 production of North American producers was 42% hedged at $408 per ounce, and 29% of 1997 production was hedged at $421 per ounce, 8% of 1998 production was hedged at $447 per ounce, 8% of 1999 production was hedged at $467 per ounce, and 7% of 2000 production was hedged at $435 per ounce. Overall, as of the fourth quarter of 1995, at total of 18.3 million ounces was sold forward (Reeve, 1996).

Forward sales contracts are commitments to sell gold at a future date at a predetermined price. These contracts can be traded on exchanges or negotiated "over the counter" with a bullion bank. The vast majority of North American companies choose to deal directly with bullion banks and, hence, do not trade futures on exchanges. In a forward sale, the seller receives a premium, the contango, over the current or spot price at the time the sales contract is negotiated to deliver at a future date. The contango generally represents the time value of money and is based on the difference between current interest rates and the gold leasing rate. While the seller benefits from higher prices because of the contango, the seller has to forego the opportunity to sell at higher spot prices in the future if prices rise because the forward sale is a firm commitment. If the spot price rises above the agreed upon delivery price by the date of delivery against a fixed forward sale, producers suffer a "notional" loss, i.e., they could have received a higher price. However, it is important to recognize that sellers still make the profit they anticipated when they entered into the contract.

Spot deferred contracts are not exchange traded and are exclusively sold "over the counter." Spot deferred contracts, like forward sales, are a commitment to sell gold at a future date at the current spot price. The seller, however, may elect to defer delivery if the spot price at the agreed upon delivery date is higher than the spot price agreed upon in the contract. When delivery is deferred, the agreed upon price is adjusted to account for the buyer's costs of carrying forward the commitment to buy. Such contracts may be deferred numerous times but ultimately require delivery or settlement in cash. The seller will deliver the gold if the price has fallen to or below the contract price, or settle in cash if the price has risen.

Because of this flexibility to sell at the higher of two prices, spot deferred contracts are used much more frequently than fixed forward sales which require the seller to give up potential "notional" profits. Our survey of major U.S. producers showed about ten ounces sold via spot deferred contracts for every one ounce sold via fixed forward contracts. A broader survey conducted by ScotiaMcLeod (Reeve, 1996), however, shows a ratio of approximately two ounces sold via spot deferred contracts for every one sold via fixed forwards.

Clearly, one motivation in using either of these hedging instruments is to enhance producers' revenues. This is best achieved through fixed forward sales when prices stay within a narrow trading range as they have done through the past three years. Analysis of corporate reports have shown that producers have adjusted to the narrow trading range in the spot price of gold with more aggressive hedging activities. Over the period from 1993 to 1995, net hedging activity has increased by almost 50% but net hedging gains, i.e., earnings on gold sales over and above the spot price have increased more than five times from $2 per ounce to over $10 per ounce. This net gain underscores the growing importance of hedging since this $10 is over 13% of the industry gross margin of profit.

It is important to note that these hedging gains have implications beyond simply increasing producers' profits. From a mining engineer's perspective, cut-off grades are a function of prices. By using forward sales and taking advantage of the contango, cut-off grades are lowered, higher proportions of gold resources can be classified as recoverable reserves, and the resources are used more efficiently.

A second motivation in using these hedging instruments is revenue protection. Indeed, revenue protection is perhaps a more compelling reason for hedging, given the fundamental relationships among commodity price stability, production costs, and profitability.

Clearly, fixed forward sales and spot deferred contracts provide revenue protection. However, they are also criticized because they "give away" upside price risks, i.e., the potential to make more if prices rise. Put options provide additional mechanisms for revenue protection that do not "give away" the upside price potential. These hedging instruments give the buyer of the put option the right, but not the obligation, to sell at a predetermined price. The seller of the put option agrees to buy at the agreed upon price in the event the buyer elects to exercise the option. Producers purchase put options at prices below the current price ("out of the money" puts) as a precaution against the price falling.

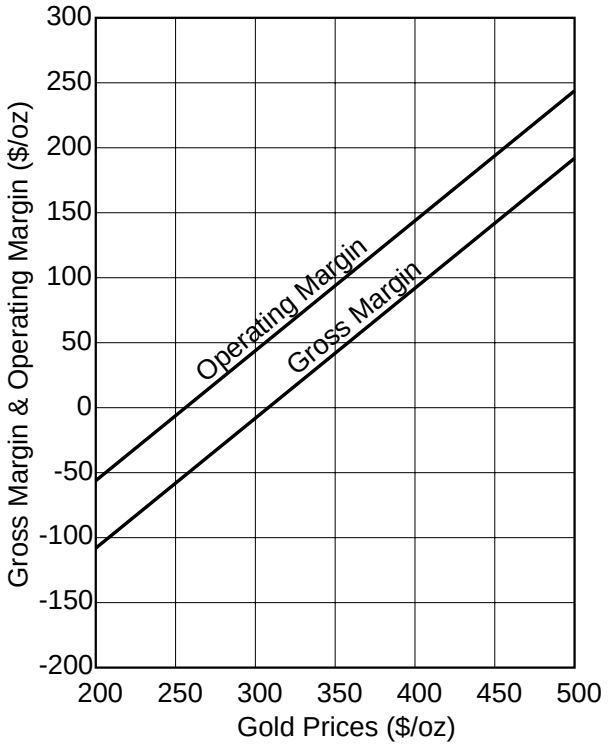

FIGURE 8. Gold industry price risk exposure.

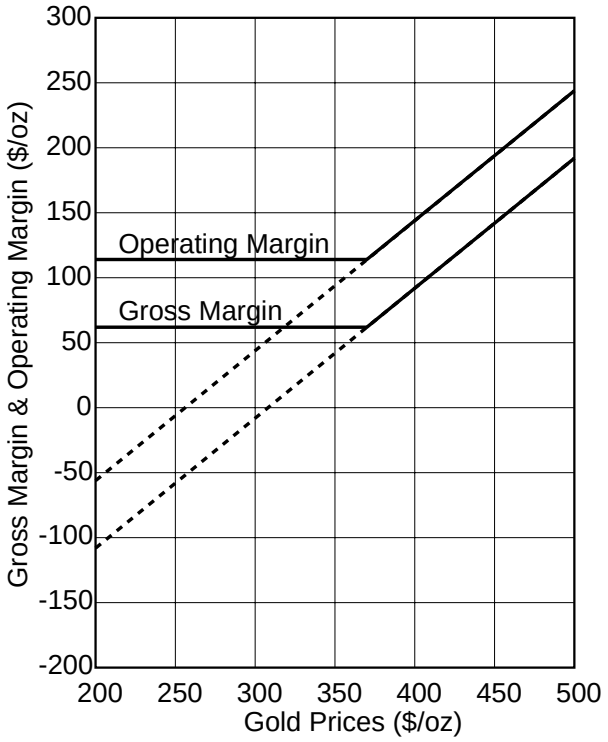

FIGURE 9. Gold industry price risk exposure with a put option at $370 per ounce.

Because the industry's costs are relatively fixed, operating and gross profit margins are highly leveraged by fluctuations in commodity prices. Based on production cost data above, the industry's average operating margin (price minus cash costs) and gross margin (price minus average total costs) for 1995 are $128 and $76 per ounce, respectively. These costs, however, do not reflect other necessary costs associated with an ongoing precious metals industry such as exploration and development costs, so these figures overstate profitability but, nonetheless provide a useful benchmark.

Without revenue protection, producers' margins on a per-ounce basis are leveraged dollar-for-dollar by gold prices indicated by figure 8. In other words, for example, at a price (shown on the horizontal axis) of $308 per ounce, the average producer just covers their operating costs and their current fixed costs and the Gross Margin line on figure 8 crosses the zero line. As a consequence of the producer's fixed short-term production costs, every dollars' increase or decrease in gold prices directly increases or decreases profits.

Under the assumption that producers can buy "out of the money" puts at $370 per ounce for $0.20 per ounce (September 20, 1996 for delivery in November 1996), figure 9 shows the industry's price risk exposure with these options in force. As illustrated by the figures, put options reduce upside earnings by a minimal amount ($0.20 per ounce assuming all production is sold forward through puts), but the puts (fig. 9) create a revenue floor for producers.

While this example is simplistic, it does illustrate the fundamental purpose and attraction of hedging to commodity producers. This purpose, however, is not without disagreement within the industry. Some boards of directors in the industry have, in the past, announced a no hedging policy because they believe (1) gold is a hedge against political and financial instability, and (2) hedging a hedge fundamentally defeats the purpose of buying gold and stock in gold mining companies as a proxy on physical gold - "you don't hedge a hedge," it defeats the purpose of buying gold stocks. Hedging using put options, however, counters these arguments since they are options to sell, not commitments.

On the other hand, directors of companies that hedge production cite a different theory. Mineral commodity producers frequently use forward sales (straight forwards, gold loans, and the purchase of put options) to guarantee recovery of capital investments. This strategy has been pursued

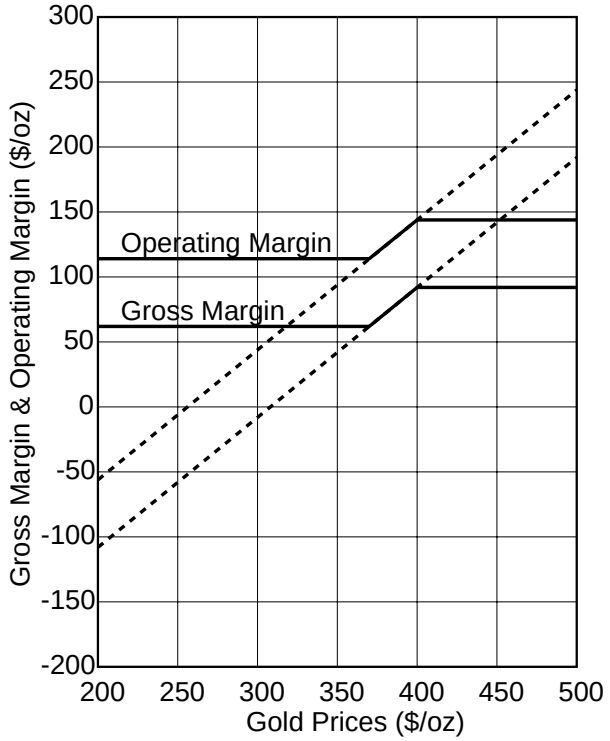

FIGURE 10. Gold industry price risk exposure with a put option at $370 per ounce and a call option at $400 per ounce.

by a number of major U.S. producers including Barrick Gold and Santa Fe Pacific Gold, both active hedgers, which have in essence adopted the objective of making money producing gold and letting others speculate on gold prices.

As noted at the outset, hedging performs the same economic function as a long-term supply contract and is, in that sense, no different than a contract that an aircraft manufacturer might make with an airline to supply aircraft. Long-term contracts for the delivery of aircraft or other manufactured goods will generally be quite complex, specifying (possibly multiple) delivery dates, cost related price escalators, various options for both buyer and seller and their associated costs or benefits, and all other conditions of the sale that the buyer and seller deem relevant.

The various derivative instruments used by gold and other mineral commodity producers serve essentially the same function. Standard forward sales and options contracts are actually much simpler than those used by many manufacturers. Their use is complicated somewhat in practice because they are frequently used in tandem. For example, a common practice is to cover the cost of purchasing the put option by selling a call option at a higher price and taking what is known as a "collar" position. A call option is the right, but not a commitment to buy at a specified price. The buyer of the call option has the right to buy and the seller of the option must sell the commodity.

Modifying the example illustrated by figure 9 to show the effect of selling call options at $400 to offset the cost of buying puts at $370 would yield the price risk exposure illustrated by figure 10. As the figure illustrates, the producer is not exercising the options but selling at spot prices at prices between $370 and $400 per ounce. At the same time, the producer has covered its downside price risks by being able to exercise its put options at prices below $370, but has lost its upside price risk potential earnings by selling calls that require the seller of the option to sell at $400 if prices rise above that level.

In addition, it should also be noted that the "collar" position is fundamentally the opposite of the "straddle" position, which is a primary vehicle for speculating in these markets. With a straddle position the speculator buys both puts and calls and, thereby, stands to profit from any change in price.

The variations in hedging strategies as well as variations in derivative instruments used by producers to hedge have multiplied dramatically in the past few years. Jessica Cross's (1994) book, *New Frontiers in Gold: The Derivatives Revolution*, provides an excellent overview of these trends and derivative instruments used by producers to hedge and others to speculate.

One variation on the collar used in the industry involves the purchase of put options and straightforward sales to protect revenues coupled with the purchase of out of the money calls above spot prices to allow companies to benefit from future price increases. Other variations on these hedging strategies are being developed all the time as new financial instruments are developed in this innovative market. The key issue relevant to investor risk, however, is whether these transactions can be covered by production. If this is the case, producers are "hedging," not "speculating."

TRENDS IN CAPITAL DEVELOPMENT COSTS

A question frequently asked in the financial community concerning the U.S. gold industry is whether capital costs are rising. The basic answer to the question is yes. The industry is seeing bigger projects, more complex financing arrangements, especially in the case of offshore projects, but also in the U.S. As a result, capital costs for projects are rising.

On a per-ounce basis, however, the available evidence suggests that capital costs are falling for precisely the same reasons. Bigger projects both in the U.S. and particularly offshore, should result in lower capital costs per ounce of reserves. These trends carry important implications for both the way mining companies approach new projects and the way investors view mining companies.

This section examines capital costs for gold mine development in the U.S. from the late 1980s through 1996 to look at trends in capital development, exploration and acquisition costs. The general trends and developments include:

- The trend toward bigger projects—which ties into the complexity of project financing—both in the U.S. and offshore, including Barrick's expansion at its Goldstrike Mine on the Carlin Trend and the development of its adjacent underground Meikle Mine, Placer Dome's Pipeline development project, Newmont's activities at its Carlin Trend property, and Santa Fe Pacific's Lone Tree deposit on the Battle Mountain Trend in Nevada.
- Bigger projects also tend to reduce economic risks of projects related to geologic risks.
- Longer lead time for permitting in the U.S.
- More costly underground development is on the rise, e.g., Barrick's Meikle Mine, Independence Mining's Murray Mine, Newmont's underground operations, and Getchell Gold's Turquoise Ridge.
- Surface oxidized ores are being depleted and replaced with deeper sulfide and refractory ores which carry higher development costs.

Most of the above issues relate to development costs which, of course, are an important component of capital costs. But overall capital costs include exploration and acquisition costs because these costs must ultimately be amortized into the total cost of production and affect company profitability and returns to investors. Unfortunately, data on exploration and acquisition costs are much more difficult to collect and evaluate. For example, we do not generally learn about unsuccessful exploration efforts, and acquisitions are rarely clean "turn-key" transactions, so they are generally difficult to aggregate and evaluate.

Table 7 presents a summary of U.S. development costs extracted from three previous U.S. gold industry studies from 1989 through 1996 (Dobra and Thomas, 1991, 1992, 1995). The table shows capital costs for ten mines brought into production in the 1989-90 period, five brought into production in 1991-92, eight projects under development in

TABLE 7. Capital costs for selected new mines and development projects, 1989–96

Development Cost Category	Number	Total Cost ($Millions)	Initial Reserves (1,000 oz)	Cost of New Reserves ($/oz)
New Producing Mines (1989–90)				
Surface	8	369.7	7,465	49.52
Underground	2	87.4	1,136	76.94
Total	10	457.1	8,601	53.14
New Producing Mines (1991–92)	5	262.0	5,594	46.84
Development Projects (1992–93)	8	741.0	13,891	53.34
Development Projects (1994–96)	11	2,151.2	42,811	50.25

1992-93 and 11 projects under development in 1994-96, for a total of 34 projects. During the 1989-93 period, capital investments in the U.S. added 65.3 tonnes or 2.1 million ounces of net new production capacity and almost 30 million ounces of reserves from the projects included in table 7. This, of course, does not include new production capacity and reserves added in the 1994-96 period.

Of the ten mines brought into production in the first period, 1989-90, two were underground projects which had higher capital costs (table 7). The weighted average for the period, however, was $53.14 per ounce. Development costs for five mines brought on-line in the 1991-92 period showed lower costs at $46.84 per ounce but then increased to $53.34 for eight mines under development during 1992-93. Costs decreased again to $50.25 for eleven mines under development in the 1994-96 period.

Note that there is some overlap between projects in the development categories, e.g., the figures include existing mine expansions in the 1992-93 figure which tend to bring down the average for that period slightly. However, because development projects stretch out over several years in many circumstances and often involve expansions into newly delineated orebodies, allocating development expenditures to a single period frequently becomes arbitrary.

It is very interesting to note that the $50.25 figure for the 1994-96 period probably overstates development costs per ounce somewhat because of the mix of properties included. For example, of the eleven new mines and expansions included in the overall average, seven are projects with over one million ounces of reserves and, since Newmont's activities at its Carlin property are counted as one project, table 7 should probably list 14 projects in the 1994-96 period, seven of which with one million ounces or more in reserves. Looking at the group of mines and expansion projects with over one million ounces in reserves, the average development costs per ounce is $44.90, which is approximately $7 and 14% below weighted average cost per ounce in the 1989-93 period (costs for this group are shown separately on table 7). Hence, considering this group of mines and expansions with one million or more ounces shows a significant decrease in capital development costs in the industry.

The strength of investment in U.S. properties is, perhaps, somewhat surprising in light of the political controversies that have clouded the industry in the early 1990s. Indeed, table 7 shows a decline in development activity in the 1991-92 and 1992-93 periods but it is impossible to tell from this aggregate level data if, in fact, this is the result of political factors or other business reasons. Nonetheless, the 1994-96 period has seen a remarkable amount of new investment. Our survey indicates just under $2 billion in new investment in both expansions and new mines. These expansions and new mines are in the process of developing 42.8 million ounces of new reserves. This represents a net increase in U.S. reserves of approximately 10 million ounces because approximately 30 million ounces will have been produced during this three year period. This brings total U.S. reserves to over 170 million ounces and gives the industry about a 17-year life at current rates of production. All indications are that new reserves will continue to be proven up and extend that life further. However, it is difficult to predict how a change in political fortunes would affect these trends.

Focusing only on larger projects clearly understates overall industry costs since average development costs at the five projects with reserves under one million ounces is over $130 per ounce. However, most of these smaller projects are projects where a decision has been made to proceed in development with exploration underway. We expect, although we cannot be certain, that new reserves will be found at some of these properties which will bring development costs per ounce down.

It should also be noted that, because of political and regulatory problems in the U.S., i.e., mining law reform, and delays in permitting, it is commonly believed that major companies are bypassing marginal U.S. properties. If this is indeed the case, then we would expect future per-ounce development costs to fall as only the best prospects are developed in the U.S. For example, Barrick's Meikle Mine, an underground project, has development costs around $31 per ounce, well below the averages shown on table 7. The same can be said of Placer Dome's Pipeline deposit where development costs are estimated at about $40 per ounce and Getchell Gold's Turquoise Ridge underground development with costs reportedly comparable with Barrick's Meikle Mine.

Another notable trend, of which the Meikle Mine and Pipeline are examples, is the number of new projects and expansions of old projects coming on line that are expanding the U.S. reserve base in four, five, six, and seven million ounce increments. Other recent examples in this class include Getchell's Turquoise Ridge, Cyprus-Amax's Fort Knox, Santa Fe Pacific Gold's Lone Tree and, as noted,

Newmont's development projects. Not long ago a million-ounce orebody was considered a "world class" deposit. More recently, however, million-ounce orebodies have attracted relatively little attention. Not only do newly discovered million-ounce orebodies have to compete for "world class" attention with these larger domestic orebodies, they must compete for attention with comparably sized and much larger deposits being discovered outside of North America.

There are several implications of this trend toward developing larger deposits. First, these projects are more costly in total because they are larger. However, as noted above, on a per-ounce basis, we expect development costs to fall, all other things being equal. Second, this will lower the non-cash component of industry production costs. Indeed, preliminary results from the 1996 Gold Institute survey indicate a substantial drop in long-term average total costs from $318 per ounce in 1994 to less than $311 per ounce in 1995 excluding acquisition and exploration costs, which sets a new benchmark for evaluating projects.

Another implication of the trend to developing larger deposits involves more normal mining project risks, namely, geologic risks. Demonstrating reserves at larger deposits generally requires proportionately more exploration drilling which, from a statistical standpoint, reduces geologic related risks. While a geologist would likely take exception to this characterization, the point is primarily economic. For example, strictly speaking, we suppose that there is an equal probability of 20% shortfall in reserves at a one-million-ounce deposit and a five-million-ounce deposit. However, the implications of such a shortfall for capital costs per ounce of reserves are quite different. A 20% shortfall in reserves at the smaller mine would increase capital costs and, hence, total production costs on a per-ounce basis. The same percentage shortfall in reserves at the larger mine, however, would probably have a negligible impact on capital costs primarily because of the longer mine life involved. Production at the end of the relatively longer mine life is more heavily discounted in calculating costs, and the longer lived mine would be able to reduce its expenditures on sustaining capital.

There are countervailing factors, however, because all other things are not equal. A second implication of deposits being developed more recently is that they have tend to be deeper, requiring costlier development and mining on a per-ton basis. In addition, deposits being developed recently have also tended to contain more metallurgically complex ores that require more costly treatment, and this typically requires greater capital investment in roasters, autoclaves, and other processing equipment. Conventional wisdom suggests that these factors would increase capital costs. These capital investments have increased total costs but, because these orebodies have tended to have higher grades than the oxide orebodies, the net effect of underground development so far has been to lower costs on a per-ounce basis. Indeed, of the seven projects noted above with more than one million ounces in new reserves, three of these are underground projects, and two of these have the second and third lowest costs in the group.

Having noted the shift from oxide orebodies, which can be processed with relatively inexpensive heap-leach technologies, to more metallurgically complex, higher grade orebodies as a general trend, the counter-trend deserves mention. As a consequence of bio-leach technology developed by a number of companies and applied with most notable success in the U.S. by Newmont Gold at its Carlin property, lower grade ores can be brought into production at a very low cost. Bio-leach technology involves using naturally occurring bacteria to speed up the oxidization of low grade sulfide ores that could not be processed using low cost heap-leach technology used to treat low-grade oxidized ores. Other companies have used bacteria to treat higher grade sulfidic ore, such as Newmont's innovation of using bacteria to oxidize low-grade sulfidic ores which allows these ores to be processed by cyanide leaching. As a consequence, Newmont has been able to reclassify over 100 million tons of material, previously classified as waste, to reserves of over six million ounces of gold, and develop these resources for approximately half the average cost per ounce shown on table 7.

It should further be noted that the implications of this technological development are not well understood at this point. In the survey of North American companies, producers were asked how much low grade material they had that might be processed by bio-leaching technology. Responses to the question revealed that, at this point, most producers do not know. So, at this point, the implications of this technological development are yet to be determined.

A third implication of these trends and, more specifically, the trend toward international development, is that financing these projects will become more complex, more time-consuming and, hence, more costly. In addition, while the perceived relative political risks in investing in many parts of the world has decreased in recent years, invest-

ments in large foreign properties are clearly long-term propositions while political risk perceptions must be regarded as short-term forecasts at best. It is still too early to tell how the marginal risks and costs avoided in the U.S. stack up against those acquired by investing abroad. One finding from the survey of U.S. producers is that the trend toward foreign investment by North American companies is reversing, and U.S. investment in the projects discussed above has increased substantially since the early 1990s.

In answer to the question posed at the start of this section, "Are capital costs rising?" the answer is "yes" on a project basis because bigger projects are being developed both in the U.S. and abroad. However, on a per-ounce basis, most evidence suggests that capital costs are falling for the reasons discussed above. This conclusion and the various issues raised by the question carry a number of interesting implications for investors, both the equity investor and the companies investing in exploration, acquisition, and development of properties.

One of the reasons for focusing on capital costs on a per-ounce basis rather on total project costs, which some analysts have done because of the sheer size of many of the newer projects coming on line, is that the per-ounce cost provides a benchmark to evaluate properties. For example, take what might be characterized as an average gold mine (although such a thing probably does not exist). In 1995 average total costs for U.S. producers were $308 per ounce. Of these costs, $256 per ounce were cash production costs, which leaves $52 per ounce to cover capital costs and to achieve average production costs. Note that at a price of $384 per ounce, this average mine would have a gross margin of $76 per ounce or 19.8% before other non-production related expenditures (which include exploration and acquisition costs), and before federal income taxes (which would take the gross margin down to around $61 per ounce and 15.8%).

With these numbers, the so-called average mine is not particularly profitable given the risks inherent in the business. Hence, if one were to go out and invest in a mineral property or equities in a gold mining company, one would certainly want it to be better, i.e., have lower costs, than this average mine.

Going back to the question of capital costs and as a first approximation, if a typical orebody is acquired at approximately $43 per ounce, with cash production costs of $243 per ounce which is the average for the years reported in table 7, this would only leave about $22 per ounce for capital development costs just to achieve the modest profitability of the benchmark average mine. Referring back to table 7, $22 per ounce is clearly far less than what has been observed in the industry. Hence, acquisition costs need to be determined keeping capital and operating costs in mind.

Looking at a real example of this analysis, Pipeline's capital development costs of approximately $42 per ounce is below the average as noted above. Also below average for Pipeline are its discovery costs, although these costs are sunk and should have no bearing on the decision to proceed in development. Nonetheless, they do need to be considered in looking at the overall profitability of a project. When these figures are combined with projected cash production costs of $110 per ounce, we get average total costs of around $160 per ounce, which should indicate why Pipeline has attracted the considerable attention it has even if we add another dollar in costs for future investment in sustaining capital and other incidental costs.

From the standpoint of an equity investor, either an individual or an institution, the capital costs of a particular mine or company, which should be viewed as a portfolio of mines in the case of a company with more than one property, are of relatively less interest than operating costs because the level of operating costs indicates the level of cash flow generated by a company. Cash flow can be invested in expanding the resource base of the company and, hence, its market capitalization and share prices. Hence, for equity investors considering whether or not to invest in a particular stock, these capital costs are generally ignored because they are "sunk costs" much like exploration costs are "sunk" for companies considering whether or not to develop a new property. This focus on cash flow is somewhat unique to gold producers because gold producers as a group generally do not pay dividends and trade at very high price to earnings ratios.

The conventional wisdom is that investors buy gold equities as an alternative to buying the metal and, indeed, correlations between gold price movements and equity prices are high (for example, see Dobra, 1994). In view of the focus on cash flow above, equity prices move with gold price changes because these price changes directly affect cash flow.

PUBLIC POLICY ISSUES

An issue that is frequently raised in public policy debates at both the state and national level concerns the imposition of taxes and royalties on the minerals industry. There are two common misconceptions about the minerals industry that frequently arise in these discussions. First, there is the misconception that mines are immobile sources of wealth to be taxed because the mining company cannot move the mineral deposit. While it may be true that a mineral deposit is immobile, there are numerous examples and ample evidence that attest to the fact that mining capital, which includes both technical expertise and investment funds, is highly mobile. Hence, while there are legitimate reasons for taxing mining like any other business, this rationale for mineral taxation and the imposition of royalties is myopic.

A second common misconception is that mining, and precious metals mining in particular, is an enormously profitable venture. If this were true, according to conventional wisdom and common sense, we would all become gold miners. Nonetheless, the misconception is difficult to dispel even with the evidence on profitability above.

From the perspective of the U.S. gold industry, it is unfortunate that the major public policy challenges the industry has faced in recent years, and are likely to continue to face in the foreseeable future, reflect these common misconceptions. This is clearly the case in public policy debates concerning mining law reform.

Mining Law Reform

The mining law reform issues that had attained relatively high profile in the press and in the 103rd and previous Congresses received relatively less attention in the 104th Congress. Clearly, the election of a Republican majority in the House of Representatives in 1994 limited the ability of reform advocates to continue their efforts because the most ardent advocates for radical reform have been Democrats. Consequently, after the 1994 election, the bills offered in the House by Representatives Miller and Rahall and in the Senate by Senator Bumpers proposing relatively radical reforms were once again offered but stood little chance of passage. Instead, rival bills offered in the House (the Young, Calvert, Orton and Vucanovich Bill, H.R. 1580) and in the Senate (the Craig Bill, S. 506) were passed through committees.

Collectively, these bills addressed five key areas of reform: royalties, the price for patents, maintenance fees, uses of patented lands, and abandoned mine lands cleanup. The 104th Congress, however, was preoccupied with other matters including the “Contract with America,” and battles over balancing the budget. As a result, the reform bills were not passed. Nonetheless, because many of the reform issues relate to revenues, key provisions of the House and Senate mining law reform bills made their way into the Balanced Budget Act of 1995 (H.R. 2491) which was ultimately vetoed by the President.

Both the House and Senate bills cited above included provisions for a royalty. The Senate bill included a royalty of 2.5% of net smelter return. This would essentially mean a 2.5% tax on production since the gold industry’s smelting and refining costs are minimal. The House bill carried a 3.5% royalty patterned after the Nevada Net Proceeds of Mines Tax. In conference committee, conferees compromised on a 5% net proceeds royalty. Both the Nevada tax and the proposed federal royalty allow producers to deduct direct mining, processing, and selling expenses incurred on site. Note that this excludes costs incurred at the corporate headquarters and any pre-production costs such as development and exploration costs.

The federal royalty proposal would have only applied to lands acquired for mining purposes after the passage of the Act. Congress was unwilling to impose the royalty retroactively and on lands already patented under current law because of concern over possible takings litigation.

With respect to the controversial provisions of the current law that allows sale of patented land for $2.50 to $5.00 per acre, both the Senate and House bills called for sale of mineral lands at fair market value with the reservation of the federal government’s right to a royalty. This change in the law had been proposed in legislation during previous sessions but failed to pass in spite of its apparent reasonableness because it has always been bundled with more onerous provisions.

In the 1993 Interior Appropriations Act Congress chose to replace the requirement that claim holders must spend at least $100 per year diligently developing claims with a $100 claim maintenance or rental fee. The 1995 Balanced Budget Act would have made these fees permanent and would have required the fee to be doubled after the third year a claim is held to discourage speculative claimstaking and promote diligent development.

The post-mining use of patented lands was addressed in the Senate bill by providing that the Secretary of the Interior could revoke title to lands acquired for mining purposes that were used for non-mining related purposes. The reversion of title to the federal government had been sought by advocates of reform so that lands would revert back to public use after mining and reclamation. Like the requirement to pay fair market value for lands acquired for mining purposes, this proposal was not strongly opposed by the industry.

Finally, the legislation proposed that 40% of royalties collected under the legislation would be used to fund state reclamation of abandoned mine lands with the balance of these funds going to the federal treasury. This provision would apply to lands disturbed by mining and abandoned by operators before the advent of reclamation laws in the 1980s. The industry was also not opposed to this provision. Indeed, in Nevada, the industry has agreed to a fee on claims to be used for these purposes by the State.

As noted, these reforms were vetoed as part of the Balanced Budget Act. Nonetheless, in all likelihood, these issues will continue to be debated in the future by Congress.

The Percentage Depletion Allowance

During the same Congressional battle of the balanced budget discussed above, the administration proposed a budget reconciliation package that contained measures targeting "Corporate Subsidies and Loopholes." Among these "subsidies and loopholes" was the percentage depletion allowance on minerals produced from lands acquired under hardrock mining laws. Note that this targeted hardrock minerals and would have preserved this "loophole" or "subsidy" for the oil, coal, and other industries producing non-locatable minerals.

The percentage depletion allowance has a long history of debate in both Congress and the Courts. It has been the subject of Congressional debate in the passage of every piece of major tax legislation since 1926. It is also probably one of the least understood policy issues facing the industry—even among people working in the industry.

The issue arises from the fact that while the Sixteenth Amendment gives Congress broad powers to tax income, regardless of its source, it does not allow for taxing assets or property. In imposing taxes on income, Congress has long recognized that the principal capital asset of a mineral producer is its mineral reserves and that mineral producers' assets are unique in that they "waste away" as minerals are produced. In the process of production, these assets are continually being liquidated or depleted.

In recognition of the wasting nature of these assets, since 1913 Congress has allowed a portion of the value of these assets (reserves) to be deducted from taxable income to allow producers to replace their orebody. In principle, there is little difference between allowing mineral producers a depletion allowance and allowing a manufacturer to depreciate plant and equipment. In the process of manufacturing, the manufacturer's equipment gradually wears out and eventually requires replacement. Hence, a depletion allowance for mineral producers simply levels the playing field between these classes of taxpayers.

As with tax rules concerning depreciation of plant and equipment, the methods used to calculate the deduction have frequently been criticized as too liberal or too strict by various parties. Yet, it is rarely argued that no such deduction is appropriate. The Administration's argument in this matter is similar in its focus only on minerals produced from lands acquired under current mining laws.

The argument that the Administration's proposal would only deprive mineral producers that received mineral rights for free (as opposed to manufacturers which must purchase their equipment) and pay no royalties (unlike oil, gas, and coal producers) may be an appealing rationalization to some, but it largely ignores the facts. Mineral rights may have been conveyed by the federal government for free, but it is erroneous to conclude that they were acquired at no cost to the producer. To acquire those rights the producer had to either bear the costs of discovering the mineral or purchase them from the discoverer. Some have undoubtedly acquired these rights at very low costs while others have perhaps paid more than they were worth. Hence, all the Administration's proposal will do is randomly penalize individuals for decisions made in the past, which hardly seems an appropriate goal of public policy.

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