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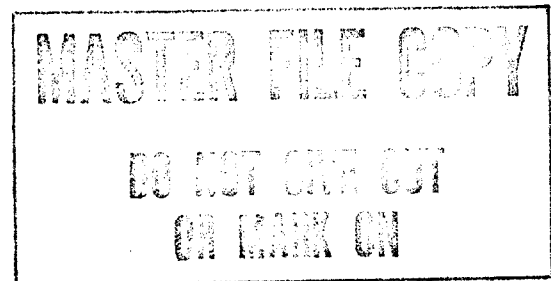
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The Gold Market: Trends in Supply and Demand

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A Research Paper



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A Research Paper

*Information available as of 24 December 1981
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The author of this report is [redacted]
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Comments and queries are welcome and may be
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The Gold Market: Trends in Supply and Demand

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Overview

The recent surge of interest in returning to some form of gold standard stems from a desire to devise a monetary program that would simultaneously reduce interest rates, slow inflation, and ensure future monetary discipline. For a gold standard to function, the supply of gold must be adequate to meet both monetary needs and nonmonetary demand at a set price. Developments over the past decade or so raise doubts about whether the supply of gold will be sufficient to satisfy anticipated rises in demand at a set price.

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The elevenfold rise in the price of gold between 1968 and 1981 reflects large shifts in supply and demand components:

- World gold production declined from 1,500 tons ¹ in 1968 to less than 1,340 tons in 1980.
- Soviet gold sales in the period of 1979-81 fell substantially below the levels of the mid-1970s.
- Between 1972 and 1979 official institutions—central banks and the International Monetary Fund (IMF)—were net suppliers to the gold market. In 1980, official institutions became net demanders. Gold purchases by central banks in less developed countries (LDCs) have been steadily increasing; governments of the Organization of Petroleum Exporting Countries (OPEC) alone purchased nearly 150 tons of gold in 1980.
- Since the removal of the \$35-per-ounce ² price ceiling in 1968, the desire to hold private gold as an investment hedge against inflation has grown dramatically.

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The introduction of gold futures markets into the United States in 1974 increased the volatility as well as the sophistication of gold trading. The ability to purchase and sell gold contracts at future dates on a highly leveraged basis has sharply increased the volume of trading. Over 34,000 tons of gold—25 times world production—was traded in the US exchanges during 1980.

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¹ All tons in this publication are metric tons.

² All ounces in this publication are troy ounces

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Gold production and some components of demand can be projected for a few years with a fair degree of confidence. Production worldwide is expected to increase by about 3.5 percent a year through the mid-1980s and decline thereafter as high-grade South African reserves are exhausted. But the amount supplied to the market by the Soviets or demanded by private investors and official institutions is subject to wide, unpredictable swings. Although Soviet gold production has been steadily climbing, sales during the 1970s ranged from 3 tons to 401 tons per year. About 75 percent of gold production is controlled by the Governments of South Africa and the Soviet Union, which do not produce or sell gold according to short-term profit motives and thus impede market self-adjustment.

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The Gold Market: Trends in Supply and Demand

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The Structure of the Market

The gold market is composed of buyers and sellers dealing in bullion and in gold futures. Gold bullion transactions are actual spot exchanges of gold bars or transfers in gold accounts with banks and dealers, which often do not result in physical movements of gold. Contracts for purchases and deliveries of gold at a specific date in the future are made on futures exchanges.

going long—or to sell gold he does not currently possess—known as selling short. Transactions are set for some specified date in the future. A key advantage of dealing in the futures market is that investors do not have to tie up as much money for a given amount of gold. Nor do investors have to get insurance or worry about the fineness and weight of the gold. Most important, transactions costs are extremely low.

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Bullion Market

London and Zurich are the main gold-trading centers, with Hong Kong a distant third. Smaller markets exist in New York, Frankfurt, Tokyo, and other cities. The Zurich market, the largest in terms of volume, is dominated by three Swiss banks: Credit Suisse, United Bank of Switzerland, and the Swiss Banking Corporation. The Swiss banks handle almost all of the Soviet Union's gold transactions and over half of South Africa's.

One of the prime objectives of the futures market is to provide insurance against price fluctuations. On the buyer's side, gold-product manufacturers in particular have taken substantial losses over recent years by issuing fixed price catalogues without owning the gold they needed to produce the products. Such manufacturers are increasingly engaging in the futures rather than the spot market in order to hedge. Some gold mines and refiners have also started to use the futures market to hedge future production.

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London continues to be the most influential gold-pricing center despite having lost some of its volume to the Zurich market. Until Britain expelled South Africa from the Commonwealth in 1961, nearly all of South Africa's gold was marketed through the Bank of England. London dealers now handle about half of South Africa's gold sales.

The Commodity Exchange, Inc. (COMEX) in New York and the International Monetary Market (IMM) in Chicago are the two dominant trading centers. Trade volume in US gold futures reached 34,000 tons in 1980; COMEX and IMM accounted for 95 percent of the volume (see figure 1). Markets in Singapore and Sydney also handle gold futures, and in August 1980 the Hong Kong Commodity Exchange expanded into gold futures trading. London is developing a futures trading center which will fill the time zone difference between the Far East and New York. Trading volume outside the United States, however, is likely to remain insignificant for several years, until expertise and customer familiarity with the new exchanges are built up.

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Hong Kong benefits from the time zone differences between the Far East and Europe, operating when European markets are closed. It also enjoys a relatively free regulatory atmosphere and close connections with London banks. The United States is increasingly influential in determining gold prices because of the large amount of funds available for investment and the multiple forms of transactions offered in the US futures market.

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Supply and Demand for Gold

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Futures Market

The introduction of futures trading in recent years has added a new dimension to the marketing and pricing of gold. The futures market gives an investor the opportunity to buy gold for future delivery—known as

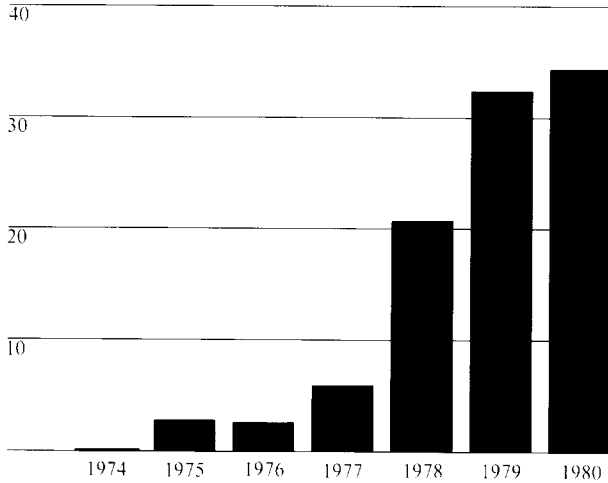
The supply of gold to the market comes from newly mined production in the Free World, net sales by the Communist countries, net dishoarding by private investors, and net sales by official institutions. An

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Figure 1**United States: Gold Futures Trading Volume**

Thousand Metric Tons



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estimated 1,053 tons of gold entered the world market in 1980, down sharply from 1,778 tons in 1979. In 1980, non-Communist official institutions were net purchasers of 186 tons, whereas in 1979 they had been net suppliers of 567 tons. In addition, Communist gold sales—mainly from the USSR—dropped from 250 tons to only 110 tons in 1980.

Non-Communist Production

The massive fluctuations in the price of gold during the past few years have created great uncertainty for the world's gold producers (see figure 2). Moreover, the large-scale financing and long leadtimes—up to five years—required to bring a new mine into production tend to prevent rapid increases in output. Gold production in the non-Communist countries actually declined to an estimated 943 tons in 1980 compared

with 961 tons in 1979. Non-Communist production is expected to increase by 175 tons by 1985 and then to decline toward the end of the decade.

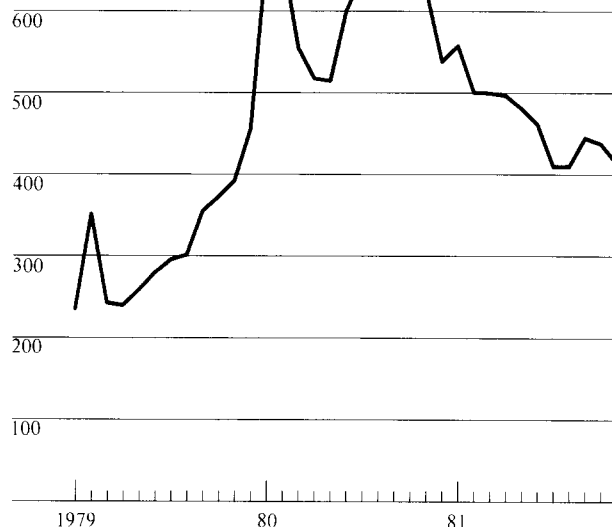
Production in *South Africa*, which accounts for over 70 percent of non-Communist output, fell by nearly 30 tons to 674 tons in 1980. The reduction in output was due to the lower gold content of the ore mined. Between 1978 and 1980 the average ore grade dropped from 9.4 grams of gold per ton to 7.3 grams; since 1972 the gold content of South African ore has fallen by 42 percent. For one thing, the South African Government directs producers to mine lower grade ore when the price of gold is high. This policy increases the economic life of the mines, which are a major source of tax revenues and employment. The major reason for the long-term decline in gold production, however, is the exhaustion of high-grade ore reserves held by the major producers in the Orange Free State (see figure 3).

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Figure 2**Gold Prices**

US \$

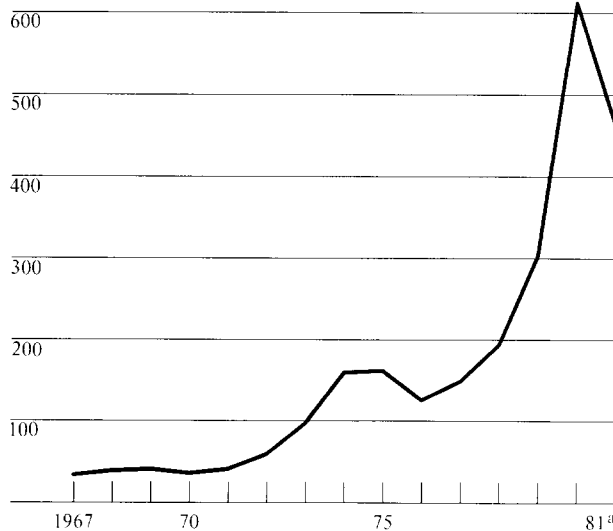
Average Monthly Gold Prices

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The cost of producing gold rose dramatically during the past decade because of the mining of lower grade ore and rising factor costs.

- In 1972, the average cost of producing an ounce of gold in South Africa was \$27; the cost rose to \$183 in 1980 and is expected to be up another 20 percent in 1981.
- The average depth of South African gold mines is greater than 1,500 meters. The capital cost of developing a new mine can range from \$200 million to \$450 million.
- Wages account for 50 percent of total mining costs and represent the greatest concern for the mining industry. The average wage for unskilled workers increased eightfold during the 1970s.

Gold production in *other non-Communist countries* totaled nearly 270 tons in 1980, up 11 tons from 1979. In Papua New Guinea, where gold is produced as a byproduct of copper, output fell from 20 tons in 1979 to 15 tons in 1980. On the other hand, gold production increased between 1979 and 1980 in Brazil from 25 to 35 tons.

Average Annual Gold Prices

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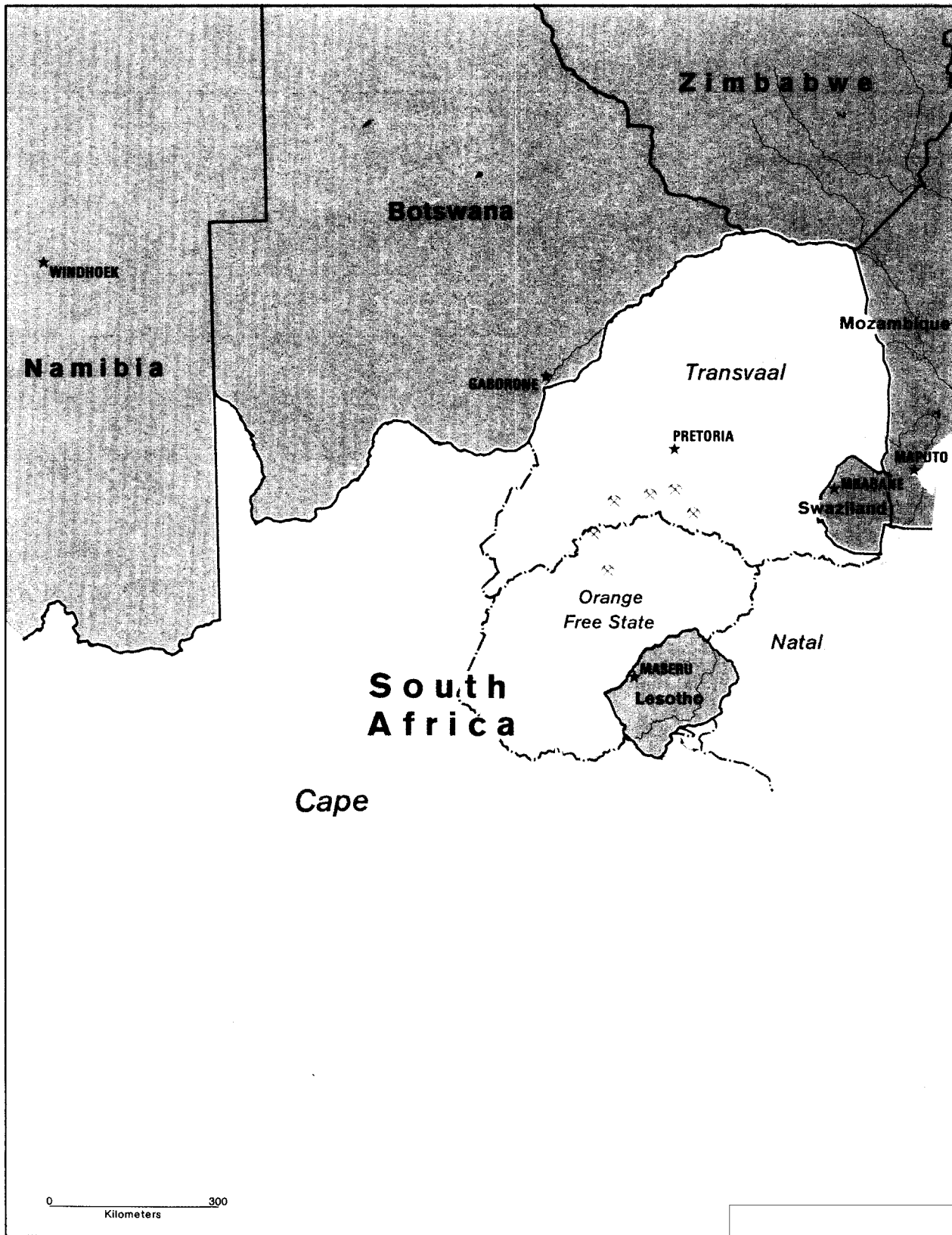
^a January to November 1981.

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Figure 3
South Africa: Gold Mining Centers



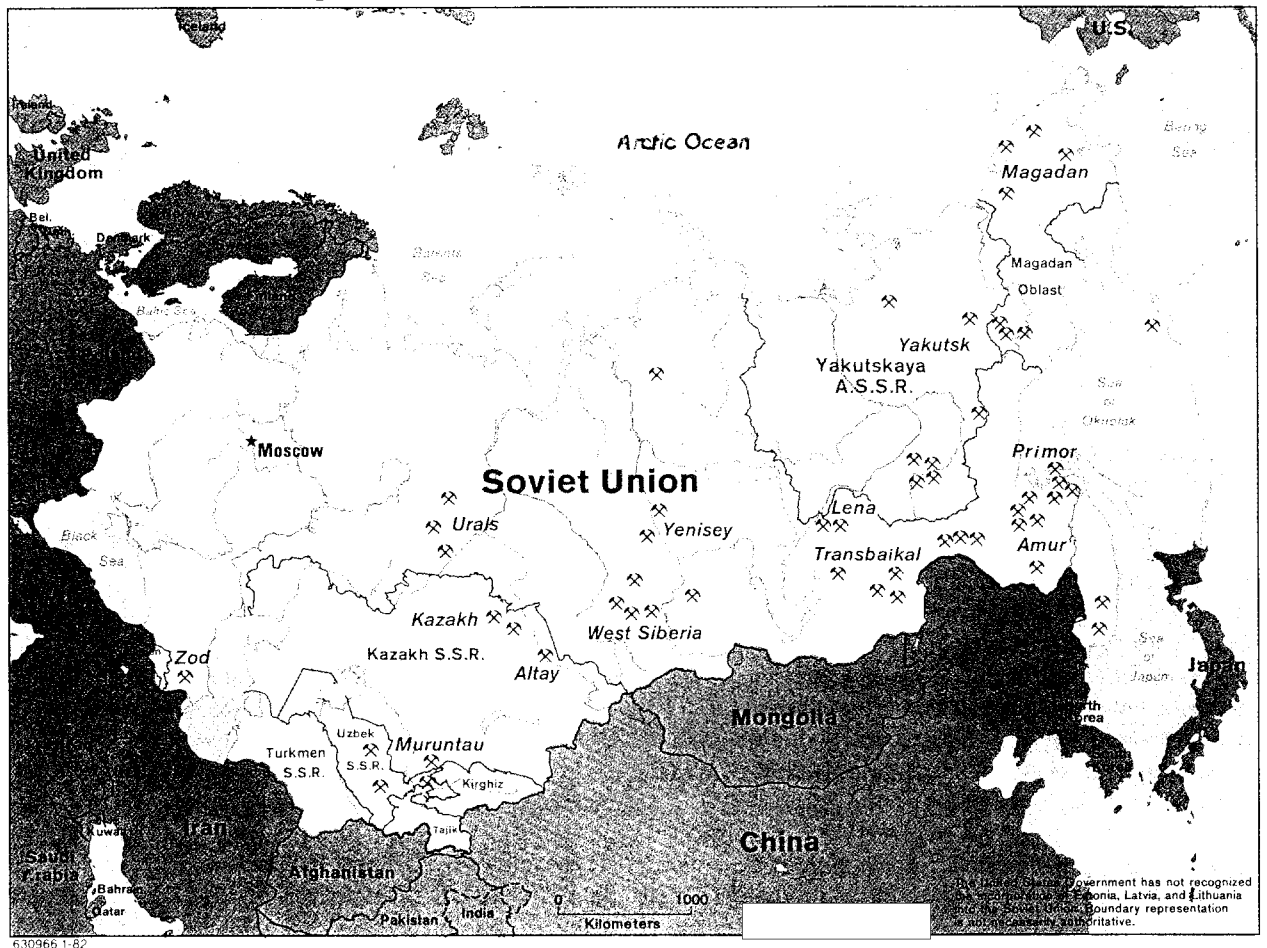
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Figure 4
Soviet Union: Principal Gold Mining Centers



Non-Communist production should increase during the 1980s. During the next five years the combined output of the United States, Canada, and Australia should increase by more than 50 tons, while output in the developing countries, especially in Latin America, also may increase by 50 tons. South African production from existing mines and mines in the process of opening should remain relatively close to 700 tons per year until 1987. It then is expected to decline steadily to about half that level by the turn of the century, causing total non-Communist gold production to fall during the 1990s.

Communist Production and Sales

Production. Communist countries produced an estimated 395 tons of gold in 1980, 30 percent of the world total.

About one-fifth of total Soviet production is a byproduct from processing copper, lead/zinc, and uranium ores. The principal gold-producing areas were originally in the Urals, but large new deposits were opened in northeast Siberia beginning in the late 1920s (see figure 4). The eastward trend was later

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reversed with the discovery of deposits in the southwest, and in 1958 a major discovery was made at the foot of Muruntau Mountain in the Kazakh Republic. Output in the northeast still accounts for almost 35 percent of total Soviet gold mined, although production in the region has increased little since 1970 because of the depletion of higher grade deposits. The Muruntau complex now produces about 40 tons, or 13 percent of total Soviet output. [REDACTED]

There is little information on which to base Soviet gold-production costs; a best guess estimate would place average costs at about \$230 per ounce in 1980. The Soviets make little effort to adapt mining equipment to climatic extremes. For example, the same basic equipment that operates in the permafrost of the Magadan region is found in the desert heat of Muruntau. [REDACTED]

Investment decisions already made indicate that Soviet gold production will continue to rise steadily during the 1980s, with annual production approaching 400 tons by 1990 and perhaps 500 tons by the turn of the century. China, the second-largest Communist producer, is devoting considerable effort to the search for new gold mines and is likely to nearly double production during the 1980s. Annual output could reach 60 tons by 1985. [REDACTED]

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Transactions by Official Institutions

In 1979 the US Treasury and the IMF both had gold sales programs; together they added over 700 tons of gold to the market—367 tons by the US Treasury and 353 tons by the IMF. Even after purchases by other official institutions, net official sales in that year totaled 567 tons, about one-third of world supply. In 1980, however, the official institutions became substantial net buyers of gold. The US auctions were suspended in November 1979, and the IMF halted sales in 1980 after supplying another 106 tons. Although Canada sold some gold, official institutions purchased a net total of 186 tons in 1980. [REDACTED]

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South Africa added 66 tons to its gold stocks in 1980 by withholding supplies of newly mined gold from the market. OPEC countries accounted for the bulk of other additions to official holdings: Indonesia increased its gold holdings by 66 tons; the Iranian

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Table 4

Metric Tons

**Official Free World
Gold Holdings ^a**

| | 1978 | 1979 | 1980 | 1981 ^b |
|---|---------------|---------------|---------------|-------------------|
| Total | 35,334 | 34,776 | 34,961 | 35,066 |
| United States | 8,597 | 8,230 | 8,221 | 8,217 |
| West Germany | 3,690 | 2,963 | 2,960 | 2,960 |
| France | 3,172 | 2,548 | 2,546 | 2,546 |
| Switzerland | 2,590 | 2,590 | 2,590 | 2,590 |
| Italy | 2,585 | 2,075 | 2,074 | 2,074 |
| Netherlands | 1,704 | 1,368 | 1,367 | 1,367 |
| Belgium | 1,325 | 1,064 | 1,063 | 1,063 |
| Japan | 746 | 754 | 754 | 754 |
| United Kingdom | 710 | 568 | 586 | 588 |
| Canada | 688 | 690 | 653 | 650 |
| Portugal | 688 | 688 | 690 | 690 |
| Austria | 654 | 657 | 657 | 657 |
| South Africa | 305 | 312 | 378 | 382 |
| OPEC countries | 1,135 | 1,146 | 1,297 | 1,391 |
| Other West European countries | 1,087 | 1,090 | 1,096 | 1,097 |
| Other Asian countries | 570 | 595 | 612 | 602 |
| Other countries in the Western Hemisphere | 570 | 608 | 650 | 666 |
| Other Middle Eastern countries | 450 | 453 | 457 | 456 |
| Rest of Free World | 317 | 326 | 332 | 332 |
| IMF | 3,676 | 3,323 | 3,217 | 3,217 |
| European Monetary Fund ^c | 0 | 2,653 | 2,664 | 2,666 |
| Unspecified | 75 | 75 | 97 | 101 |

^a Sources: *International Financial Statistics*, IMF, for all except OPEC. OPEC data are CIA estimates.

^b Through the end of June.

^c Established in connection with the European Monetary System.

Government by an estimated 40 tons; and Saudi Arabia, Libya, Iraq, Qatar, and Nigeria a total of 43 tons. OPEC central banks purchased an additional 94 tons of gold during the first half of 1981 (see table 4 and figure 5).

Net Private Investment in Gold

Gold held as an investment by the private sector also has increased markedly over the last few years.

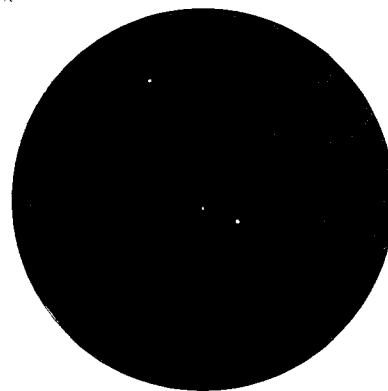
Private institutions and investors in developing countries normally purchase small gold bars or wafers as a

Figure 5

**World Gold Holdings: Distribution Among
Official Institutions, 1980^a**

Percent

South Africa (1.0)
Other Communist
Countries (2.1)
Japan (2.0)
OPEC Countries
(3.5)
USSR (4.7)
European
Monetary Fund
(7.1)
International
Monetary Fund
(8.6)



Total: 37,500 Metric Tons

^a Yearend.

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means of storing and transporting wealth. In contrast, investors in Western countries generally will accept gold certificates or open an account with a bullion dealer, often on a leveraged basis.

Private investors' net purchases of bullion and official coins and medallions totaled an estimated 785 tons in 1979 and 540 tons in 1980, about 45 and 50 percent of the total demand for gold in those years. The major source of new gold coins was South Africa, which provided 107 tons of krugerrands and other gold coins to the market in 1980. Total sales of other gold coins—including the Canadian maple leaf, the Mexican gold peso, the English sovereign, the US medallions, and the Russian chervonetz—amounted to nearly 90 tons.

In general, the flow of dishoarded gold went from developing countries toward Europe. In 1980, private dishoarded gold flowed from Lebanon to Switzerland, from Turkey through Bulgaria and Romania to Zurich, from Spain and the Far East to London, and

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from South America to New York. The net flow of gold bullion through these channels in 1980 totaled roughly 200 tons. []

Consumption for Jewelry and Industry

The rising price of gold bullion during the period of 1978-80 sharply depressed purchases of newly manufactured jewelry. Private-sector purchases of gold jewelry dropped sharply from 1,007 tons in 1978, to 737 tons in 1979, and to only 310 tons in 1980. Gold jewelry purchases in 1980 were larger than the increase in jewelry holdings, since a large amount of old jewelry was converted into gold bullion. Massive dishoarding took place in the Middle East and Far East during 1980. In total, gold jewelry holdings fell an estimated 150 tons in developing countries while increasing 270 tons in the developed countries. []

Italy, the world's largest producer of gold jewelry, cut output to about 100 tons in 1980, less than half the 1979 level. This reflected a substantial reduction in orders for jewelry from the Middle East. To reduce consumer resistance to the higher gold prices, Italian jewelry producers switched to lighter items. Output in the United States, the second-largest jewelry producer, shifted toward lighter items as well as lower karat values. []

The total amount of gold used in industry is small, averaging only 10 to 15 percent of total demand in the period of 1979-80. The largest industrial user of gold is the electronics industry, which in 1980 accounted for 81 tons or 56 percent of total non-Communist industrial consumption. []

With the fall in gold prices from 1980 levels, the quantity of gold demanded for consumption is likely to rebound. Regional private dishoarding of gold jewelry has stopped, and developing countries are once again net demanders. Substantial dishoarding of gold jewelry is unlikely to resume unless gold prices climb to a new peak. []

Factors Causing Price Volatility

The nature of the supply and demand for gold tends to make prices volatile. Speculative demand for gold, in particular, is very sensitive to actual and expected

changes in currency values and interest rates. In recent years several events have aggravated the price swings:

- The rapid growth of the gold futures market has given speculators an attractive vehicle for leveraged investing.
- The 50-to-1 ratio of gold stocks to new production means that relatively small shifts in expectations concerning changes in production or official purchases and sales can result in large price movements.
- The entrance of a large number of new market participants adds to price volatility; OPEC government purchases have become quite sizable and a growing number of smaller investors are in the market buying gold coins.
- The volatility of Soviet sales contributes to price fluctuations. []

The dishoarding of gold from private stocks provides a stabilizing force against rapid increases in gold prices; prices must increase substantially, however, before large amounts are called forth. Estimates are that over 40,000 tons—more than official Free World holdings—are privately held in various forms. In late 1979 and early 1980, when gold prices were rising sharply and peaked at \$850 per ounce, private dishoarding exerted downward pressure on prices and would be likely to do so again if prices reach or exceed the previous peak. []

Supply and Demand Prospects

In the absence of technological breakthroughs in the mining and processing of gold ore or discoveries of major new deposits, non-Communist gold production is expected to increase []

[] and then decline. []

Gold production by Communist countries should also rise by about 20 percent (75 tons) by 1985 as the USSR and China expand output. By 1990 Soviet output may approach 400 tons, and by the turn of the century the USSR's gold output could exceed South

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Africa's, with Soviet recovery at 500 tons annually. Communist gold sales, however, will continue to fluctuate from year to year, depending on hard currency needs.

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On the demand side, industrial and dental gold consumption is likely to grow at a very moderate rate over the 1980s as a result of industry efforts to economize on gold use. Jewelry purchases are difficult to project because of the investment nature of jewelry in developing countries; net purchases, however, will almost certainly exceed the unusually low 1980 level. If inflationary expectations remain at or near recent levels, individuals and large private investment institutions can be expected to increase the proportion of gold in their portfolios. A relatively small shift in portfolio holdings of gold by investment institutions would substantially increase the demand for gold.

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With gold production likely to increase only 3.5 percent a year on average through the mid-1980s and decline thereafter, even moderate growth in demand will put upward pressure on prices over the long term (see appendix). For the near term, the dominant factor will be changes in the desired holdings of private gold stocks. If investors believe they can gain a higher return on gold than on financial assets, the demand for gold will increase. Their decisions will depend largely on expectations of future inflation and interest rates.

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Appendix

A Strict Gold Standard and Potential Destabilizing Factors

The prime requisite for a gold standard is that the central bank or treasury buy or sell unlimited amounts of gold at fixed prices. Moreover, the buying and selling price must be practically the same, and imports and exports of gold bullion or coins must be permitted. A gold standard can be operated in a number of ways. Under a gold coin standard, gold coins circulate freely and can be bought or sold at the central bank or treasury. Another alternative, in which gold bullion is not used as money, is for the treasury or central bank to buy or sell bullion at fixed prices. []

In theory, under a strict gold standard, inflows/outflows of gold to/from the central bank lead to an automatic expansion/contraction in certain categories of central bank liabilities, such as currency and deposits at the central bank. Changes in these central bank liabilities produce corresponding changes in the money stock. []

With a strict gold standard, certain central bank liabilities¹ can be either fully backed by gold or backed at a fixed fraction. In the latter case, a \$1 change in central bank gold holdings will cause a multiple change in central bank liabilities, which in turn causes a multiple dollar change in the money stock. For example, given the 1980 average money multiplier in the United States for M1-B—2.5—and a fractional gold standard of \$1 of gold for every \$2 in currency and deposits held at the central bank, an inflow of \$1 worth of gold would lead to an increase of \$5 in M1-B.² []

Under a more flexible gold standard, the central bank can offset inflows and outflows of gold to some extent. If the purpose of a gold standard is to restrict central

¹ The liabilities subject to gold backing can differ. For example, gold could back only currency issued or it could back all central bank liabilities. []

² A \$1 increase in the monetary stock of gold results in a \$2 increase in central bank liabilities. With a money multiplier of 2.5, $\$2 \times 2.5 = \5 . []

bank activity, however, any flexibility granted to the central bank tends to undermine the credibility of the gold standard. []

When gold was sold at a fixed price during the era of the gold standard, gold production tended to increase whenever deflation occurred, since deflation lowered production costs and made the mining of gold more profitable in the country on a gold standard. The subsequent increase in production raised the money supply, which tended to halt or slow the deflation. In times of inflation the process worked in reverse, ultimately causing inflation to subside. []

An impediment to a present-day gold standard is the loss in the downward flexibility of prices and wages. Any reduction in the growth of aggregate demand, caused by a stagnant or declining monetary gold stock, would lead to a reduction in economic growth rather than to deflation. In addition, about 75 percent of gold production today is controlled by the Governments of South Africa and the Soviet Union, which produce or sell gold according to considerations other than the short-term profit motive and thus impede the automatic self-adjustment that was inherent in the gold-standard era. The substantial rise in the free-market price of gold from \$35 an ounce in 1968 has been met with a decline in production [] More- over, production will probably increase [] during the mid-1980s and decline thereafter, reflecting the exhaustion of high-grade ore reserves in South Africa. These developments could lead to a drain on gold reserves for a country or countries operating a gold standard. []

The likelihood that the Soviet Union would intentionally try to disrupt a gold standard seems minimal. The USSR's gold sales fluctuate in proportion to its need for hard currency and the alternative cost of external borrowing. Even if the Soviets decided to withhold gold from the market, there would be little effect on the operation of a gold standard. Recent Soviet gold sales have been relatively small compared to the total

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supply of gold coming into the market. On the other hand, the USSR is unlikely to sell off its entire gold stock in exchange for foreign currency, since Moscow has been particularly wary of foreign-currency depreciation. If the Soviets decided to sell their gold holdings, however, a central bank could temporarily disobey the rules and offset any undesired increases in the money stock by open-market sales of government securities with little, if any, loss of credibility in the gold standard. Unlike the case where the proportion of gold that backs central bank liabilities is reduced, an increase in the proportion would probably not result in a loss of confidence in a gold standard.

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A strict gold standard would be susceptible to large private speculative gold purchases and shifts in demand for gold by official and private institutions. If investors believed that the gold ceiling price set by the central bank could not be maintained, there would be a sudden surge in the demand for gold. The outflow of monetary gold would call for a reduction in central bank liabilities, resulting in a rise in interest rates and a contraction of the money stock until the gold flow reversed direction.

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A relatively small amount of net gold purchases from the monetary stock could substantially affect the money stock and national output if the gold outflow could not easily be reversed. For example, if a gold standard in the United States required that Federal Reserve notes and deposits at the central bank be backed by gold and if the price of gold were set at \$450 an ounce, the present US gold stock would be sufficient to back every dollar of these Federal Reserve liabilities with approximately 78 cents worth of gold at June 1981 levels. If this ratio were maintained, a \$1 billion gold purchase from the monetary stock would call for a \$1.3 billion reduction in central bank liabilities and an approximately \$3.2 billion drop in M1-B (0.75 percent), given the average money multiplier for 1980. In 1980, OPEC government institutions bought 150 tons of gold, worth more than \$2.1 billion at \$450 an ounce; a \$2.1 billion gold purchase from the US monetary stock would cause M1-B to drop by more than 1.5 percent

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