

# The role of the gold reserves and the rate of return on gold

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*Most central banks in industrialised countries have gold reserves which are part of the total foreign reserves. The reason for this is that gold has played a historic role in the monetary system. During the past decade, the price of gold has steadily fallen so that the role of gold in foreign currency reserves has been called into question in a portfolio-theoretical perspective. Central banks which have gold in their foreign reserves are able to obtain a return by lending the gold, however.*

## The historic role of gold

Gold was already used as a means of payment and as a store of value in ancient Egypt and in Mesopotamia. Gold has retained its role over the millennia. Gold continued to play an important role in a number of monetary systems at the end of the nineteenth century and for the greater part of the twentieth century.

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The first international gold standard was introduced by Great Britain during the 1870s. Great Britain was then the world's leading industrial power with very extensive trade. A lot of the world's major trading nations joined the gold standard system. The value of each currency was linked to a fixed quantity of gold which also meant that the exchange rates between the participating countries were fixed. The Riksbank exchanged gold for a particular quantity of kronor<sup>1</sup> and everyone had the right to exchange their banknotes for gold at this exchange rate. During the First World War, the gold standard collapsed although an attempt to re-establish it was made in 1925. However, the war had brought weaknesses in the gold

<sup>1</sup> The Riksbank's official exchange rate was SEK 2.48 per gram of fine gold.

standard system and this led to major problems during the economic depression in the early 1930s. On 21 September 1931, Great Britain announced that it would no longer be bound by the obligation to redeem pound notes for gold. Only six days later, Sweden also abandoned the gold standard.

Towards the end of the Second World War, there was great interest in the re-establishment of global economic forms of collaboration in the field of foreign exchange. A

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A new international monetary organisation, the International Monetary Fund, was accordingly established in July 1944 at an international conference at Bretton Woods in the United States. The main objective of the Fund was to facilitate the movement of goods and services from one country to another without major problems with trade restrictions. The Bretton Woods system was established as a result of this meeting and Sweden joined in 1950. In this system, it was now only the United States that undertook to maintain a fixed exchange rate to gold.<sup>2</sup> Unlike the situation during the gold standard, only central banks were now allowed to exchange U.S. dollars for gold at the Federal Reserve. During the 1960s, however, confidence in the U.S. dollar fell as a result of the large deficits in the American balance of payments, while Western Europe had increasing surpluses in its balance of payments. The surplus of dollars abroad eventually exceeded the value of the United States' gold holdings. Those with large dollar holdings had a tacit agreement not to destroy the system by demanding gold for their dollars. However, despite this, the situation became untenable in the long run. In August 1971, Richard Nixon announced that the United States was withdrawing its commitment to convert gold at a fixed exchange rate with the dollar. However, another two years were to pass before the Bretton Woods system collapsed altogether. Since 1971, gold therefore no longer plays a role with regard to exchange rate parities between countries.

## Price trends after 1971

Ever since 1971, when the fixed price of gold in relation to the dollar was abolished, the price of gold in dollars has been very volatile. At the end of the 1970s and in the early 1980s, most countries in the western world

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<sup>2</sup> The fixed exchange rate was 35 dollars per ounce. An ounce is equivalent to 31.103 grams.

suffered from high inflation which had been set off by a number of oil price shocks, among other things. This resulted in investors fleeing to gold which was considered to serve as a so-called “inflation hedge”. The price of gold rose dramatically in real terms (see Diagram 1).

**Diagram 1. The real gold price in dollars, January 1971–September 2001 (monthly data)**



Source: EcoWin.

**Since the mid-1990s, the trend for the gold price in dollars has been negative.**

At its peak, the gold price was 850 dollars per ounce, which was recorded on 21 January 1980. Since then, the trend for the gold price in dollars has been negative (see Diagram 2).

The gold price was at its lowest in mid-1999 at 255–257 dollars per ounce. There are a number of reasons for the negative trend. The factors which are often mentioned are reduced inflation in the world, the loss of the role of gold as a “safe haven” and the sales of gold by the central banks.

The rumours on future sales of gold by central banks were considered as having a negative effect on the price of gold. For this reason, fifteen European central banks<sup>3</sup> published a joint statement on gold holdings on 26 September 1999. Their agreement was to apply for five years, accordingly until 26 September 2004, and the statement published had the following wording:

<sup>3</sup> The fifteen central banks were the national central banks that then took part in the Eurosystem (Greece was not a member at this time and therefore did not participate), the European Central Bank and the central banks of Switzerland, the United Kingdom and Sweden.

1. Gold will remain an important element of global monetary reserves.
2. The undersigned institutions will not enter the market as sellers, with the exception of already decided sales.
3. The gold sales already decided will be achieved through a concerted programme of sales over the next five years. Annual sales will not exceed approximately 400 tons and total sales over this period will not exceed 2,000 tons.
4. The signatories to this agreement have agreed not to expand their gold lending and their use of gold futures and options over this period.
5. This agreement will be reviewed after five years.

**Diagram 2. The price of gold in SEK and USD respectively  
January 1971–October 2001 (monthly data)**



Note. As only monthly data is used, the highest daily listings that occurred during January 1980 are not visible.

Source: EcoWin.

When this agreement was published, the price of gold in dollars initially rose by approximately 25 per cent, although it then fell back to approximately the same level as before the agreement was reached. Diagram 2 shows gold price movements from January 1971 until October 2001 inclusive in Swedish kronor and U.S. dollars.

## The Riksbank's gold reserves

**The Riksbank's gold reserves total 185.4 tonnes, which is equivalent to approximately 10 per cent of the total reserves.**

The Riksbank's gold reserves total 185.4 tonnes, and the value of these corresponded to slightly more than 10 per cent of the total reserves on 30 June 2001. Table 1 shows a selection of central bank holdings of gold in relation to the total reserves also on 30 June.<sup>4</sup> The table shows that a number of countries in Europe, as well as the United States, have very large gold reserves in relation to other reserves. Among the Nordic countries, Sweden has the largest gold reserves.<sup>5</sup>

**Table 1. The gold reserves versus other foreign reserves of the industrialised countries**

	Gold holdings Tonne	Gold holdings Million USD	Total foreign reserves Million USD	Share of gold of total foreign reserves Per cent
<b>Euro countries</b>				
Germany	3 469	29.42	81.49	36.1
France	3 025	25.65	60.96	42.1
Italy	2 452	20.80	46.85	44.4
The Netherlands	912	7.73	16.96	45.6
Portugal	607	5.15	13.91	37.0
Spain	523	4.44	35.86	12.4
Austria	347	2.95	15.01	19.6
Belgium	258	2.19	12.25	17.9
Finland	49	0.42	8.12	5.1
Ireland	6	0.05	5.39	0.9
Luxembourg	2	0.02	0.11	18.8
<b>Other industrialised countries (excl. Nordic)</b>				
Switzerland	2 354	19.96	50.98	39.1
USA	8 137	69.01	122.70	56.2
United Kingdom	436	3.70	43.57	8.5
Japan	764	6.48	362.63	1.8
Australia	80	0.68	18.90	3.6
Canada	36	0.31	33.21	0.9
<b>Other Nordic countries</b>				
Sweden	185	1.57	15.71	10.0
Denmark	67	0.56	13.71	4.1
Norway	37	0.31	20.84	1.5

Source: International Financial Statistics, IMF.

<sup>4</sup> The gold holding is market value at the actual gold price as per 30 June 2001. This value can therefore differ from the book value that certain banks use in their accounts.

<sup>5</sup> The total quantity of gold that was owned by the public sector as per 31 December 2001 was 32 973 tonnes. Public sector here means all central banks and the supranational bodies such as the Bank for International Settlements, BIS, and the International Monetary Fund, IMF.



The Riksbank's gold reserves, measured by weight, have not changed in recent decades. The size of the gold reserves depends on the part played by the gold reserves earlier in the monetary system. The question of whether gold still plays a role in the monetary system will be taken up later in this section. First, an evaluation will be carried out of the gold reserves in a purely portfolio-theoretical perspective, independent of the agreement that the Riksbank is subject to on future gold management.

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## THE GOLD RESERVES

### IN A PORTFOLIO THEORETICAL PERSPECTIVE

In this section, the characteristics of the gold reserves relative to the foreign reserves are analysed from a risk and result-oriented perspective. The question is whether the Riksbank would have chosen to have gold in the total reserves had the bank not owned gold for historical reasons.

The return in the gold and foreign reserves is measured in Swedish kronor, which means that both the interest rate effect and the exchange rate effect are included. The period studied is from January 1985 up to July 2001 inclusive. During this period, the Swedish krona has depreciated in relation to all currencies that are now represented in the foreign reserves. The interest rate level (both as regards long and short loans) is generally lower at the end of the period than at the beginning. Two part-periods have also been selected in the study: January 1985 to August 1992 inclusive and January 1990 to December 1993 inclusive. The first part period was dominated by a depreciation of the dollar. The Swedish krona was then linked to the European currencies firstly through a basket of currencies and then through an ecu-basket. The second part period was dominated by a global reduction in interest rates at the same time as the krona, which towards the end of the period was no longer linked to the European currencies and started to float, depreciated in relation to all currencies in the present foreign reserves.

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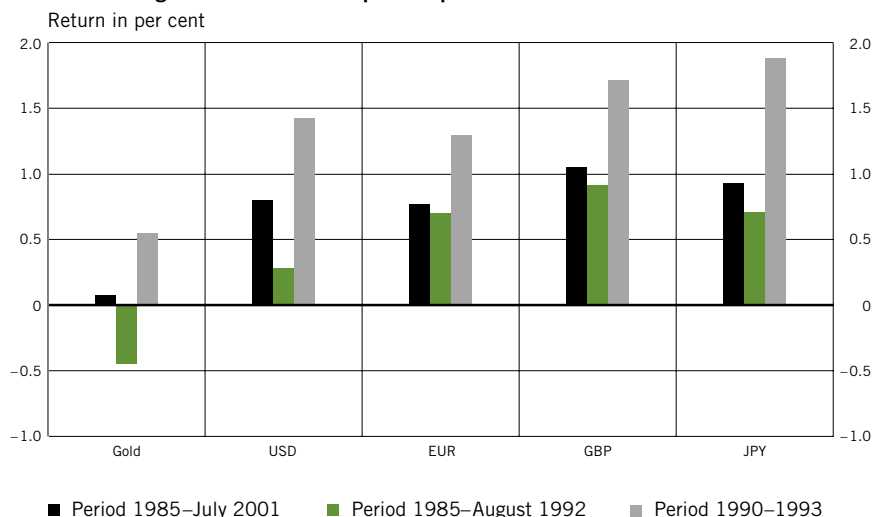
**The return on the gold and foreign reserves is measured in Swedish kronor, which means that both the interest rate effect and the exchange rate effect are included.**

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Diagram 3 shows the return measured in Swedish kronor and Diagram 4 the risk measured in standard deviation, in both diagrams for gold<sup>6</sup> and the curren-

<sup>6</sup> The return on gold consists both of the change in value of the gold and the return on gold received by lending the gold. In the calculation, three-months' deposit interest for gold has been used. The gold price, the gold borrowing fee and the exchange rate development have been taken from EcoWin.

**Diagram 3. The average monthly return on gold and for currencies in the foreign reserve for the respective period**



cies<sup>7</sup> included in the foreign reserves. The rate of return on gold has been relatively low throughout the period. The reason for this is primarily the negative development of the gold price in dollars. Since the return on gold is measured in Swedish kronor, the average monthly return is maintained over zero, however, since the Swedish krona has depreciated slightly in relation to the U.S. dollar during the period. The fact that the return on gold was negative during the period January 1985 to August 1992 inclusive is mainly due to the appreciation of the krona in relation to the dollar. During the period January 1990 to December 1993 inclusive, the depreciation of the krona contributed to the return being relatively high.

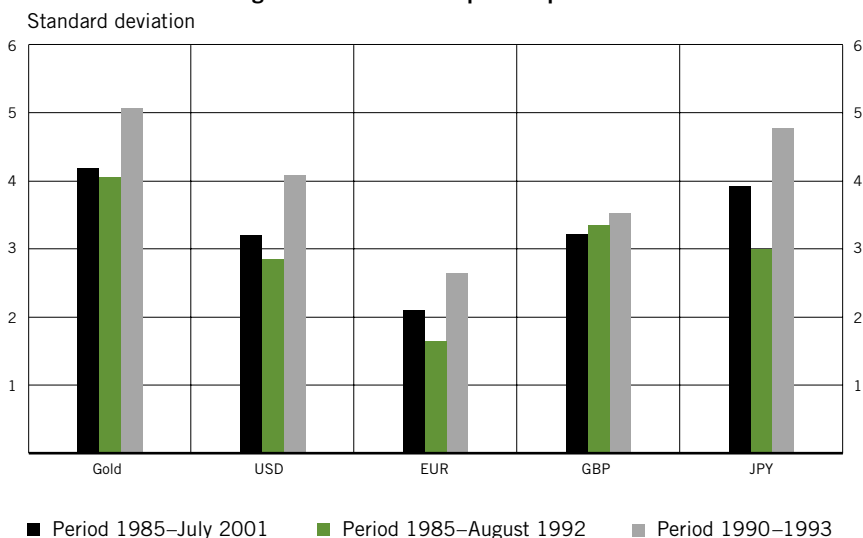
If one studies the risk measured in standard deviation, the risk for gold at the same time has been high relative to the currencies included in the foreign reserves. It is only the interest rate investment in Japanese yen that has had as high a risk as gold in the different periods.

In an assessment of the risk for a portfolio, it is, however, not only the risk of each individual asset that plays a role, but also the correlation between the returns on the assets. A low or negative correlation between two assets indicates that the risk can be reduced by investing in both assets.

There are not many studies that analyse gold as part of a portfolio. The few

<sup>7</sup> The interest index for the different currencies has been obtained from SalomonSmithBarney.

**Diagram 4. Risk measured as standard deviation for gold and for currencies in the foreign reserve for the respective period**



studies that exist claim that gold can improve the return on a portfolio by its price having a negative or low correlation to the price of other assets.<sup>8</sup> The studies only relate to a portfolio that is exclusively invested in American assets such as short U.S. government paper, U.S. shares and the like. In an assessment of the correlation between the gold reserves and the American interest portfolio in local currency (USD) for the three periods, the correlation is negative, between 0.00 and  $-0.20$ . When the correlation calculations are made between the gold reserves and the U.S. interest portfolio expressed in Swedish kronor, a somewhat different result is obtained. The correlation between these two assets is very high. This is due to there being an equal effect on the interest portfolio in dollars and the gold reserves in the event of an appreciation or depreciation of the Swedish krona in relation to the dollar. Diagram 5 also shows the correlation coefficients<sup>9</sup> between the gold reserves and the three other interest portfolios in the exchange reserves.

The fact that the correlation is negative to certain currencies during the peri-

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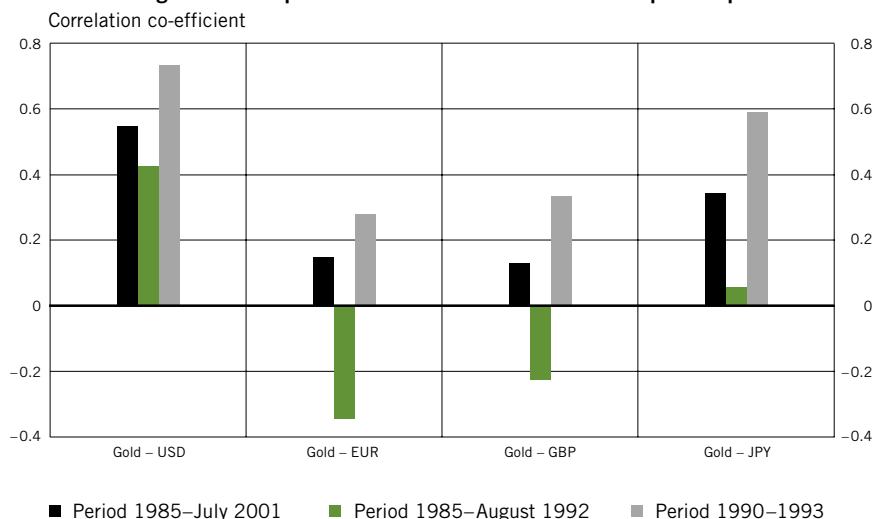
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<sup>8</sup> World Gold Council (1999) and World Gold Council (2000).

<sup>9</sup> If the correlation coefficient of the two assets is 1, this means that they are perfectly correlated, if it is 0, this means that they are uncorrelated and if it is  $-1$ , this means that they are perfectly negatively correlated.



**Diagram 5. Correlation co-efficients between gold and the four currencies in the foreign reserve expressed in Swedish kronor for the respective period**



od January 1985 to August 1992 inclusive, is probably due to the Swedish krona being first linked to a basket of currencies and then to an ecu basket before the krona was allowed to float in November 1992.

Based on these data, effective fronts<sup>10</sup> between reserves with a gold holding of 10 per cent and reserves without a gold holding have been calculated for the three periods (see Diagram 6, 7 and 8). In the calculation, it is assumed that the weights for the currencies included in the foreign reserves are the same as in the present foreign exchange norm distribution<sup>11</sup>, since they are set on the basis of other criteria than risk and return.

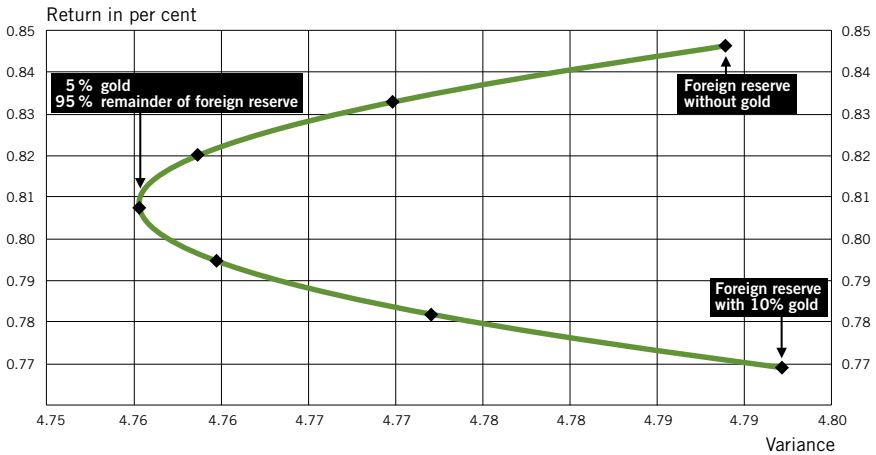
Since the calculation has only been carried out on two assets, the gold reserves and the foreign reserves, all combinations of the two assets end up on the front. The combination with lowest risk indicates that the proportion of gold should only be half as large as today, i.e. 5 per cent. In the effective front for the period January 1985 to August 1992 inclusive, it can be seen that despite gold producing a negative return, the negative or low correlation of gold to the currencies included in the foreign reserves made a positive contribution to the portfolio

<sup>10</sup> An effective front is obtained by optimising the distribution between the two assets in a portfolio, given a specific level of return. A portfolio is accordingly a front portfolio if it has the lowest variance of all portfolios with the same expected return.

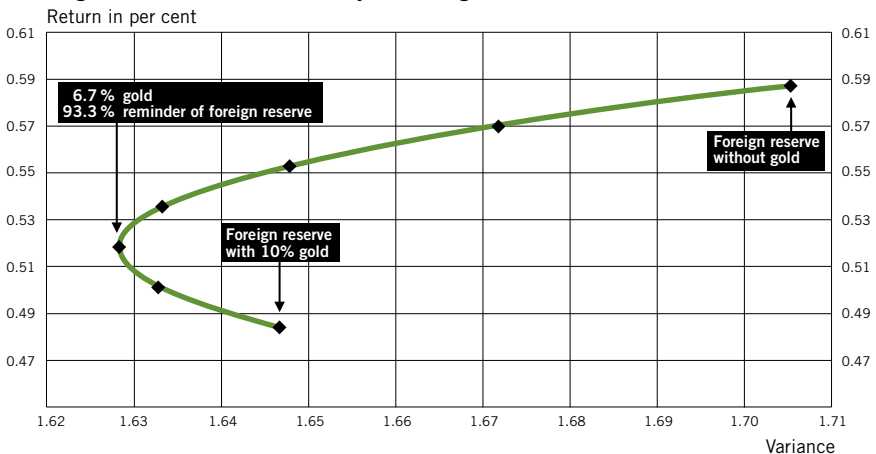
<sup>11</sup> The foreign exchange norm distribution for the foreign reserves is 35 per cent USD, 35 per cent EUR, 15 per cent GBP and 15 per cent JPY.



**Diagram 6. Effective front January 1985–July 2001**



**Diagram 7. Effective front January 1985–August 1992**



in terms of risk and the proportion of gold in the combination with the lowest risk is proposed as being 6.7 per cent. During the second part period from January 1990 to December 1993 inclusive, the result is the opposite.

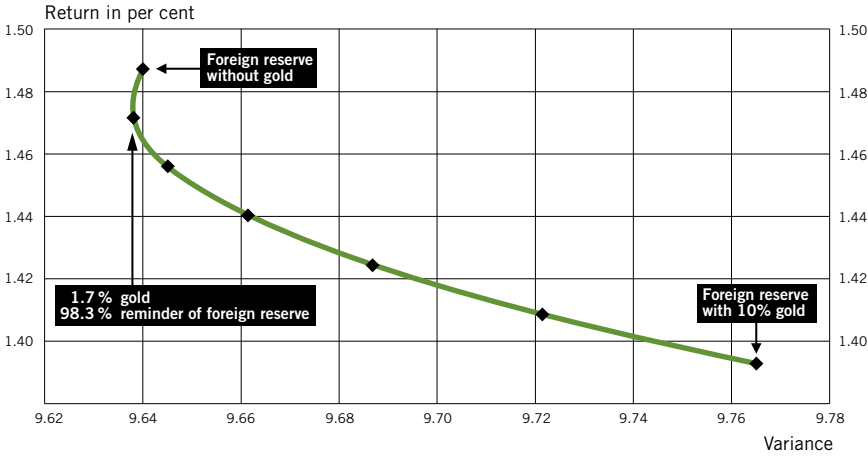
The interpretation of the result of the analysis is thus that gold serves to some extent to diversify risk in the total reserves although gold reserves of 10 per cent can be considered as being too large from a portfolio theoretical perspective. However, one should be careful in interpreting this result since the analysis is based on ex post-calcula-

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**Gold serves to some extent to diversify risk in the total reserves, although a proportion of 10 per cent can be considered too large from a portfolio theoretical perspective.**

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**Diagram 8. Effective front January 1990–December 1993**



tions over a period that cannot be considered as being representative for the future. It is not probable that the pattern from the period with a fixed exchange rate regime will be repeated.

### DOES GOLD STILL PLAY ITS TRADITIONAL PART IN THE MONETARY SYSTEM?

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**Gold is considered to be a safer asset in global crisis periods than other assets. The central banks therefore keep the gold reserves for reasons of preparedness for emergencies.**

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Gold has not served as an anchor in a fixed exchange-rate system since the Bretton-Woods system ceased in 1973. Since then, gold has served more as a store of value during turbulent periods both for central banks and investors. In the recent period, investors have tended, however, to replace gold as a so-called safe haven with currencies such as U.S. dollars and Swiss francs. In the above-mentioned agreement between the 15 European central banks, the participants consider, however, that gold is still an important component of the global reserves. The reason for this is that gold is considered a safer asset in global crisis periods, a reserve asset. The central banks therefore keep the gold reserves for reasons of preparedness for emergencies. The probability of gold playing a part in a fixed exchange rate system, as under the gold standard and the Bretton Wood, must be considered as very small, however.



## The lending market for gold

Central banks, who opt to retain gold in their reserves, have an opportunity to obtain a return on the gold beside the change in value. This takes place either through the central banks lending gold through making a so-called gold deposit. Or the central banks can obtain a return on their gold through a so-called gold/currency swap in the spot market, invest the payment received in a risk-free interest-bearing asset and purchase back the same quantity of gold on the forward market. The counterparty in both cases is a bullion bank. As a rule, the maturities are short, three to twelve months, due to restrictions in the risk mandates of the central banks. The fact that a demand to borrow gold has arisen is due to the derivative markets for gold that have developed over the last decade. Before these existed there was largely only a spot market for trade with gold.

The derivative markets that exist for gold are used both in speculative and price-hedging purposes. Above all, the derivative market for gold offers new opportunities for gold producers to hedge against future price risks, since it takes a long time to extract gold from the mines. The next section describes how a central bank obtains a return on its gold.

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**The derivative market for gold has offered new opportunities for gold producers to hedge against future price risks.**

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### GOLD DEPOSITS

Gold deposit is the commonest way for central banks to lend gold. A typical example of how a gold deposit can take place is described here. The starting point is that a gold producer wishes to hedge his future gold production.

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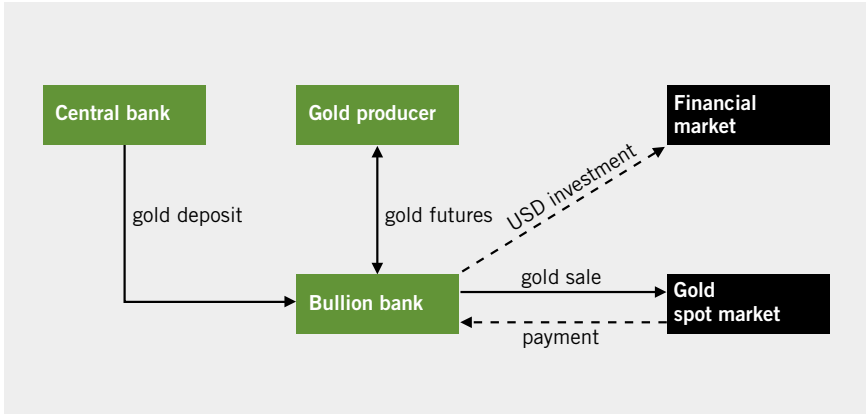
**Gold deposits are the commonest way for central banks to lend gold.**

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At the time  $t$  the gold producer hedges against a price risk by selling gold production as a future to a bullion bank. The bullion bank wishes to cover its open position and therefore borrows on deposit the equivalent quantity of gold from a central bank for a gold lending rate. We assume for the sake of simplicity that the maturity for the forward and the gold deposit are equally long. The gold is then sold by the bullion bank in the spot market and the payment received for the gold invested at a dollar interest rate.

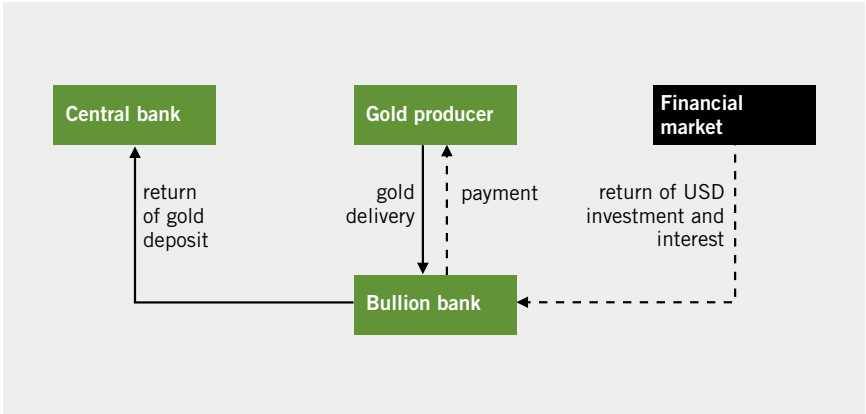
At time  $T$ , the bullion bank receives back the dollar investment and the interest in dollars. The gold producers supply the gold to the bullion bank for payment at the forward price. The bullion bank returns the gold to the central bank and pays the gold lending rate.

**Figure 1. Business transactions and flows at the time  $t$**



The return for the central bank in the case of a gold deposit is accordingly a gold lending rate received from the bullion bank. If the bullion bank is declared bankrupt, the central bank can lose the gold lent. The gold lending rate must therefore compensate for this risk.

**Figure 2. Business transactions and flows at time  $T$**



**GOLD/FOREIGN EXCHANGE SWAP**

A gold/currency swap is less risky for the central bank since the bank in theory sells the gold to buy it back at a fixed price at the end of the maturity. The central bank receives dollars for its gold which are invested at a risk-free interest rate. This investment can be regarded as collateral in the event of the failure of the

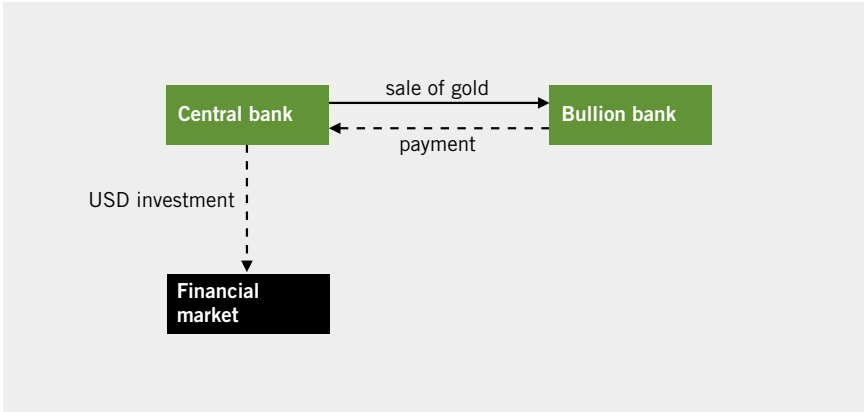
counterparty. The same transactions take place between the gold producer and the bullion bank as in the case of the gold deposit so that only the transactions and flows between the central bank and the bullion bank are shown here.

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**A gold/foreign exchange swap is less risky for the central bank since the bank in theory sells the gold to buy it back at a fixed price at the end of the maturity.**

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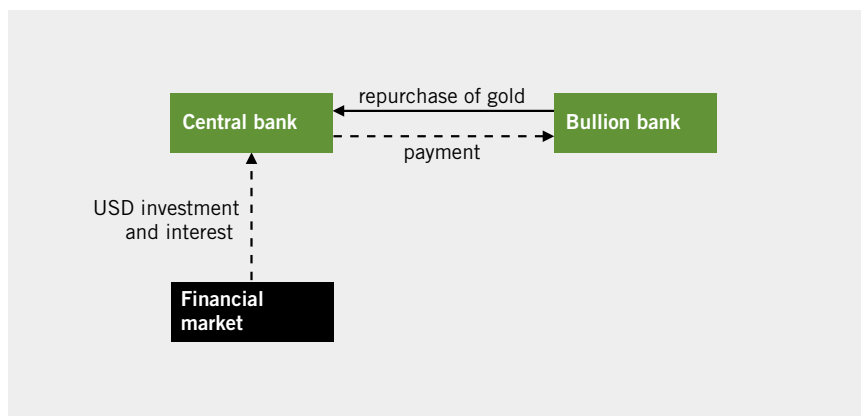
**Figure 3. Business transactions and flows at time  $t$**



At time  $t$  the central bank makes a gold/currency swap with a bullion bank, i.e. the central bank sells gold in return for an agreement to re-purchase the gold at a fixed price, a “forward price”, when the swap falls due. The dollars received by the central bank are invested at a risk-free market interest rate for dollars.

At time  $T$ , the central bank receives the dollars back that were invested and interest on the investment. The gold is repurchased from the bullion bank at the forward price set at time point  $t$ . As long as the amount the central bank receives for its dollar investment is larger than the amount the bank is to pay to re-purchase the gold according to the forward contract, the central bank makes a profit. The gold/currency swap is associated with some risk, however. If the bullion bank cannot supply the gold that has been agreed upon according to the forward contract, the gold must be re-purchased at market price. If the market price is higher than the future price, the central bank can make a loss. The risk in a swap transaction is, however, lower than in lending gold without collateral. The return the central bank receives is therefore normally lower in a gold/currency swap than in a gold deposit.

Figure 4. Business transactions and flows at time  $T$



## Historical trend for the gold lending rate

### RISKS WHEN LENDING GOLD

By lending gold, the central banks assume a credit risk and a liquidity risk.

A central bank's holding of gold is wholly risk-free viewed from a credit perspective. Gold as an asset generates no return, however, except by a change in its market value. By lending gold or by making a gold/currency swap, central banks assume in this way as described earlier a risk that the return must compensate for. The risks are:

- **Credit risk on gold deposit.** By lending gold without collateral, the central bank assumes a counterparty risk since there may then be a risk that the bank will not get the gold back if the counterparty fails.
- **Credit risk in a so-called gold/currency swap.** If the counterparty cannot comply with his undertaking in the future contract, the central bank may need to repurchase the gold at a higher price than the forward price in order to retain the gold reserve.
- **Liquidity risk.** During the maturity that the gold is lent or sold, there is small possibility of changing the gold into liquid assets.

If the central bank can accept an increased risk taking, there is an incentive to lend gold<sup>12</sup> as long as the return is higher than the risk.

<sup>12</sup> By assuming a credit risk on lending gold, the central bank places a burden on the set credit risk which could possibly be used for a more effective management of assets with higher returns.



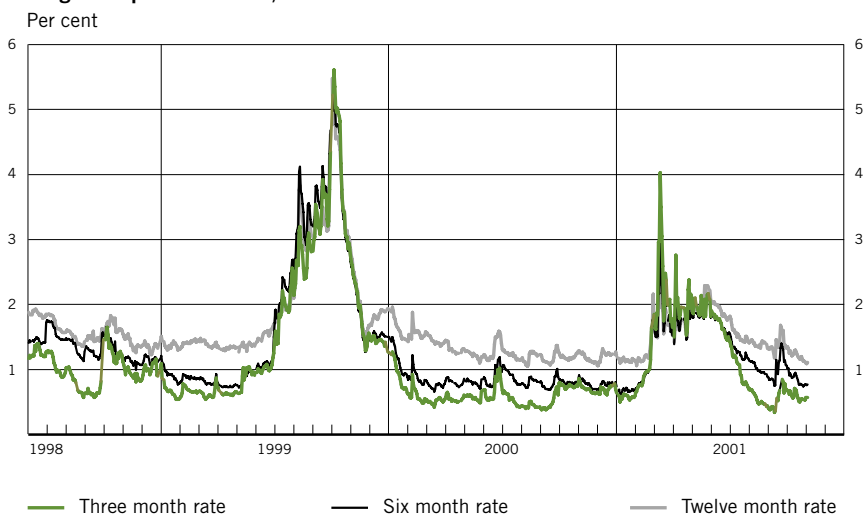
Many central banks are willing to lend their gold to obtain a return on the gold in addition to the change in value. The supply of gold for loan has increased in recent years. As per 31 December 2000 the estimated quantity of gold for lending by central banks was 4 830 tonnes.<sup>13</sup> At the same time, gold producers have reduced their forward books somewhat which means that the demand for gold for lending has fallen. This means that the return for lending gold is relatively low for central banks (see Diagram 9).

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**The return for lending gold is relatively low for central banks.**

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**Diagram 9. Gold lending rate 1 June 1998–30 October 2001 for gold deposits of three, six and twelve months**



Source: EcoWin.

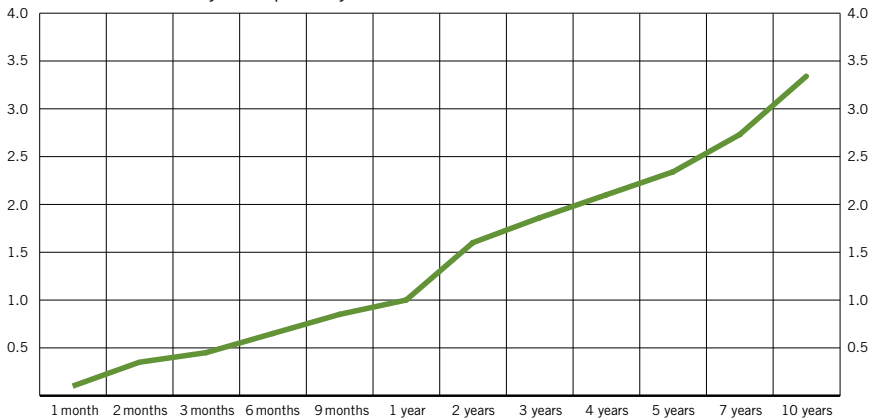
In the above example as regards gold deposit, it is assumed that the maturity for gold deposit and the gold forward were equally long. Gold lending by central banks previously took place as mentioned above most often on short maturities because of the credit risk. Gold producers on the other hand want to have a long maturity on their forwards since it can take a number of years to extract gold from gold mines. In this way, a mis-match arises between the preferred maturities for supply and demand for gold lending. This mis-match is reflected in the yield curve for gold which has a steep positive slope (see Diagram 10).

<sup>13</sup> According to Gold Fields Mineral Services Ltd.



**Diagram 10. The yield curve for gold as of 2 November 2001**

Per cent and month/year respectively



Source: Soci t  General.

## Summary

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**From a portfolio theoretical perspective, there is no major reason for the gold reserves to be as large as 10 per cent of the total reserves.**

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The reason that there is still gold in central banks' reserves is not due to gold being considered to be an effective asset versus currencies in the foreign reserves. The return on gold has been low in recent years at the same time as the risk has been high. When the correlation between gold and interest rate portfolios in the foreign reserves is measured in Swedish kronor, the correlation is so high that gold can no longer be considered as being a risk-diversifying asset in a portfolio. In this way, there is from a portfolio-theoretical perspective no major reason for the gold reserves being as high as 10 per cent of the total reserves. The reason for gold remaining in the reserves is rather that gold is still considered to play a special role in the monetary system.

Gold as an asset does not generate a return apart from a change in value. Central banks can obtain some return on the gold reserves by lending their gold, however. The fact that there is any demand to borrow gold whatsoever is due to the development of a derivative market for gold which makes it possible for gold producers to hedge future gold production. When lending gold, the central banks assume both a credit and a liquidity risk, however.



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