

The Swiss National Bank and seignorage

Autor(en): **Ungern-Sternberg, Thomas von**

Objekttyp: **Article**

Zeitschrift: **Revue économique et sociale : bulletin de la Société d'Etudes Economiques et Sociales**

Band (Jahr): **55 (1997)**

Heft 3: **La Banque Nationale Suisse : sous la loupe**

PDF erstellt am: **22.07.2024**

Persistenter Link: <https://doi.org/10.5169/seals-140638>

Nutzungsbedingungen

Die ETH-Bibliothek ist Anbieterin der digitalisierten Zeitschriften. Sie besitzt keine Urheberrechte an den Inhalten der Zeitschriften. Die Rechte liegen in der Regel bei den Herausgebern.

Die auf der Plattform e-periodica veröffentlichten Dokumente stehen für nicht-kommerzielle Zwecke in Lehre und Forschung sowie für die private Nutzung frei zur Verfügung. Einzelne Dateien oder Ausdrucke aus diesem Angebot können zusammen mit diesen Nutzungsbedingungen und den korrekten Herkunftsbezeichnungen weitergegeben werden.

Das Veröffentlichen von Bildern in Print- und Online-Publikationen ist nur mit vorheriger Genehmigung der Rechteinhaber erlaubt. Die systematische Speicherung von Teilen des elektronischen Angebots auf anderen Servern bedarf ebenfalls des schriftlichen Einverständnisses der Rechteinhaber.

Haftungsausschluss

Alle Angaben erfolgen ohne Gewähr für Vollständigkeit oder Richtigkeit. Es wird keine Haftung übernommen für Schäden durch die Verwendung von Informationen aus diesem Online-Angebot oder durch das Fehlen von Informationen. Dies gilt auch für Inhalte Dritter, die über dieses Angebot zugänglich sind.

THE SWISS NATIONAL BANK AND SEIGNORAGE

Thomas von UNGERN-STERNBERG
Professeur, Ecole des HEC
Université de Lausanne

Abstract: The purpose of this paper is to study the SNB's performance in managing Switzerland's seignorage wealth. The main conclusion is that the SNB has held an asset portfolio that was excessively liquid, not sufficiently hedged and not sufficiently diversified. This risky portfolio strategy was in large part dictated by the excessive legal restrictions placed on the SNB's asset management. It has cost the Swiss tax-payer in excess of 6'000 mio. Fr. in the period 1984-94. There is an urgent need to adjust the legal constraints and the institutional rules governing the management of this huge stock of assets, while at the same time maintaining or reinforcing the SNB's independence in formulating its monetary policy. The main propositions put forward in this paper are to: a) modify the law requiring the SNB to hold only short term foreign currency assets; b) abolish the anachronistic gold coverage requirement; c) take a substantial fraction of Switzerland's financial wealth out of the control the SNB and place it in a « seignorage fund ». This « seignorage fund » would manage its assets according to the standard criteria of portfolio management; d) impose legal or constitutional restraints on this seignorage fund to prevent the government from running down its assets. The net result of these changes would be a substantial gain to the Swiss government and tax payer.

I Introduction

In the eyes of the general public the long run performance of a central bank is usually judged by its record in keeping the rate of inflation at a sufficiently low level. According to this simple one-dimensional criterion the Swiss National Bank

(SNB) and the Deutsche Bundesbank (Buba) have certainly been among the most successful in Europe. In the last 15 years the average rate of inflation has been 3% in Germany and 3.1% in Switzerland.

In the shorter run even the general public realizes that this reductionist view may be too simplistic. Low rates of nominal wage increases and inflation may be the result of other institutional factors such as conservative trade unions and must not necessarily be attributed solely to the foresight of its central bankers. Furthermore, restrictive monetary policies may lead to excessively high real interest rates and /or exchange rates and have substantial costs in terms of (transitory) increases in unemployment. At various points in time the population has felt that the SNB has not given these social costs the weight they deserve in formulating their monetary policy ¹. Unfortunately the macro-economic interactions between the money supply, inflation and unemployment are quite complex and it is very hard to obtain unequivocal results on these issues.

The purpose of this paper is to analyze the performance of the SNB **in a different** domain, which is amenable to simple economic analysis. As lenders of last resort central banks are conferred a very lucrative monopoly, i.e. that of supplying interest free high-powered money. This monopoly is lucrative because commercial banks are willing to give up interest bearing assets to the central bank in exchange for interest free high-powered money. The assets which the central bank receives and the interest income it earns thereon are basically a **monopoly rent**. This rent is the direct result of the legislative powers of the country conferring to one single central bank the right to create high-powered money. This monopoly rent is usually referred to as the **seignorage** collected by the central bank. For the purpose of this paper it is useful to distinguish between asset seignorage and seignorage income. By **asset seignorage** we mean the value of the assets the central bank has obtained in return for supplying high powered-money. **Seignorage income** is the interest income it earns on these assets. In this paper we critically examine the use to which the SNB has put the seignorage it has collected in the last 10 years.

We shall emphasize the following points:

1) *Asset Composition*

The Swiss legislator has created practically no legal basis governing the allocation of the SNB's seignorage profits ². The SNB has reacted to this absence of legal restraints by retaining most of its profits. Over the years this has led to a situation where the (conservatively evaluated) assets of the SNB are approximately **twice** as high as the total central bank money supply. In 1994 the main components of the total asset holdings of 65.8 bio. Fr. were as follows:

- Foreign currency denominated assets of 46 bio. Fr., of which 87.5% were held in dollar form (essentially short term US government debt), and a mere 7% in DM assets. Only 43% of the dollar assets were hedged against exchange rate risks (through swaps). The Swiss franc value of the remaining 23.5 bio. Fr. worth of dollar assets was thus subject to substantial exchange rate risks.
- Approx. 2'600 tons of gold evaluated at 4595 Fr./kg, i.e. a total of 11.9 bio. Fr.
- Swiss Franc assets of the order of 4 bio. Fr.

On the liability side of the balance sheet there were 35 bio. Fr. of central bank money outstanding ³.

This asset structure is different from that of any other central bank in the world. No other central bank in the world:

- holds net foreign assets in excess of the total central bank money supply;
- holds an unhedged portfolio of foreign currency denominated assets in essentially one currency only (the dollar) equal to 70% of the central bank money supply. (For the Buba this fraction is 20%);
- holds a stock of gold equal to 40% of currency circulation. (The Buba's gold stock is less than 5% of its money supply).

2) *Return on investment*

Since the government has never participated to any significant extent in the SNB's seignorage income, the legal constraints it has placed on the SNB's investment activities have not given its **rate of return** on investment the consideration it deserves. Two types of legal constraints have turned out to be particularly costly:

- According to art. 14.3 of the law on the SNB, the latter may buy only foreign government debt with a maturity of less than 12 months. This has had two serious consequences:

First, the average return on long term assets is higher than on short term assets, i.e. the yield curve usually has a positive slope. Holding liquid assets far in excess of the total central bank money supply cannot be justified by any reasonable considerations of monetary policy. It is however clear that such a constraint has a substantial cost in terms of foregone interest income. Over the period 1984-1994 the average difference in returns on 3-month and 2-years dollar assets was of the order of 1 percentage point. The SNB could have earned, and transferred to the government, roughly **150 mio. Fr. more each year** if it had held slightly longer term debt rather than being forced to hold only short term debt.

Second the supply of short term government debt by countries other than the US is quite low. This may be part of the explanation why the SNB holds mainly dollar denominated foreign assets. But holding large amounts of unhedged US government debt has been both a very risky and a very unprofitable strategy over the last 10 years. Since the SNB does not publish detailed information about the composition of its dollar portfolio at any point in time, it is not possible to compute the exact returns it has earned. One can however quite easily obtain conservative estimates of the gains that could have been earned by using very simple alternative investment strategies. In Section II we show that by conservative estimates:

- a) If in the period 1984-1994 the SNB had held its unhedged foreign reserves in the form of German rather than US government debt it would have earned approximately **700 mio. Fr. per year** more. It could have transferred this amount to the Federal and Canton governments and still be no poorer than it is today.

- b) If instead the SNB had hedged all its dollar holdings against exchange rate fluctuations, it could have transferred an additional **550 mio. Fr. per year** to these governments, and still hold the same assets as it does today.

The unfortunate and risky investment strategy, which consisted of investing its unhedged foreign asset holdings essentially in dollars, would probably have been avoided if the SNB had been given the possibility of holding longer term foreign debt. It would certainly have been easier for the SNB to buy more DM assets, if it were not restricted to holding only foreign debt with a maturity of less than a year.

It must however also be emphasised that there is nothing in the law, which prevents the SNB from hedging a larger fraction of its foreign asset portfolio. **The decision to hold an important stock of unhedged US government debt was made by the SNB alone.**

- According to art. 19.2 of the law, the SNB is required to maintain gold reserves equal to 40% of currency circulation. The SNB's decision to hold on to its total gold stock since the break-down of the system of Bretton Woods is probably essentially due this legal requirement. Holding a huge stock of gold (2'600 tons) has been an excellent investment in the 1970's. In the last decade, however, most of the profits made then have been lost again. The price of gold has fallen from a high of 27'100 Fr./kg in 1984 to 16'700 Fr./kg in 1994, i.e. by 38%. Since the price level in Switzerland has increased by 33% in that period, the loss in terms of real (1994) francs was of the order of 53%. Gold is a totally sterile asset, i.e. there is no interest income to offset this capital loss.

3) *Central Bank Independence*

The SNB and other central banks claim (correctly, we believe) that they should have a considerable amount of independence in formulating and executing their monetary policy. From this they (incorrectly) deduce that they should also be given a considerable degree of freedom in choosing their investment strategies. Monetary policy is essentially concerned with controlling the money supply. No matter whether the central bank pursues a given growth target for the money supply, wishes to influence interest rates or pegs exchange rates, the central policy variable through which the central bank can influence the economy is always the quantity

of high-powered money it supplies. This amount appears on the liability side of the central bank's balance sheet. It is obvious that any change in the liability side of the balance sheet must be accompanied by an equivalent change on the asset side. It is however also true that any given structure of the liability side can be achieved by a wide variety of different compositions on the asset side: The fact that the SNB wishes to reduce the money supply does not mean that it must necessarily sell US government debt. It can achieve the same result by selling e.g. German government debt. Similarly, if the SNB wishes to hold foreign currency reserves to be able to defend the Swiss franc against a "speculative attack" from abroad, it does not need to hold huge amounts of unhedged foreign currency reserves. The same defensive capacity can be achieved if the dollar holdings are hedged against exchange rate risks.

The SNB currently performs not just one role but two, and these are to a large extent independent of each other. While it may have been very successful in managing the country's money supply, the return it has achieved in investing the nation's assets has not been impressive. A way must be found to improve the return Switzerland earns on its seignorage assets, without at the same time reducing the SNB's independence in formulating its monetary policy.

4) *Institutional Change*

The current legal constraints and institutional setting has not given the SNB the possibility and incentives to pursue investment strategies that were in the best interest of the Swiss tax payer over the last 10 years. The legal constraints and institutional setting should be adjusted to improve this state of affairs. In particular:

- The gold reserve requirement should be abolished.
- The SNB should be allowed to hold foreign government debt of longer maturity.
- The SNB should be encouraged to a) hedge most of its foreign asset holdings and b) diversify its portfolio of speculative (unhedged) foreign assets.
- Every year that part of the SNB's assets which exceeds 50% of the central bank money supply should be placed in a separate « seignorage fund » which is **not** given the same degree of institutional independence as the SNB. The

use to which the benefits generated by this investment fund are put, and the circumstances under which the assets could be used to finance long term investment projects of national importance, should be determined by the (democratically elected) Swiss legislator.

The rest of this paper is organized as follows: Section II studies the strategy the SNB has pursued with respect to its foreign asset investments. It emphasizes the fact that the risky strategy adopted by the SNB, which consisted of holding a huge portfolio of unhedged short term dollar assets has cost the Swiss economy considerably more than 6 bio. Fr. in the period 1984-1994. Section III briefly comments on the social cost of the gold reserve requirement, to which the SNB is still subject. Section IV proposes some institutional changes that would increase the SNB's independence in formulating its monetary policy and at the same time permit the Swiss economy to obtain a substantially higher return on its financial assets. Section V ends with some concluding remarks.

II Return on Foreign Assets

The SNB holds a portfolio of assets which at the end of 1994 was conservatively evaluated at 65.8 bio. Fr. One would expect that both the legal constraints placed on the investment strategy and the actual investment strategies pursued with an asset portfolio of this importance should be primarily concerned with achieving a good return on investment. After all, any increase in the interest income earned on the central banks investments can be used to alleviate the tax burden on the citizen, or finance useful expenditures (or transfers). **It is striking to note that both the legislator and the SNB seem to consider the rate of return achieved on this stock of assets far in excess of 50 bio. Fr. as being of secondary concern only.**

As a result one observes the curious situation whereby the minister of finance goes to great pains to adjust the maturity structure of government debt with the aim of minimizing his interest payments, while the legislator imposes constraints on the SNB's investment strategies without giving much thought to the consequences these have on the rate of return it can achieve. One might be tempted to justify this discrepancy by the requirements of monetary policy. It is however

quite obvious that this cannot be the true reason. **The SNB's holdings of unhedged short term US government debt of the order of 23.5 bio. Fr. cannot possibly be justified by monetary considerations.**

II.1 The legal framework

The reason why the government never gave much thought to the rate of return the SNB achieves on its investments is relatively easy to understand. The SNB has a long standing policy of not distributing its interest seignorage. Until 1991 it distributed slightly less than 7 mio. Fr. per year to the Federal government and the Cantons. This rule was changed in 1991, and as of 1992 the SNB pays out a maximum of 607 mio. Fr. per year. At the end of 1994 the SNB held financial assets evaluated at more than 50 bio. Fr. (on top of its sterile gold reserves). The current situation is thus that the SNB proposes to obtain a return of just over 1.2% which it is willing to pay out to the government.

It is interesting to note that the SNB has seemingly managed to convince the general public that there is something economically and politically suspect about the SNB paying out its interest seignorage to the government ⁴. We thus have the following situation: The SNB is given a monopoly to supply interest free high-powered money. The Swiss economy has to pay interest to obtain this money; and it is supposed to be economically unsound if the SNB is obliged to pay this interest income back to the Swiss economy. If anything, the opposite is true.

When increasing the maximum amount of seignorage income it was willing to pay out to the government in 1991, the SNB used a rather complicated formulation to explain that this would create no additional inflationary pressure: «The additional profit distribution will not weaken money supply policy. The Swiss National Bank will offset the effects of the additional distribution on the monetary base by means of its monetary policy instruments. Additional money creation for the purpose of profit distribution does not enter into consideration». This formulation might induce a reader to think that the distribution of the SNB's profits could lead to increases in the money supply and inflationary pressures, unless appropriate compensating measures were taken. This is not the case. There is **no link** between the fraction of its profits the SNB pays out to the government and the rate of

growth of the money supply. To understand this one can think of the following two ways the SNB could transfer its seignorage income to the government:

First, it could simply transfer a certain amount of treasury bills. The government would sell these on the open market. The money supply would be in no way affected **as long as the SNB did not decide to buy back the treasury bills itself**. There is no reason why it should do so.

Second, the SNB could itself sell the treasury bills on the open market, and exchange the dollars thus obtained against francs. This **decreases** the central bank money supply. When the SNB transfers these funds to the government who then either spends them or uses them to buy back government debt, the money supply **returns to its previous level**.

In both cases the transfer of seignorage profits has no incidence on the money supply. The only way a transfer of seignorage could lead to an increase in the money supply would be, if the SNB decided to finance this transfer by increasing the money supply rather than transferring a (small) fraction of its additional asset holdings to the government. There is obviously no reason why this should ever be necessary.

Given that the government has never participated in the SNB's seignorage profits, it is unsurprising that it never showed much interest in the return the SNB achieved on its assets. This manifests itself in the following ways:

- First, the law on the SNB nowhere specifies that it should aim at achieving a good rate of return on its investments.
- Second, art. 14.3 specifies that the SNB may hold only short term foreign currency debt. This has a major cost in terms of foregone interest income.
- And third, the SNB is nowhere obliged to either hedge or diversify its foreign asset portfolio.

The substantial cost this lack of appropriate incentives has had on the SNB's investment policies will be spelled out further on.

II.2 The SNB's policy

The claim that the SNB is not particularly concerned about the returns it earns on the assets which are entrusted to it may seem hard to believe in view of the sums involved. It is nevertheless true. The SNB has presumably always been aware of the fact that there is no other central bank in Europe giving such a small fraction of its annual seignorage income to the government. It nevertheless made only limited attempts to invest its assets in such a way that the country might expect a good rate of return on its (forced) savings.

In its annual report of 1982 the SNB summarized the policy it pursued with regard to its foreign asset holdings as follows: "Only a small fraction of the exchange reserves of the Swiss National Bank are placed on current account. For the most part they are held in the form of easily realized foreign debt, in particular on the American money market. In principle the dollars acquired on the basis of swaps are invested so that the terms coincide. For the rest of the reserves, the terms are spread over 12 months. In choosing its investments, the degree of liquidity and the quality of the debtors are the principal criteria, **the rate of return being a secondary consideration**". (Emphasis added.)

The formulation has changed slightly since then. It now reads: "The foreign currency reserves of the National Bank are invested taking into account the criteria of security, liquidity and return". One notes that return still comes only in third position.

It is worth reflecting on the question why both the legislator and the SNB should be so concerned with the liquidity of the assets it holds. As regards domestic assets, the central bank is a lender of last resort. It can create liquidity, and does not therefore need to hold liquid assets. As regards foreign assets, a certain amount of liquidity is desirable to be able to buy back Swiss francs at short notice. However this liquidity requirement in terms of foreign assets should not be exaggerated. The Federal Reserve Banks will always be able and willing to provide the SNB with liquidity, as long as it can show that it holds a sufficiently large stock of medium term US government debt. Similarly, the SNB could always sell its long term assets to commercial banks if it was in need of liquid foreign assets. And even if for some unfathomable reason the SNB is totally unwilling to rely on

either foreign central banks or commercial banks to supply it with foreign currency, there is still no reason for the SNB to hold (unhedged) short term foreign assets to the tune of 24 bio. francs, and (hedged) short term foreign assets for another 14 bio. francs. Under no conceivable circumstances will the SNB ever buy back Swiss francs for this amount within a short period of time. Even if it just sold the unhedged assets, it would decrease the Swiss central bank money supply by approximately 70%!

II.3 The cost of liquidity

Clearly the high degree of liquidity of the asset side cannot be justified by considerations of monetary policy. Holding liquid assets is however quite costly. On the Eurodollar market the differential between the 3-month interest rate and the 2-year interest rate was of the order of 1 percentage point over the period 1984-1994. For every billion the SNB had placed in longer term papers, it could thus have earned an additional 10 mio. francs. Over the last 11 years the SNB has held unhedged dollar assets with an average value was far in excess of 15 bio. Fr. (c.f. Table 1 below). **The SNB could easily have transferred to the government an additional 150 mio. Frs. per year (without running down its assets), if it had only been able to hold its unhedged dollar assets in the form of longer term debt.**

Note that by coordinating the maturity of its asset holdings intelligently, the SNB would still have been holding an important amount of liquid assets at any given moment in time. Its ability to pursue its desired monetary policy would not have been inhibited in any way. **Over the last ten years the legal constraint to hold only short term foreign assets has cost Switzerland more than 1'650 mio. Fr. just in terms of foregone interest income.** Given the magnitudes involved one should seriously consider whether a rapid modification of this legal constraint might not be desirable.

The loss in interest income of the SNB is of course a gain to somebody else. In this case the winner is the US government. **The legal constraint binding the SNB to hold only short term debt has essentially allowed the US government to finance part of its deficits at low short term interest rates.**

II.4 Security

The SNB regularly claims that it is concerned with the security of its investments. It does not specify in any detail just what criteria it uses to measure “security”. Looking at its investment strategy one comes away with the impression that it has a rather partial view of what “security” is. It goes to some pains to eliminate the risk that one of its debtors might default, but it seems to be rather less concerned when it comes to exchange rate risks. Table 1 gives the SNB’s holdings of foreign assets since 1984. We have chosen the annual averages rather than the values at the end of the year, since the former seem to us to be more relevant. In the second column of Table 1 the reader will find the central bank money supply. The only purpose of that column is to give the reader some idea of the relative magnitudes of the SNB’s assets and the outstanding money supply. The SNB each year evaluates its foreign asset holdings by using the average exchange rates in December of that year.

Table 1

Year	Central Bank Money	Foreign assets (Mio. Fr.)	Hedged dollar assets	Unhedged dollar assets (estimate)	Other currencies (estimate)
1984	31'089	30'450	12'369	13'775	4'307
1985	31'716	36'074	13'695	18'324	4'055
1986	32'248	35'296	14'264	17'480	3'552
1987	33'432	33'782	13'913	16'963	2'906
1988	31'486	31'760	11'935	17'037	2'798
1989	29'925	32'640	11'638	17'216	3'786
1990	28'898	35'029	10'431	20'152	4'446
1991	29'274	34'005	11'345	17'941	4'718
1992	29'020	37'872	12'547	20'654	4'670
1993	29'525	43'397	15'773	22'134	5'490
1994	30'051	44'328	14'384	24'223	5'722

One notes that the SNB holds **substantial** unhedged foreign currency positions. The total value of just the unhedged dollar positions has gradually increased from roughly 40% of central bank money supply (in 1984) to approximately 80%

of central bank money supply in 1994. One further notes that the SNB has not only been willing to hold such a substantial amount of unhedged foreign assets, it has not been particularly concerned with diversifying its foreign asset portfolio to reduce this exposure to any one currency depreciating. In the whole period more than 90% of its foreign asset holdings were denominated in dollars, and more than 75% of its unhedged foreign asset holdings were so denominated. This portfolio composition might have seemed reasonable in the middle of the seventies, just after the break-down of the system of Bretton Woods. By 1984 the SNB had had **10 years** to readjust its foreign asset portfolio. The SNB has obviously done very little to readjust its portfolio in the past, and apparently does not plan to do so in the future.

It would be a mistake to blame only the SNB for its unbalanced portfolio composition. The main responsible is art. 14.3 of the law governing the SNB, which states that it should hold only foreign debt with a maturity of less than one year. The market for short term government debt is nowhere as developed as in the US. The legal requirement to hold only short term government debt has thus had the effect of pushing the SNB into the market for US treasury bills.

It should however also be emphasized that there is no legal constraint preventing the SNB from hedging its foreign currency positions. The decision to hold an ever increasing share of its foreign assets without covering itself against exchange rate risks is the SNB's own. Similarly the SNB could have diversified its portfolio by continuing to hold dollar assets, but selling a fraction of these dollars on the forward market against other currencies (such as the DM or the yen).

II.5 The cost of holding unhedged dollar assets

To approximate the losses the SNB has made on its unhedged dollar assets, one must compare the return it has effectively achieved with the returns it would have obtained using other investment strategies. For this purpose one cannot just look at the capital losses it has made on its dollar holdings. These may to a certain extent be offset by higher interest income it may have received on its dollar assets.

We shall study two simple alternatives. The first is a situation where the

SNB holds all its unhedged foreign assets in DM ⁵ bonds. The second is the situation where the SNB hedges all its dollar assets. The difference in return is the result of two components: On the one hand the difference in losses due to foreign currency devaluations (relative to the Fr.); on the other hand the difference in interest income.

Since the SNB holds practically only short term assets, the difference in yield will be approximated by the difference in the 3-month Euromarket interest rates for the different currencies.

Table 2 summarizes the results of these comparisons for the period 1984-94. (All the numbers are in millions of Swiss francs.)

Table 2

Date	Unhedged \$ (estimate)	official \$ capital gain	estimated \$ capital gain	estimated DM capital gain	interest differential ($i_s - i_{Fr}$)(Ass)	interest differential ($i_s - i_{DM}$)(Ass)
1984	13'775	2'600	2'265	439	880	693
1985	18'324	-3'600	-3'247	258	618	564
1986	17'480	-3'700	-3'632	6	437	385
1987	16'963	-3'500	-3'431	-486	558	531
1988	17'037	1'970	1'897	567	814	624
1989	17'216	1'090	1'060	1'117	382	379
1990	20'152	-3'980	-3'732	-1'062	-137	-46
1991	17'941	1'697	1'564	620	-405	-590
1992	20'654	693	510	308	-841	-1'171
1993	22'134	764	653	-1'101	-363	-881
1994	24'223	-2'339	-2'235	-318	138	-150
Total		-8'304	-8'345	-347	2'081	336

The estimated dollar capital gains in Table 2 (column 4) were obtained by simply multiplying the SNB's estimated average unhedged dollar holdings by the rate of depreciation of the dollar. One notes that the results obtained by this simple approximation correspond closely to the capital gains (and losses) published by the SNB in its annual reports (column 3).

The estimated DM capital gains (column 5) were calculated in the same way, i.e. we multiplied the value of the average unhedged dollar holdings by the rate of depreciation of the DM.

The interest differentials were obtained by multiplying the (Swiss franc value of the) unhedged dollar asset holdings by the difference in (3 month) interest rates between the two currencies ⁶.

One notes that:

- a) the DM capital gains fluctuate substantially less than the dollar capital gains. This is a result of the fact that the Fr./DM exchange rate is much more stable than the Fr./\$ exchange rate. **The SNB could have substantially reduced the variability of its rate of return if it had been able to hold its unhedged foreign assets in the form of DM rather than dollar assets.**
- b) The capital loss (8.3 bio. Fr.) the SNB has made on its unhedged dollar holdings over the period 1984-94 was offset only very partially by the higher interest income it earned on its unhedged dollar assets (2.1 bio. Fr.). The net effect of the SNB's holding of unhedged dollar assets in the period 1984-94 was thus a loss of roughly 6'200 mio. Fr. or 550 mio. Fr. per year. **If the SNB had hedged all its dollar assets it would have been able to transfer 550 Fr. more per year to the Federal and Canton governments, and still hold the same assets it is holding today.**
- c) If the SNB had held all its unhedged foreign assets in the form of DM instead, it would have made a capital loss of only 350 mio. Fr. over the period 1984-94, i.e. 8'000 mio. Fr. less than it actually lost on its dollar holdings. The difference in interest income would have been a mere 350 mio. Fr. **The SNB would have been richer by 7.7 bio. Fr. at the end of 1994 if it had held all its unhedged foreign assets in the form of DM assets. Alternatively formulated, the SNB could have transferred an additional 700 mio. Fr. a year to the Swiss governments and still be holding the same assets as it does today if it had adopted the alternative investment strategy of holding German government debt.**

In view of the fact that the SNB is the only central bank in the world holding such a huge amount of unhedged foreign assets (in relation to the central

bank money supply) one can draw only one conclusion from these comparisons: **The SNB has, in the period 1984-1994, held a substantial speculative position in foreign assets. The legal constraints it faces have made it quite difficult for the SNB to diversify this position by holding assets denominated in a currency other than the dollar. The SNB has lost heavily on its speculative dollar position.** It may be difficult to quantify precisely the losses it has made on its dollar holdings. One can however obtain reasonably good (conservative) approximations of the amounts it could have saved if it had pursued other reasonable portfolio strategies. As a first approximation one can say that **over the 11 year period studied here the Swiss tax payer could have been saved 6'200 mio. Fr. if the SNB had hedged all its dollar assets. The tax burden could have been reduced by 7'700 mio. Fr. if the SNB had held its unhedged foreign assets in the form of DM.** These are substantial sums.

The reader can easily compute for himself the results the SNB would have obtained if the investment strategy it had used were some linear combination of its actual strategy and the two alternative strategies proposed here.

We do not for a moment wish to suggest that the SNB should have pursued either of the two very simple portfolio strategies outlined above. We do believe however that the numbers mentioned above are a **conservative** estimate of the cost imposed on the Swiss economy by the legal restraints and the SNB's policy choices that have resulted in the SNB's asset portfolio being held essentially in terms of unhedged dollar assets.

When politicians explain to the general public why they have to reduce public deficits they like to use a simple household analogy: a private household cannot afford to continuously spend more than it earns and neither can a government. The analogy is just as valid for portfolio decisions: **If a government authority holds a large fraction of the nations assets in a portfolio that is both undiversified and unhedged, this is a risky portfolio strategy. The losses made on that portfolio are a reduction in the nations wealth just as a fall in the value of shares held by a private household is a loss in that household's wealth.**

II.6 The SNB's justification

It is interesting to analyze how the SNB tries to justify its policy of holding such a large amount of unhedged and undiversified foreign assets. In its annual report of 1991 one finds the following quotes concerning the allocation of its profits.

« There is however no regulation on how the profit of the Swiss National Bank is to be calculated. It is uncontested that the Swiss National Bank must be in a position to fulfill its constitutional task without being under constraint to show a profit, and to create those reserves which are necessary from an operational and economic point of view. Thus the question arises to what extent the Swiss National Bank may withhold surpluses for the purpose of setting aside further provisions over and above the legal reserves. »

« In the past the Swiss National Bank has used its provisions mainly for building up foreign exchange reserves. The emphasis was on unsecured foreign exchange reserves, i.e. reserves not hedged against exchange rate risks through forward sales in the foreign exchange market. The unsecured foreign exchange reserves serve a number of purposes. They permit the Swiss National Bank to intervene in the foreign exchange market should the Swiss franc exhibit undue weakness. This function would have a particular significance if Switzerland ever decided to return to a fixed Swiss franc rate. In addition, unsecured foreign exchange reserves strengthen the Swiss financial center's resistance to crises and constitute a vital contingency fund in case of crisis or war. »

(This paragraph has the title: Purposes served by unsecured foreign exchange reserves.)

« Currency swaps, i.e. foreign exchange reserves that are hedged in the forward market, may not be used for currency interventions and as emergency funds in case of crisis or war. Such swaps in fact represent foreign exchange that has already been sold in the forward market. They serve, instead, as an instrument for steering the money supply. They are therefore increased in tune with the expansion of the monetary base rather than with the surpluses of the Swiss National Bank.»

(This paragraph has the title: Currency swaps increased by expanding the money supply)

II.6.1 Comments on the justification

It is worth thinking more deeply about these paragraphs. They quite obviously wish to convey the impression that unhedged foreign assets can be used to stabilize the Swiss franc while hedged foreign assets cannot. This is incorrect. If the SNB holds a large stock of US treasury bills it has the possibility of selling these on the market at any point in time, no matter whether it has already sold the corresponding dollar amount on the forward market or not. When it does so it

- a) increases the offer of US treasury bills on the US market, and
- b) reduces the Swiss money supply by an equivalent amount.

This is exactly the same effect which the SNB achieves when it sells unhedged US treasury bills. The only difference between holding hedged or unhedged dollar positions is thus as follows. When the dollar positions are unhedged, the SNB is permanently exposed to exchange rate risks. When the dollar positions are hedged it is exposed to exchange rate risks only in those (very rare) moments, when it actually intervenes on the foreign exchange market to stabilise the Swiss franc. The SNB's ability to intervene on the foreign exchange markets and stabilise the Swiss franc is the same in both situations.

If the SNB wishes to intervene on the foreign exchange markets in case of a weak franc, it must hold assets and be willing to sell these. Whether it has bought insurance against exchange rate risks or not makes no difference in this respect.

It is somewhat misleading to claim that the SNB has to hold huge stocks of unhedged foreign reserves to prepare for the time when Switzerland might wish to return to a fixed exchange rate regime. It may be true that Switzerland will have to hold substantial foreign assets when it does return to a system of fixed exchange rates. If that happens, however, the exchange rate risk will also be much lower. There is no need to hold a substantial (and very risky) stock of unhedged foreign assets today just to prepare for this somewhat hypothetical contingency.

Quite to the contrary, if the SNB does consider that Switzerland might wish to enter a system of fixed exchange rates in the future, this is an excellent reason

to **hedge its foreign asset holdings** until that point in time has actually arrived. If the SNB had hedged its dollar assets in the period 1984-94 it would today be in possession of a substantially greater stock of dollar assets. If the SNB really wishes to accumulate foreign assets, it should try to buy these assets when they are cheap rather than buy them when they are expensive, and then passively watch their real value fall.

The claim that holding a huge unhedged stock of dollar assets increases the resistance of Switzerland as a financial center is similarly unconvincing. As pointed out, the SNB has lost substantially more than 6'000 mio. francs on its unhedged dollar holdings in the period 1984-94. That is not an efficient way to strengthen the Swiss economy or increase the attractiveness of Switzerland as a financial center.

The best way to strengthen the Swiss Franc is to keep both the rate of inflation and the national debt at a low level. To keep the rate of inflation down one needs a restrictive monetary policy. One of the simplest and least painful ways to keep the national debt low is to invest the nation's financial assets so as to obtain a good return on investment. It is interesting in this respect to note that the treaty of Maastricht requires countries to have a) a low rate of inflation, b) low deficits and c) a low level of government debt. The question whether the countries' central banks hold large stocks of (short term) foreign assets is not even mentioned ⁷.

The formulation that swaps (hedged dollars) serve « as an instrument for steering the money supply » and « may not be used for currency interventions » is ambiguous. The SNB earns an interest income on its hedged foreign assets which is approximately equal to the (short term) Swiss interest rate on the Euro-franc market. This increase in the Swiss franc value of its hedged assets is clearly a seignorage profit. There is thus no reason why the stock of swaps should not increase as its surplus increases. The only way to interpret the above claim is that **the SNB has a deliberate policy of placing all its seignorage income in the form of unhedged foreign assets and is willing to increase its stock of hedged foreign assets only in line with the central bank money supply.** This is probably a fair description of what has actually happened.

II.6.2 Summary

The paragraphs cited above can at best be viewed as a rather weak attempt to justify the SNB's unbalanced portfolio composition. The SNB has faced legal constraints, which have made it quite difficult to hold a sufficiently diversified asset portfolio. The SNB itself has made only limited attempts to hedge or diversify this portfolio. **The current portfolio composition cannot be justified by appealing to considerations of monetary policy.** The SNB could have tried to diversify its foreign asset portfolio or buy insurance against exchange rate fluctuations (through forward sales, currency options etc.) like any other participant on the foreign exchange markets. The Swiss legislator has given the SNB no incentives to do so. Quite to the contrary, he has made it impossible for the SNB to hold longer term foreign debt and thus (indirectly) made it difficult to diversify its foreign asset portfolio. These legal constraints together with the SNB's decision to hedge only a small fraction of its dollar assets have cost Switzerland several billion francs in the last ten years.

III The Gold Stock

Under the Bretton Woods system the various national banks were legally obliged to exchange a foreign central bank's holdings of their own currency against gold, at the rates determined by the gold standard. The SNB made substantial use of this possibility. By the beginning of the 1960's it had accumulated roughly 2000 tons of gold, which were then gradually stocked up to reach the current level of 2590 tons. The SNB's ability to oblige other central banks to proceed to such exchanges may well have been reinforced by the fact that it was legally obliged to maintain a certain coverage of its notes in circulation by gold. This reserve coefficient is still fixed at 40%.

After the breakdown of the Bretton Woods system the price of gold soared, and many countries admired Switzerland's foresight in holding a large part of its reserves in gold (whose value rose sharply) rather than dollars (whose purchasing power fell continuously). This admiration may have been premature. The international monetary system is no longer based on gold. The IMF, the Federal Reserve Banks and other central banks have realised this, and have sold part of their gold

reserves when the gold price was high. The gold reserves of the SNB have been lying around as socially and privately unproductive capital for more than 20 years now. The price of gold in terms of Swiss francs has fallen steadily from a high of 32'800 Fr./kg in 1982 to 16'700 Fr./kg at the end of 1994, a **fall of 50 %**. The chances of this trend reversing itself seem slim. Other central banks have realized that gold has been demonetised, and continue to sell their reserves. Only a major political upheaval can reverse this tendency. In view of the quantities of gold held by central banks there seems to be virtually no chance that the price of gold can rise substantially in the near future. On the contrary, a gradual erosion is by far the most likely scenario.

It must be emphasized that the gold prices mentioned above should be interpreted with very great care. The stock of gold held by the Swiss national bank alone exceeds the world's annual production. If the SNB at any time decided to sell its stock of gold even at a slow rate, this would be enough to substantially accelerate the decline in the price of gold. The SNB could never have sold any major share of its gold stock at the list price of 27'000 Fr./kg in 1984 just as it could never hope to sell any substantial amount of gold at the list price of 13'900 Fr./kg at the end of 1995. The numbers do however illustrate that there is little to be gained and much to be lost, by following the conservative strategy which consists of just sitting on a huge gold stock because it happened to be there in 1973. If one waits till still more central banks have started to sell their gold the price one can obtain will be even lower.

By forcing the SNB to hold on to its gold reserves via the 40% coverage requirement the Swiss legislator has let the best period to reduce the SNB's excessive gold reserves slip by. Switzerland is now in the position that it can either hang on to an investment, where roughly 12 bio. Fr. are blocked with no reasonable expectation of obtaining a positive return in the not too distant future, or try to rid itself of this dead weight, in which case the truly disastrous consequences of the conservative investment strategy pursued in the past will become fully apparent.

One could of course try to argue that the stability of the Swiss franc over the last twenty years was possible only because the SNB held such a substantial gold stock. In view of the fact that the DM could become one of the most solid reserve currencies of the world in spite of a gold coverage that is smaller by a factor of

approximately ten, this argument cannot really be taken seriously. The strength of the Swiss franc, just like the strength of the DM, are essentially due to these countries' excellent macro-economic performance and stable monetary policies.

One may also adopt the perspective, that Switzerland should hold on to its gold stock in preparation of the next great war. If that is really the aim being pursued, the gold stock should be transferred out of the reserve holdings of the SNB into some account which is under the direct control of the Swiss political system. The democratic institutions can then freely decide whether the country really wishes to bear the huge opportunity cost of holding such an enormous stock of socially unproductive assets for the benefit of very uncertain future returns.

Either way Switzerland should follow the rest of the world and realize that at the end of the twentieth century a gold reserve requirement is a (very costly) anachronism. The relevant article of the law governing the SNB should be repealed, so that the issue of what to do with this unfortunate investment can at least be democratically discussed.

IV Institutional change

In the previous sections it was shown that the SNB has in the last ten years invested the huge seignorage profits which should really have gone to the Swiss population in a way that is hardly in the country's best interest. The reasons for this unfortunate state of affairs are to be found both in the legal constraints placed on the SNB and in its own autonomous investment decisions.

One of the main reasons why this costly state of affairs has been able to continue unchecked for such a long period of time is the fact that nobody in Switzerland was ever able to participate in the SNB's profits. The profits and losses the SNB made ended up being considered as something that happened only in their annual balance sheet, and had no direct implication for the Swiss taxpayer or the government's finances⁸. This is of course a fundamental mistake. When the SNB invests Switzerland's financial wealth in low return assets, this reduces the income of the Swiss population. If on top of this the assets it holds are issued mainly by foreign governments the net effect is a (substantial) redistribution at the cost of the Swiss citizen.

The institutional problem is thus as follows: On the one hand it is clearly in Switzerland's best interest to see to it that the nation's assets are invested so as to achieve a decent rate of return. On the other hand one wishes to maintain the SNB's independence which has allowed it to keep the rate of inflation in Switzerland at very reasonable levels in the past.

Attaining both these goals is not as difficult as one might think. The clue to finding the solution lies in thinking more carefully about the reason **why** one wants central banks to have such a large degree of independence. The reason is simple: governments are frequently tempted to finance their expenditures by increasing the money supply. In the longer run this invariably leads to an increase in the rate of inflation. This is socially very costly. The main purpose of giving the central bank a large degree of independence is thus the desire to have a monetary authority that decides on the rate of growth of the money supply (and formulates monetary policy) independently of government influence.

Monetary policy is essentially concerned with controlling the money supply (as a function of various macroeconomic variables). The SNB itself is well aware of this fact: The chapter of its annual reports it devotes to « monetary policy » is concerned essentially with the rate of growth of various monetary aggregates and the evolution of interest rates. The latter are of course directly influenced by the former.

Central banks always emphasize that their primary role is not to make profits. It would indeed be a catastrophe if the SNB should let its monetary policy be influenced by the question of how much more seignorage profits it could make if it increased the money supply more rapidly.

The analysis of the previous sections in no way criticized the way the SNB handled the money supply, interest rates and exchange rates. The essential problem is that the SNB (just like a number of other central banks) performs not just one role, but two roles which are largely independent of each other. On the one hand it formulates monetary policy. It should continue to do this with the same degree of independence. On the other hand it also manages a substantial stock of wealth. Its success in performing this role has been limited, in (large) part as a result of excessive legal restrictions.

There are no economic, political or institutional reasons why these two functions should be performed by the same institution. Quite to the contrary, there are excellent reasons why they should be institutionally separated: It is widely believed that formulating a steady and credible monetary policy requires stability, i.e. the ability to pursue the aims one has set oneself without being influenced by political pressure or short run shocks to the economic system. As mentioned before, it also requires the central bank to manage the money supply without giving any consideration to the resulting returns it earns.

Managing an asset portfolio on the other hand may require rapidly adjusting to new information that becomes available on the market. It also requires paying the greatest attention to the return one achieves on one's investments and carefully controlling the risks to which one exposes oneself. The huge losses the SNB has made on its investments of the country's seignorage are partly the result of the fact that the SNB has used essentially the same approach in its investment decisions as it did in the formulation of monetary policy.

The logical solution is thus to place the portfolio investment decisions and monetary policy into the hands of two separate institutions: Monetary policy continues to be the domain of the SNB. The SNB is also endowed with a stock of assets sufficiently large for it to be able to perform its functions. A stock of assets equal to 50% of the central bank's money supply should certainly be sufficient to achieve that goal. It might be advisable to encourage the SNB to hedge and/or diversify this asset portfolio.

The rest of the assets currently held by the SNB should be entrusted to a new institution which we shall call a « seignorage fund ». The seignorage profits the SNB makes and which increase its asset holdings over the above mentioned 50% limit would be automatically transferred to this fund. The role of the « seignorage fund » would be to invest the seignorage profits the country earns through the creation of high-powered money. Its essential objectives would be to obtain a high return on its investments without taking excessive risks. It is clear that civil servants frequently do not have the qualifications required to perform this kind of task successfully. The best solution would probably be to manage this seignorage fund in much the same way big companies manage their pension funds, i.e. entrust the funds to commercial banks specialized in the management of

financial assets, and periodically reallocate the assets between the banks on the basis of the performance they have achieved.

The Swiss government might want to define certain guidelines for the type of assets the « seignorage fund » can buy. It could for example prevent the fund from holding large amounts of liquid assets, since this might run counter to the aims of the SNB's monetary policy. Similarly the fund could be required to invest a certain fraction of its assets within the country. There is for example a wide spread feeling among economists that one of the factors hampering the growth of the Swiss economy is the absence of a well developed venture capital market. If this is the case, the country might well profit if a small fraction of the assets currently held by the SNB in the form of US treasury bills were used to increase the availability of venture capital in the Swiss economy.

One could argue that the one positive effect of the SNB's hanging on to the country's seignorage profits was the fact that this has prevented the government from dissipating them through increases in government expenditure. Alternatively formulated, if the SNB had paid out its seignorage income to the central government and the cantons, this would simply have led to a increases in (wasteful) expenditures rather than reductions in the tax burden. One may argue about the questions, to what extent the increased income would indeed have been used for increases in expenditures (rather than tax reductions) and to what extent these expenditures could be considered as « wasteful ». Either way it must be remembered that the SNB's policy has **not** let to the income being accumulated. A substantial fraction was simply lost as a result of the portfolio's excessive degree of liquidity and unbalanced composition. This is surely more wasteful than almost any use to which the central government or the cantons could have put the money.

There is one lesson one can learn from this type of argument. One wants to avoid a situation, where the government uses the increased seignorage income to simply increase its expenditures. It is thus desirable to set up institutional controls which prevent the Canton and Federal governments from running down the nation's assets. This could be achieved by setting up constitutional safeguards which specify that:

- a) the sum of the assets held by the SNB and the seignorage fund must **never** be allowed to fall below the total value of the countries money supply, and

should as a rule grow in line with the nominal national income.

- b) withdrawals in excess of the annual interest income can be made only to finance **long term investment projects of national importance**.

The essential effects of such an institutional modification would thus be as follows:

- 1) The independence of the central bank in the pursuit of its monetary policy would be not just maintained but strengthened. It would no longer be under any pressure to concern itself with the return it earns on the nations assets, and could devote itself to the pursuit of a credible, stable, long run monetary policy.
- 2) The country's seignorage would be invested by professionals whose qualifications allow them to effectively pursue the aims the country could reasonably expect from the investment of the financial assets it owns: a high rate of return at low risk.
- 3) The ultimate outcome would be that the country's seignorage income is put to the use to which it should always have been put. Either accumulate assets for the country which can be used in times of need, or alleviate the tax burden of the population. This is definitely preferable to what has been happening in the last 10 years: a large fraction of Switzerland's seignorage profits have been irretrievably lost because of the SNB's holding large stocks of unhedged short-term dollar assets. Only the US government can be really happy with this state of affairs.

V Conclusion.

The purpose of this paper was to emphasize that the SNB fulfills not just one but two important functions for the Swiss economy. First it formulates the country's monetary policy, and second it manages (a large fraction of) the countries stock of financial assets. While it may have succeeded well in performing the first of these two roles, its results in managing the country's seignorage profits have been disappointing. The main factors responsible for the low rate of return it has achieved were:

- a) The fact that it is legally obliged to hold practically only short term financial assets.
- b) The fact that it held a very undiversified portfolio of foreign currency denominated assets, i.e. essentially dollar assets. (This again is at least in part a result of the legal constraints under which it has had to operate.)
- c) The fact that an important share of these assets was not hedged against exchange rate risks.

If the SNB had hedged or diversified its foreign asset portfolio and been allowed to hold more long term debt, it could have saved the Swiss tax payer substantially more than 6'000 million francs over the last 10 years. The net effect of the SNB's risky asset portfolio has been an important redistribution at the cost of the Swiss tax payer.

Furthermore the SNB has held a substantial stock (2'600 tons) of gold. The price of gold has fallen continuously over the last 15 years. Since gold is a totally sterile asset, the opportunity cost of holding such a huge stock of gold is important.

The reasons for this very poor performance are largely to be found in the legal constraints the parliament has imposed on the SNB. As a consequence the legal constraints and institutional setting should be modified as follows:

- 1) The current legal restraint which does not allow the SNB to hold foreign assets with a maturity of more than 1 year, obviously cannot be justified by any considerations of monetary policy. In view of the substantial cost it imposes on the Swiss economy (estimated conservatively at 150 mio. Fr. per year just in terms of foregone interest income) this law should be rapidly modified.
- 2) Similarly the gold reserve requirement for Swiss currency circulation has imposed a huge opportunity cost on the Swiss economy over the last 15 years. Switzerland should follow the rest of the world in abolishing the anachronism.
- 3) Since formulating Switzerland's monetary policy, and managing the country's stock of financial wealth are activities that are to a large extent independent

of each other, these activities should be controlled by separate institutions. The SNB maintains its independence as regards its formulation of the country's monetary policy. As it requires a certain stock of financial assets to fulfill this role, it is left in control of a stock of assets equal to about 50% of the central bank money supply. It is encouraged to hedge or diversify this asset portfolio.

- 4) The rest of the country's financial assets are transferred into a « seignorage fund ». This fund does not influence monetary policy, but manages the country's financial wealth according to the traditional risk/return criteria. The best solution would probably be to entrust the day to day management of this fund to commercial banks specialized in such activities. The income earned by the fund is either accumulated or distributed to the Cantons and the Federal government in proportions to be determined. Constitutional controls are set up to prevent the government from running down the assets of the fund, except for the financing of important long term investment projects.

Since we started working on this paper the returns for 1995 have come in. The SNB has made a capital loss of a further 3.53 bio. Fr. on its foreign currency denominated assets. These losses are very real and not «just book losses ». They are just as real a loss to the Swiss economy, as a fall in the value of the dollar holdings of private individuals are a reduction in those individuals' personal wealth. At a time when the Swiss government is having great difficulties in financing expenditures and transfers which directly affect the welfare of the Swiss population, the country can ill afford to make such huge losses on its financial wealth. There is a strong need to adapt the legal and institutional framework, and there is a need to do so **rapidly**.

Notes :

- 1 C.f. Béguelin's article in the Journal de Genève (16.6.94) for an interesting analysis of these issues.
- 2 The exception is the legal obligation for the SNB to annually distribute a grand total of about 7 mio. Fr. to the federal and canton governments.
- 3 As well as retained earnings of approximately 25 bio. Fr.
- 4 Thus the Neue Zürcher Zeitung of the 4.1.1996 writes about "diese ordnungspolitisch problematische Ausschüttung".
- 5 Germany is Switzerland's most important trade partner.
- 6 One could try to object to this procedure on the grounds that the portfolio strategy of the SNB might substantially influence the interest rates in the different countries. This is not plausible. The Swiss central government debt has been increasing at the rate of 7.5 bio. Fr. a year, the German central government debt has been growing at the rate of roughly 50 bio. DM a year, and the US government debt at the rate of 200 bio. \$ a year. The world financial markets have absorbed these huge increases in the stock of outstanding debt without major changes in interest rates. There is thus no reason to believe that there would be substantial modifications in the interest rate structure if the SNB's asset portfolio were reallocated among the different currencies even within a relatively short period of time.
- 7 The volume of liquidity available on the Euromarkets is usually estimated to be of the order of 1'000 bio. \$. The idea that the SNB could ward off a concerted speculative attack by holding a large stock of foreign liquid assets is hard to take seriously, when one looks at the amounts that can be mobilised for an attack at very short notice.
- 8 Thus the title of the article in the Neue Zürcher Zeitung (4.1.96) reads: « Drastischer Buchverlust der Nationalbank », and not just « Drastischer Verlust.... ».

References :

- Béguelin, J.P. (1994) « Monétarisme boiteux et monétarisme plâtré » Journal de Genève 16/6/94 pp. 4-5.
- Eichengreen, B., Rose, A.K., and Wyplosz, C. (1995) « Exchange market mayhem: the antecedents and aftermath of speculative attacks » Economic Policy, October 1995 pp. 249-312.
- Schwartz, J.J. (1987) « Politique monétaire, bénéfices et comptabilité de la Banque Nationale Suisse » dans « Relations internationales, politique économique et méthodologie » O. de la Grandville ed. pp. 231-238 Geneva.
- Swiss National Bank (various years) « Rapport de gestion ».